



**An appraisal of the role of Project Management Offices
(PMO) in promoting Knowledge Management (KM)
within KSA construction companies**

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Abstract

The evolution of the construction industry and the increasing complexity of its projects, alongside the global economic crisis and concerns about repeating unsuccessful experiments in construction, have resulted in significant pressure on construction organisations, forcing them to establish new programs and departments to identify their priorities and achieve effective results. The importance of using project management (PM) practices is increasing dramatically. Organisations consider it increasingly important to employ PM to achieve project effectiveness and efficiency, helping to consistently employ knowledge, tools, and skills to meet the overall organisational objectives. In addition, the existence of knowledge management (KM) practices are important in helping to resolve PM challenges, increase project success rates, and improve business performance. In other words, the management of project knowledge not only increase the project's quality, but it also helps to avoid knowledge loss and reinventing the wheel.

A large number of researchers and experts have found that investing in Project Management Offices (PMOs) can lead to higher levels of project success whilst also embedding strong and consistent project management practices, processes, and procedures into the organisation. PMO is an organisation unit, department, or office that adopts and maintains the various practices of PM while also controlling organisational projects. Theoretically, the roles of PMO are responsible for providing and encouraging the KM practices. The PMO objective is to centralize knowledge and bring together lessons learned in order to convert this accumulated knowledge into more effective new procedures and processes. The Project Management Maturity Model (PMMM) proposed to address the different levels of PMOs to move from operation and tactical PMOs over time towards more directive and strategic PMOs by proposing a number of criteria and practices in each maturity level. Hence, PMMM should employ the KM processes and components within the PMO.

The adoption of PMOs is not without challenge. The biggest challenge currently facing the Kingdom of Saudi Arabia (KSA)'s construction firms is the introduction of robust immigration controls, in 2012, which state only a maximum of 50% of employees, can originate from outside the KSA. Given most project management staff are European and American citizens, this, together with the temporary nature of construction projects, causes a problem. Consequently, the KSA's construction firms are now facing a skills and knowledge drain as project management staff members leave both the organisation and country. Ultimately this leak of specialist knowledge and experience must now be addressed before it becomes a serious risk to both successful project delivery and organisational survival. One possible solution is to embed Knowledge Management via a PMO into the organisation in an attempt to capture the explicit and tacit knowledge returned by these professionals before they depart. Thus, this research suggests that as people hold knowledge and new knowledge is created at every phase of a project, if this knowledge is captured, it can flow seamlessly through the organisation if centrally stored and disseminated by the PMO. It was therefore resolved to appraise the emergent state of art in terms of PMO adoption and the extent tacit knowledge is amenity captured by KSA construction organisations.

The research aims to develop a conceptual framework for the implementation of Knowledge Management processes and components at various maturity levels of Project Management Offices. An extensive review of literature was undertaken to highlight the recent debates in regard to the study scope of PMO and PM maturity models and KM in functional and construction projects. As a result of this endeavor, the preliminarily theoretical framework was developed: 1) to identify the KM practices and the Knowledge Management Maturity Model (KMMM) to addresses and integrate KM within PMO; 2) to investigate the steps and procedures for establishing and evaluating PMOs and PM maturity models to assist the development of PMO; 3) to evaluate the effectiveness of PMO to encourage and adopt best practices of both PM and KM; and 4) to evaluate the current difficulties and challenges that affect the completion of KSA's construction projects and utilize the principles and values created via PMOs to address them. Current research explaining the PMOs advocates the PMO's critical function as a knowledge broker between group in the project team and senior management and also between projects within same organisation. Despite this strategically important role, current literature reveals a general lack of awareness within the KSA.

The mixed method was used in this research. The first phase carried out through a large-scale survey with KSA construction firms to test and evaluate the proposed framework. Approximately 340 questionnaires have been distributed equally between two independent groups of respondents. The first group consists of professionals working within the project environment whereas the second group targets senior and other staff, who are remote to the project, based at either regional offices or the organisation's central office. The second phase was interviews with PMO working groups, senior managers, and project managers. The interviews were conducted to test the findings of the survey and to investigate the KM processes and components at various maturity levels of PMOs. A total of 16 interviews were divided into four levels to investigate how each maturity level of PMO addresses KM practices whether in head office or projects environment. The findings of the research propose that there is mutual benefits between the maturity level of the PMO and the utilised practices of KM. This confirms that a Centre of Excellence maturity level of PMO has more effective roles for managing project knowledge.

List of Publications based on this Thesis:

- Alqahtani, A and Higham, A (2017) HOW PROJECT MANAGEMENT OFFICE (PMO) CAN BE USED TO IMPROVE BUSINESS PERFORMANCE AND CONSTRUCTION PROJECT SUCCESS. 13th International Postgraduate Research (IPGRC) 2017. *School of the Built Environment, University of Salford, Maxwell Building, M54WT, UK.*
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List of Abbreviations

Abbreviations	Description
PMOs or PMO	Project Management Offices
KSA	Kingdom of Saudi Arabia
KSA Vision	Kingdom of Saudi Arabia Vision (2030)
PM	Project Management
PMs	Project Managers
KM	Knowledge Management
OL	Organisational Learning
CoP	Community of Practice
HRM	Human Resource Management
PMI	Project Management Institute
APM	Association of Project Management
PMMs	Project Management Methodologies
PMMM	Project Management Maturity Models
KMMM	Knowledge Management Maturity Models
PWG	Project Management Office Working Group
PRINCE2	Project In Controlled Environment
PMBok	Project Management Body of Knowledge
OPM3	Organisational Project Management Maturity Model
P3M3	Portfolio Program Project Management Maturity Model

Chapter One:

INTRODUCTION AND BACKGROUND TO THE PROBLEM

1.1 Research Background

The evolution of the construction industry and the increasing complexity of construction projects, alongside the global economic crisis and concerns about repeating unsuccessful experiments, have resulted in significant pressure on construction organisations to establish new programs and departments to identify their priorities and achieve effective results (Hobbs and Aubry, 2010; PM Solutions, 2010). The importance of using Project Management (PM) practices is increasing dramatically. However, project management approaches have expanded rapidly, and one size does not fit all. This is one of the factors that have increased the pressure on construction firms to engage in these practices properly (Barnes, 2012; APM, 2012).

Both Project Management (PM) and Knowledge Management (KM) are crucial in developing business performance. The application of PM is used to employ appropriate knowledge, techniques, skills, and processes to meet the organisation's requirements (PMI, 2008; Kerzner, 2012; APM, 2012; Alsahli, 2013). Similarly, the application of KM is used to improve project activities and to secure the project's success by employing the proper knowledge at the right time (Egbu et al; 2001, Carrillo et al, 2004; Ahmad and An, 2008; Hislop, 2009). During the project lifecycle (Initiating, Planning, Executing, Controlling, and Closing) a number of activities take place, which comprise of various procedures, methods, and policies. Therefore, for delivering successful projects, the utilisation of project team member's knowledge is crucial. However, in mega and complex projects the integration of different project stages with their related activities have been a problematic challenge.

Within the Saudi Arabian context, the strategic aim of the Saudi government has been to establish a wave of development projects that can contribute to the provision of appropriate services to cope with the growing population, for instance, in areas such as transportation, healthcare, and energy (CCDOS, 2013). As a result, the majority of construction firms set out to enter the Saudi construction market and take advantage of current opportunities by winning more than one project tender (Thigah, 2012; Alsahli, 2013). Additionally, because the size and number of new projects being implemented can grow within one organisation, this has the

potential to raise questions as to how to make these projects successful. Because many construction projects in the KSA are suffering from the problem of faltering and delayed projects, how to define and create suitable project management processes and practices that can achieve the overall objectives of the company has become an important issue.

A large number of researchers and experts, including the Association of Project Management (APM) (2006), the Project Management Institute (PMI) (2009), and Tylor (2011) have found that investing in the creation of Project Management Offices (PMOs) can lead to higher levels of project success, while also driving strong and consistent project management practices, processes, and procedures across organisations. For this reason, increasing the implementation of the PMO has been highlighted as a target in the KSA government's strategic plan entitled 'Vision 2030', which articulates a series of reforms for government departments and quasi-governmental organisations.

The idea of PMO began to spread in the 1990s (Hurt and Thomas, 2009), developing initially to help organisations create modern methods of monitoring and following up on projects to ensure that they are delivered on time and either on or under budget. Yet despite the obvious benefits the PMO offers in terms of organisational management, senior leadership teams within organisations have only recently started to see the benefits associated with their implementation. Recent research by both ESI (2011) and later by APM (2013) discovered that over 60 percent of PMOs currently in operation within organisations had only been established in the preceding five years.

The PMO has been defined as *“a strategic, management orientated concept designed to manage business processes orientated towards construction as it is not designed to manage construction projects”* (Obrochta *et al.*, 2011:4). However, PMOs can also be a group of experts or a department that includes a number of people from different areas within an organisation, tasked with applying best PM practice (Rouse, 2014; Andrew, 2013; PMI, 2012). Hobbs & Aubry (2007) develop this definition, noting the PMO can also often act as a regional office, coordinating multiple projects. Alternatively, the PMO can fulfil the role of acting as a centre of excellence through which the implementation of best practice is supported and knowledge sharing across the organisation is encouraged in an attempt to improve overall performance (Hizamul, 2010; Alsadeq *et al.*, 2011).

1.2 Research Problem

The adoption of PMOs is not without challenge (Cunha et al., 2011; Shahram et al., 2014). The biggest challenge currently facing the Kingdom of Saudi Arabia (KSA)'s construction firms is the introduction of immigration controls, in 2012, which state only a maximum of 50% of employees can originate from outside the KSA (Diry, 2012; Alsahli, 2013). Given that most Project Management staff are either European or American citizens, this, together with the temporary and transient nature of construction projects, is causing a significant challenge to most medium to large construction firms operating in the KSA. As a result, the KSA's construction firms are now facing a skills and knowledge drain as Project Management staff leave both the organisation and country (Deemah, 2014; Halwah, 2013; Majmah, 2013). Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival.

Within the current literature, there is insufficient exploration of how PM and KM work within the PMO. This is a significant gap in the existing literature. Therefore, an attempt should be given to integrate KM practices into PMO as an effective tool to encourage and facilitate the various processes of KM and develop the importance of PMO from KM perspective. This will result in improving efficiency of PM and increasing project success rate. Figure (1.1) is provided to illustrate the research project's key areas:

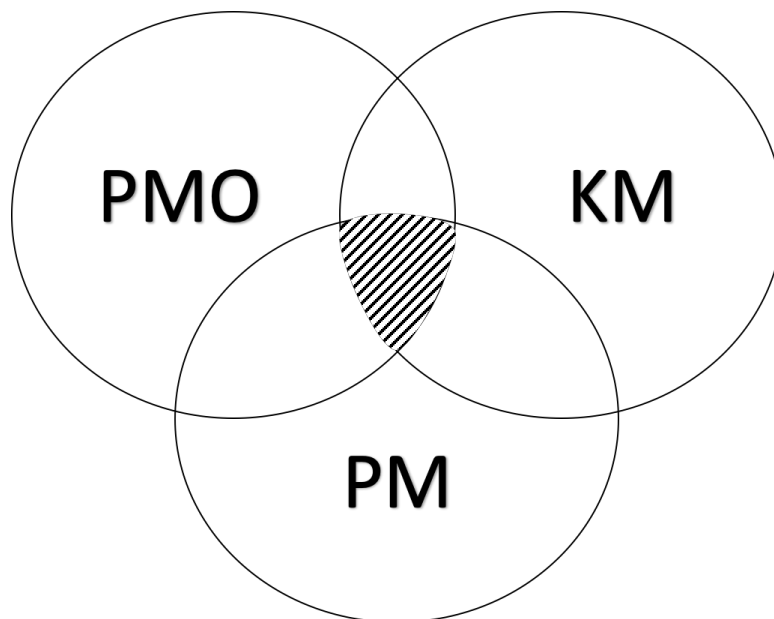


Figure 1.1: Research key areas

1.3 Rational for the research

As a result of these changes in KSA policy this research aims to develop a conceptual framework for the implementation of Knowledge Management (KM) via a PMO to capture the explicit and tacit knowledge these professionals hold before they depart. KM is becoming one of the most significant assistants for any organisation and is considered as a complement to various business activities (Wong & Fong, 2005; Levene & Kelleher, 2007). Through the suitable adoption of different KM processes, organisations can increase the possibility of achieving competitive advantage and improving the organisational learning process to enhance their performance (Li & Gao, 2006; Ahmad & An, 2008). Construction organisations are increasingly adopting KM as they seek to improve their competitiveness by integrating knowledge to reduce time and cost by sharing learning from previous experiences, whether successful or unsuccessful (Bergeron, 2006; Ahmad et al., 2007;). Thus, employees can begin to find solutions for their problems without spending more effort, time, and cost through recourse to solutions that already exist and can be accessed elsewhere in the company.

Since many companies tend to repeat the same mistakes, reinventing the wheel, they forget the most important project component: "people". Knowledge Management (KM) can form a fundamental feature of the PMO. Given that KM aims to provide a mechanism through which organisations can share, reuse, capture, and identify important knowledge, the importance of accessing and retaining the knowledge of the employees that hold this knowledge is imperative (Tserng & Lin, 2004; Ahmad & An, 2008). PMOs can be relative to KM and acting as centers, mentors, and can guide a wide range of KM practices (Hobbs, 2007; Koskinen & Pihlanto, 2008). Thus, this research argues that, as people hold knowledge and as new knowledge is created at every phase of a project, if the KSA construction sector is to respond to the risk introduced as a result of new immigration controls, it is essential tacit knowledge is captured and stored within organisations. It must therefore follow that organisations must introduce effective mechanisms that will allow this captured knowledge to be seamlessly disseminated through the organisation, which can be achieved via a central or regional PMO.

The roles of PMOs are not only being considered in terms of business performance, currently a large number of construction organisations have also begun to consider the advantages of applying PMOs to centrally mentor, facilitate, and manage the various projects delivered by the organisation (Valle et al., 2008; Kerzener, 2009; Andrew, 2013). This will often entail the

uniform application of different processes, practices and policies adopted by PMO for the entire organisation's site-based projects. It has been noted that the establishment of PMOs can result in significant benefits for the organisation through the application of improved or enhanced best practice of PM (Sontosus, 2003; Almagrabi, 2012; Rouse, 2014). This is particularly true because the PMO has been shown to foster enhanced knowledge sharing and organisational learning across the organisation (Desouza & Evaristo, 2006; Hobbs, 2007; Koskinen & Pihlanto, 2008).

Other authors corroborate this PMO objective of being able to centralize knowledge and then converting this accumulated knowledge into new more efficient procedures and processes (Rose, 2011; Unger et al, 2012). Thus, important functions and roles of PMO can confirm its direct impact on the practices of KM and PM, enabling the diffusion of valuable ideas and innovations throughout the organisation.

1.4 Research Questions

To introduce the research aim and objectives set out below, five questions of this study have been defined, as follows:

1. What are the critical success factors of PMO in increasing productivity and improving business performance?
2. How do PMO roles and functions contribute to help organisations to adopt and maintain PM best practice?
3. What processes do companies need to establish or develop unique PMOs?
4. To what extent are KM components, types, and processes employed in the PMOs?
5. How does the role of each maturity level of PMO contribute to managing project knowledge?

1.5 Research Aim and Objectives

The research aims to develop a conceptual framework for the implementation of Knowledge Management processes within KSA construction firms' Project Management Offices. Pawlowsk and Bick (2012) propose the utilisation of framework to describe both concepts and their significant relations. This is used to support such processes or systems and creating a better understanding of specific purposes. In this research, the framework will be used to identify and understand the relationships between PMO and KM with a view to structuring and guiding the application of both in order to increase the effective management of construction projects and to improve business performance. This framework is a first step towards building a conceptual framework to combine PMO and KM, which has not been achieved yet. Based on current literature, six specific functions of PMOs were identified. Taking into consideration the challenges and difficulties that lead projects to falter and be abandoned, the introduction of immigration control in KSA, and the Saudi Arabia's vision (2030); the research focuses on how KM is fundamental to the effective function of PMO and therefore requires implementation to addresses the previous issues. While every effort has been made in this research to define, integrate, and develop the key factors of KM implementation and practices at various maturity levels of PMO.

In order to fulfill this aim, the objectives of the research are:

1. To generate an understanding of the reasons project falter and/or are abandoned in the KSA in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance.
2. To critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice.
3. To identify and examine the basic steps and procedures used for establishing and evaluating PMOs to facilitate and addresses the barriers and challenges that face its implementation.
4. To critically assess the existing nature of KM components, types, and processes to identify the barriers and challenges that face its implementation in the KSA.
5. To critically assess the existing nature of PMOs maturity levels and how the PM maturity model assists its development during the different phases of the project.

1.6 Research Expected Contribution

Building upon the important insights developed by existing scholars, the management of knowledge has been undertaken largely either in focusing only in specific knowledge type as Carrillo (2007), specific processes of KM as Boyd et al. (2004) or in dealing with KM strategic issues as Kamara et al. (2003). Similarly, in the KSA, most studies on KM (Alhamoudi, 2010; Alyoubi *et al*, 2012; Nafei, 2013; Almuayqil, 2015) have shown the current interests by organisations in the KSA to implement KM. Others including Zakeyah (2007), Yasser (2011) and Sami (2013) have focused on the importance of KM as a modern principle for showing its effectiveness in developing the organisational performance. Maged and Salah (2012) have examined the problem of identifying the processes of KM and their relation to business development. However, while Alhamoudi (2010) has done important research in developing Knowledge Management System in the Public Sector in Saudi Arabia, this study missed out vital aspects that this research project will seek to address; the lack of involvement of senior management, the lack of access to different types of knowledge within organisations due to the lack of central learning resources and finally where tacit knowledge is captured within the organisation this is poorly stored and managed.

As a result, it was resolved that this study will aim to contribute to knowledge by starting to fill some of these gaps in current knowledge through integrating KM processes and components in PM maturity models within PMO. Additionally, the developed framework also represents the first clear attempt to evaluate the role of Knowledge Management and the role of PMO in KSA construction firms as well as the PMO maturity levels from a KM perspective. This study contributes to the general body of work that suggests the optimisation perspective between KM and PMOs as an influence on organisational performance (Desouza & Evaristo, 2006; Hobbs, 2007; Koskinen & Pihlanto, 2008). The expected contribution to knowledge by this research can be summarised as follows:

1. To address the serious problems that face organisations in managing their business and projects.
2. To increase the awareness of KSA's construction firms about the importance of applying PMOs.
3. To build a conceptual framework combining both PMO and KM, which has not been achieved yet.

4. To be the first clear attempt in the KSA to propose a specific tool, guidance, and model for adopting KM processes that will enable the distribution of tacit and explicit knowledge throughout the organisation.
5. To add to the general body of knowledge that suggests the optimisation perspective between KM and PMOs as an important influence on organisational performance.
6. To fill some gaps in existing knowledge that identified series weaknesses within the KSA warranting further investigation.
7. To respond to the call of Saudi's 2030 Vision that encourages all governments sectors to establish PMOs.

1.7 Research Scope

This research began by identifying the three main areas of interest and then reviewing related literature linking them together. However, based on the literature, six specific functions of PMOs were identified. Taking into consideration the challenges and difficulties that lead projects to falter and be abandoned, the introduction of immigration control in KSA, and the Saudi Arabia's vision (2030), the research emphasizes the importance of KM as one of the effective functions of PMOs. Due to the fact that the KM area is huge, the focus of this research was narrowed down to four KM processes: knowledge creation, knowledge sharing, knowledge application, and knowledge capturing.

This study proposes the implementation of PMO in promoting these practices in KSA construction firms by using five necessary perspectives known as: organisational learning, organisation structure, organisation culture, human resources, and competitive advantage. However, as it is important to consider KM types, explicit and tacit knowledge are equally considered in this research. Finally, it would have been impossible for finding the similarity of different organisations that possessing the same management styles, structure, and finances in the KSA.

This requires the research to adopt as a first phase a large survey on medium to large construction firms. The evaluation of KM processes is investigated from two areas: people who work on the site or project and people who are located in a regional or head office away from the project. The second phase was 16 interviews divided into four categories, to represent the

various maturity levels of PMOs. Figure 1.2 is provided to highlight the research relations based on further specifications within each topic:

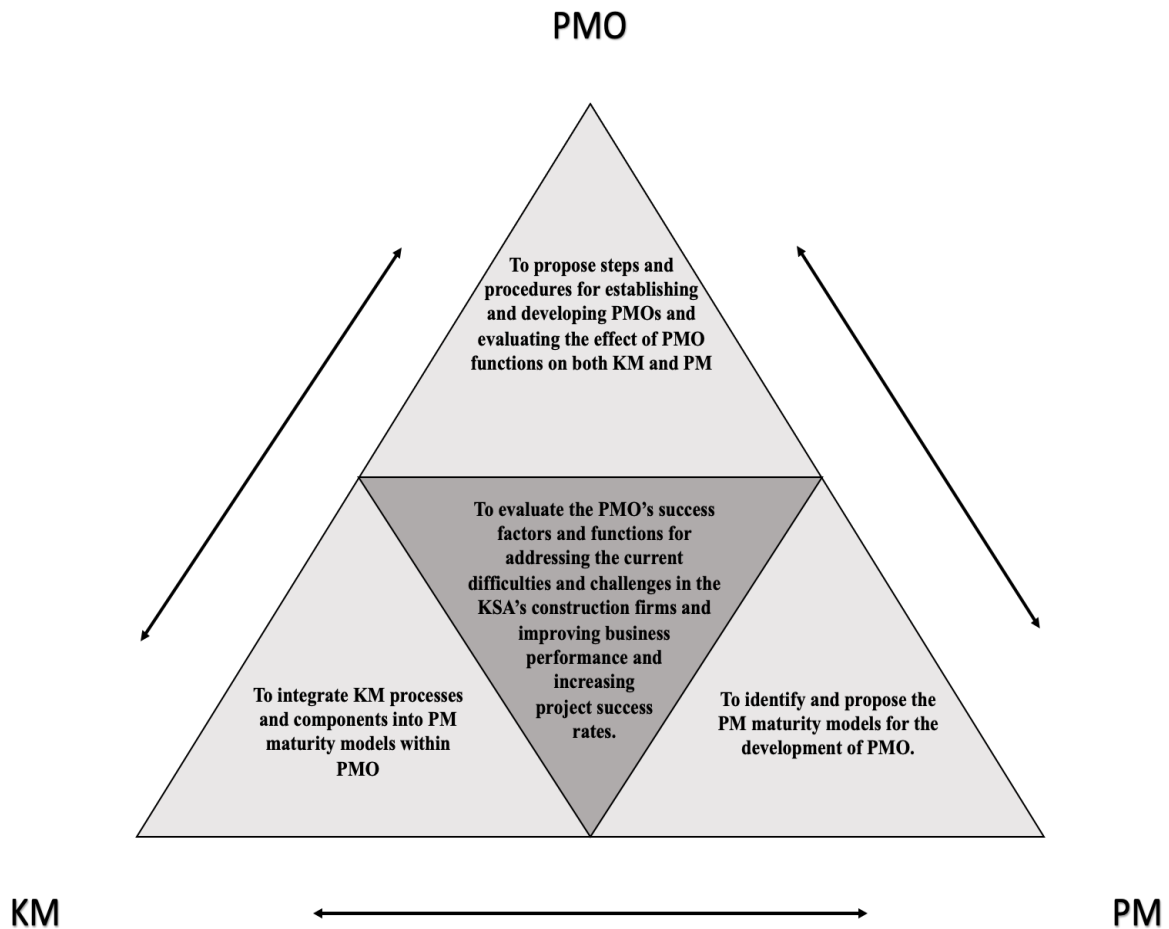


Figure 1.2: Research scope

1.8 The Organisation of the Study

In brief, the chart above 1.3 indicates how the research fulfils its aim and objectives. The thesis comprises of ten chapters. The introductory chapter presents the research background and states the problem, aim, objectives, and the contributions to knowledge that this project makes. The second chapter is used to examine the importance of applying both PM and KM practices within the context of the KSA's construction market and Saudi Arabia's vision (2030). This is followed by the third chapter which conducts a literature review in three principle areas. Firstly, it outlines PMO approaches, factors to improve business performance, and the establishment

and evaluation processes. Secondly, it explores the effect of PMOs functions on the availability of PM practice. Thirdly, it analyses the effect of PMOs functions on the application of KM practices.

Chapter 4 is divided into two sections; the first one establishes the initial theoretical framework based on the literature review and the second links this framework to the research objectives by building a conceptual model. Chapter five focuses on the research methodology and is structured and divided into two parts under several main headings to gather the necessary data and understand the research philosophy, strategies, and methods. The analysis of data is provided in chapter six and seven and the discussion and results are considered in chapter eight. Whereas chapter nine provides to ask experts in the field of interest to validate the developed conceptual framework. Chapter ten offers the research conclusions, outlining how the project contributes to knowledge and giving recommendation for further study. The project structure can be summarised as in figure 1.3:

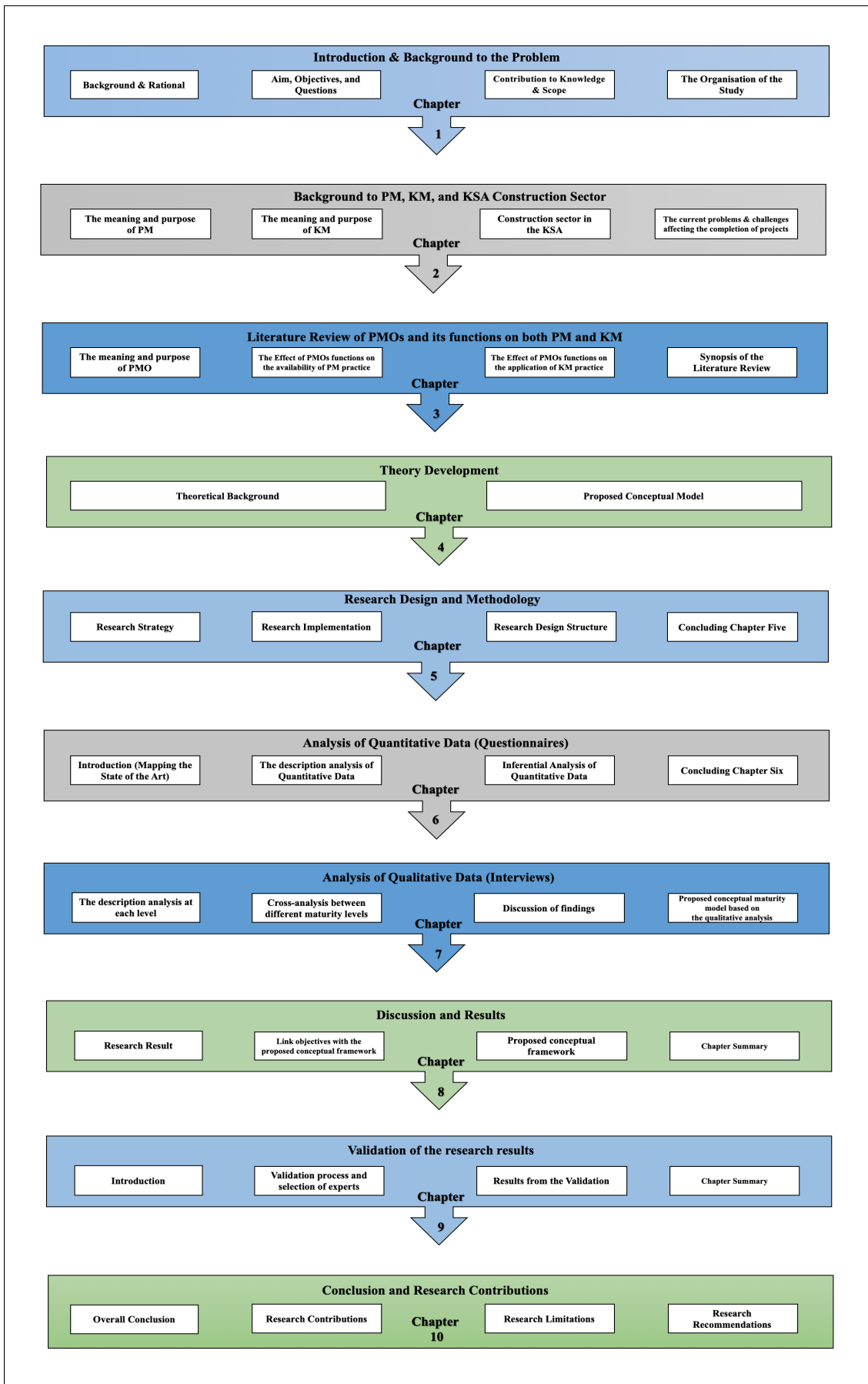


Figure 1.3: The research structure

***BACKGROUND TO PROJECT MANAGEMENT, KNOWLEDGE
MANAGEMENT AND KSA CONSTRUCTION SECTOR***

2.1 Introduction

Project Management (PM) and Knowledge Management (KM) are crucial in developing business performance. The application of PM is used to employ appropriate knowledge, techniques, skills, and processes to meet the organisation's requirement (PMI, 2008; Kerzner, 2012; APM, 2012; Alsahli, 2013). The application of KM helps to improve project activities and to secure the project success by exploring the proper knowledge at the right time (Egbu et al; 2001, Carrillo et al, 2004; Ahmad and An, 2008; Hislop, 2009). In this chapter, both of PM and KM have been highlighted to investigate the current debates, theories, and methodologies in order to confirm and formulate the needs for the PMOs to be launched.

However, the management of construction projects is different in many aspects than the general PM approaches. Construction projects require an understanding of many aspects, such as the coordination of human and material resources, and the execution of an agreed plan. Moreover, there is a need to understand the KSA construction sector in order to provide the knowledge that can address and overcome the reasons that have led to projects faltering and being delayed. This chapter provides some background to justify the focus in this study on the KSA, such as the KSA's Vision (2030) and the background of the Saudi social, culture, economic setting. Figure 2.1 outlines the literature review map, which divided into two chapters (Two and Three). This chapter begins by reviewing the important factors of Project Management (PM), Knowledge Management (KM), and the KSA's Construction Sector. Chapter three is exploring the concept of PMO and its effects of whether the application of PM and the implementation of KM.

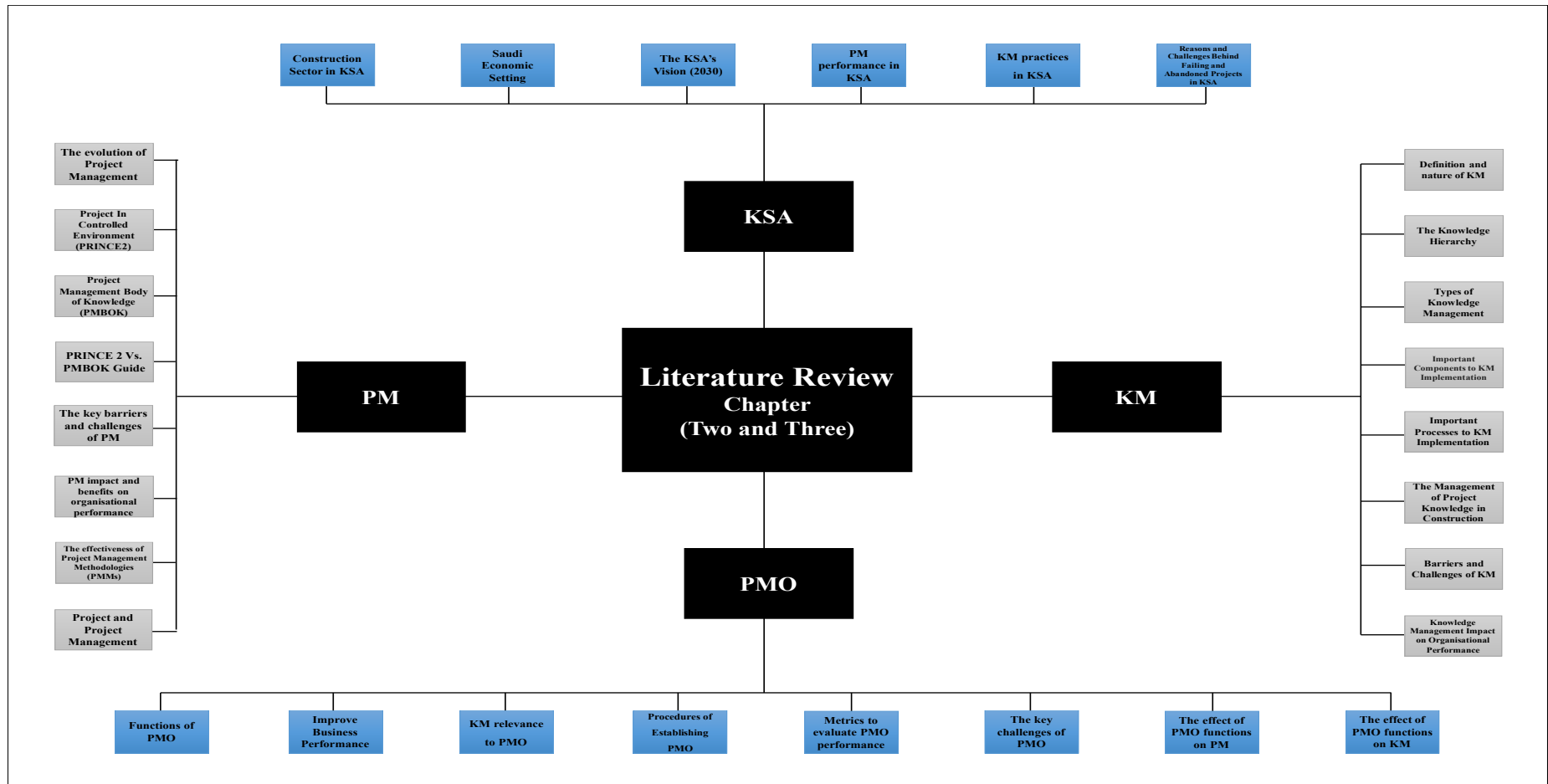


Figure 2.1: Literature review map

2.2 The meaning and purpose of Project Management (PM)

2.2.1 The evolution of Project Management

The complexity of today's construction projects and the increasing competition between construction firms, as well as the larger involvement of multidisciplinary and multinational organisations within the construction sector, are convincing construction firms to be more innovative, project oriented, and knowledge driven (PMI, 2008; Kerzner, 2012). Kontnour (2011) conforming the needs of organisations to invest in improving management tools, techniques, and market changes. According to Barnes (2012) the application of PM is used to facilitate and formalise the wide project processes, experience, skills, knowledge, and methods to obtain the organisational objectives. Generally, if the project may achieve the objectives within an agreed timescale, budget, and quality, it is usually deemed to be successful (APM, 2012). An alternative explanation might be that the Project Management Institute (PMI) defined PM as the application that meets project requirements by applying to project activities some tools, skills, knowledge, and techniques (PMBOK® Guide, 2008). However, the management of construction projects in particular have some differences than the PM approaches in general, for example:

- The management of construction projects are dealing with capital increases, greater complexity, and the interaction and participation between a wide range of experts from different areas (Chartered Institute of Building, 2008).
- The management of construction projects are usually implemented outside the organisation, which may be affected by many variables such as weather and traffic around the site (Pennypacker & Grant, 2007).
- The management of construction projects can be affected by the different environmental factors and geographic locations and the conditions that may be imposed on the executing company (PMI, 2007).
- The management of construction projects are usually controlled by many of the laws and regulations required by the public safety systems (Bennett, 2009).
- The management of construction projects are requiring the use of a large number of staff and consumption of large quantities of materials and sources (Jekale, 2014).

As a consequence of those previous aspects the PM can be worked to find out which concepts of important knowledge can be applied, and it requires skills and modern technologies in all

areas and activities of the project to achieve its objectives and requirements. Alsahli (2013) proposing the following requirements in figure (2.2) to success the delivery of any projects:

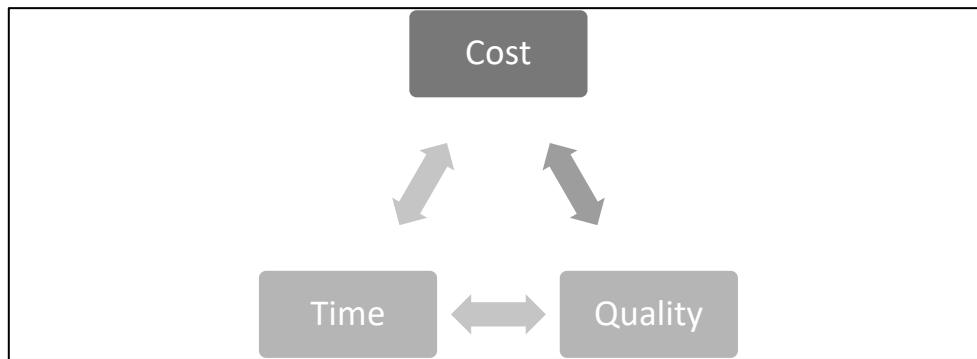


Figure 2.2: Requirements of any project (Alsahli, 2013)

2.2.2 Project and Project Management

The temporary activity of creating services or products in agreed periods of time and budget defines the meaning of project (PMI, 2008). The application of various management practices, techniques, knowledge, and tools to achieve the organisation's objectives represents the PM approach. According to Kerzner (2009) the project can be successfully executed when the knowledge and experience of project managers and project teams have been met with scope of project. Therefore, managing project knowledge within construction firms is significantly important for project success (PMI, 2008; Ajmal, et al 2010; APM, 2011).

However, the Project Managers (PMs) and project teams' knowledge of PM methodologies are crucial factors in the improvement of business performance and individual's skills (Koskinen, 2010). As KM has an effective influence on PM efficiency, appropriate methodologies and standards are proposed to address the knowledge of project management. Therefore, the Project Management Body of Knowledge (PMBOK) and the Project In Controlled Environment (PRINCE2) is a world class methodology for encouraging the best practice of PM; this will be introduced in the following section.

2.2.3 Project In Controlled Environment (PRINCE2)

Since 1990, the British's Office of Government Commerce has proposed an official PM guideline and methodology called PRINCE2 to addresses PM practices to be implemented in different project's types. PRINCE2 has become popular and widely known both as a standard in the UK and as a PM certification (Management Plaza, 2014). Bentley (2009) propose PRINCE2 as a structured approach of PM that can organise and control various processes, principles, and themes of projects as shown in figure (2.3):

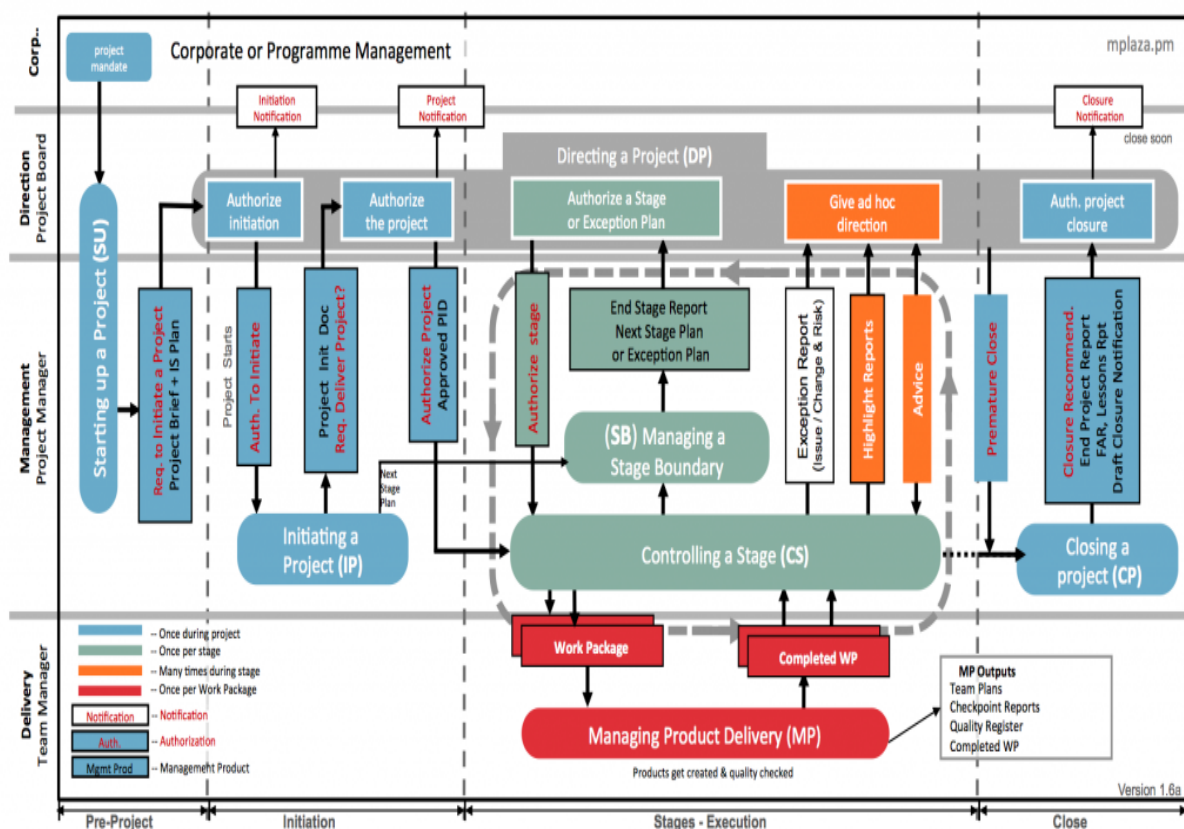


Figure 2.3: The different processes and levels of PRINCE2 (Management Plaza, 2014)

According to Bentley (2009), there are eight components in PRINCE2, namely: Business Case, Organization, Quality, Plans, Risk, Change, Configuration, and Progress. Each project component is required to acquire suitable knowledge that can be put into the project lifecycle.

2.2.4 Project Management Body of Knowledge (PMBOK)

In 1996, the Project Management Institute (PMI) introduced PMBOK as the main standard of PM that is used across the US (PMI, 2008). PMBOK, since its establishment, has been revised many times to integrate the latest practices of PM. The importance of PMBOK is to guide the PMs and project teams to successfully follow and undertake suitable project processes and activities. Table (2.1) by Baxter (2015) presented the different knowledge areas and processes of PMBOK that should be implemented in the lifecycle of project. The knowledge areas have been divided into output and input to assist each other; as follows:

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
Project Integration Management	Develop Project Charter	Develop Project Management Plan	Direct and Manage Project Work	Monitor and Control Project Work Perform Integrated Change Control	Close Project or Phase
Project Scope Management		Plan Scope Management Collect Requirements Define Scope Create WBS		Validate Scope Control Scope	
Project Time Management		Plan Schedule Management Define Activities Sequence Activities Estimate Activity Resources Estimate Activity Durations Develop Schedule		Control Schedule	
Project Cost Management		Plan Cost Management Estimate Costs Determine Budget		Control Costs	
Project Quality Management		Plan Quality Management	Perform Quality Assurance	Control Quality	
Project Human Resource Management		Plan Human Resource Management	Acquire Project Team Develop Project Team Manage Project Team		
Project Communication Management		Plan Communication Management	Manage Communications	Control Communications	
Project Risk Management		Plan Risk Management Identify Risks Perform Qualitative Risk Analysis Perform Quantitative Risk Analysis Plan Risk Response		Control Risks	
Project Procurement Management		Plan Procurement Management	Conduct Procurement	Control Procurement	Close Procurement
Project Stakeholder Management	Identify Stakeholders	Plan Stakeholder Management	Manage Stakeholder Engagement	Control Stakeholder Engagement	

Table 2.1: PMBOK process groups and knowledge areas (Baxter, 2015)

2.2.5 PRINCE2 Vs. PMBoK Guide

Implementing PM practices is still in its early phases in less developed countries. Some professional organisations and institutions such as PMI and APM made attempts to increase the adoption of PM tools and techniques by proposing a modern methodology to achieve best PM practice. Atif (2010) identifies the various standards and methodologies that are related to the concept of PM as follows: (PMBoK) by the Project Management Institute in the USA, (PRINCE2) by the Office of Government Commerce in the UK, (BoK) the Association of Project Management in UK, and (P2M) by Engineering Advancement Association of Japan. However, according to Kerzner (2008) and Kurt et al (2015), the PMBoK and PRINCE2 are considered as the most worldwide adopted methodologies. These currently known as the PM traditional methodologies that have been improved over time since 1990 (Shahram, 2014). Therefore, this project focuses mainly on a comparison between these principle methodologies. Kurt et al (2015) summaries the main differentiation of PRINCE2 and PMBoK in the following table 2.2:

Feature	PRINCE2	PMBOK
Definition	Structured PM methodology (PRINCE2, p.3)	Standard and guide (PMBOK,p.1)
Practical vs. Comprehensive	Practical, focuses on critical areas (Siegelaub, 2004; Singh and Lano, 2014)	Comprehensive (Siegelaub, 2004; Singh and Lano,2014)
Themes And Knowledge Areas	7 Themes	10 Knowledge Areas
Processes And Activities	7 Process and 35 Activities	5 Process group and 47 processes
Principles	7 Principles	-
Techniques	Only PRINCE2 specific techniques are explained (PRINCE2, p.7)	Covers techniques for each process
Interpersonal Skills	Not covered (PRINCE2, p.7)	Covered (PMBOK p.513; Ghosh, Forrest, Dinetta, Wolfe and Lambert, 2012)
Focus	Business Case and Product (PRINCE2, P.11; Singh and Lano, 2014; Ghosh, Forrest, Dinetta, Wolfe and Lambert, 2012)	Customer Requirements (Singh and Lano, 2014)
Role of The Project Board	Calls for a Project Board to provide oversight (Siegelaub, 2004)	Only suggests the role the sponsor should be playing (Siegelaub, 2004)
Organizational Assets And Environmental Factors	Partly covered	Strongly integrated with processes.
Management Principle	Manage by exception (PRINCE2, p.13 ;Siegelaub, 2004)	-

Table 2.2: Comparison between PRINCE2 and PMBoK (Kurt et al, 2015)

With PMBoK, the Project Managers (PMs) are the primary decision makers. This can limit the authority of making decisions, planning, and problem solving to PMs only. By contrast, PRINCE2 has more flexibility in sharing more of the authority with others, not just PMs. PRINCE2, in some cases, is missing the needs of soft skills that should be in place to increase the ability of PMs as PMBoK covered some techniques for each process that can be followed by PMs. PMBoK uses a knowledge-based approach for PM, which is divided into 10 knowledge areas. In contrast, PRINCE2 uses a process-based approach that includes 7 themes.

However, Kerzner (2008) realises that both PRINCE2 and PMBoK are complementary to each other and should be implemented together. PRINCE2 can be seen as a structured checklist in the way of managing projects, whereas the PMBoK Guide should be implemented to assess the professional competency and provide more details of the common project management terms. Researchers such as Singh and Lano (2014) and Kurt et al (2015) assume the similarities between them can be seen as PMBoK can coverage some aspects of PRINCE2 for example, plan theme, quality theme and risk theme are comparable to some knowledge areas of PMBoK as the management of scope, quality, and risk respectively.

2.2.6 The key barriers and challenges of PM

While using PM tools and techniques, organisations often face numerous barriers and challenges. The adoption of PM processes can be increased or decreased as a result of these challenges. According to Patil (2016) there are four major challenges that face the existence of PM, namely: poorly defined goals, improper risk management, impossible deadlines, and change in scopes. The defined goals can be affected by unrealistic factors such as setting too many goals, and factors such as cost, time, and resources can be a big challenge facing the scope management. The unreasonable deadline also can quickly result in putting too much pressure on PMs and project teams as well as failing to deal with risk management and risk tolerance which will affect the delivery of the project. However, Naybour (2016) identifies other factors that affecting the implementation of PM:

- Re-inventing the wheel each time by using different processes, tools, and templates.
- Organisation's performance is mainly dependent upon the competency and skills of individuals and general learning and KM is not used across the firm's projects.
- The sharing of valuable knowledge and gathered lessons learned occur only within individual teams in their own ways and knowledge is not shared.
- Unclearly defined roles and responsibilities.
- Not following a proper PM framework or methodology to manage the various project tasks.

2.2.7 PM impact and benefits on organisational performance

The services that PM deliver to an organisation can serve everyone from the PMs who manage a given project, the clients who are waiting for the completion of project, and the different teams who can execute and/or run the project (Picariello, 2014). PM can be seen as a roadmap that guide and enables PMs to oversee the project from point A to point B (McDonough, 2015). The benefits of PM were discussed by APM (2016), who identified the following top six beneficiaries of PM:

- Better decision taking: Based on the clarity of roles between different players; the confusion of unknown accountability in who should be able to make decisions and respond to action will cause a delay in delivering project.
- Retention and use of effective knowledge: By setting common processes and clear roadmap to save time and money; failing to manage knowledge will slow down the project, as will losing professional PM staff.
- Improving the Client's satisfaction: PM is a good tool to ensure that the customer knows what will be delivered.
- Increasing the project team's motivation: PM encourages project teams to find appropriate ways to improve their efficiency and to avoid unexpected issues affecting the work environment.
- Better efficiency in delivering projects: PM is used to identify faster the struggling projects and deal with problems in the early stages.
- Improving growth and learning from failure: PM is effective in ensuring lessons are learned and kept from both successful and unsuccessful experiments.

2.2.8 The effectiveness of Project Management Methodologies (PMMs)

PRINCE2 and PMBoK are used widely by many construction firms as a guideline, standard, and framework to increase project success and improve business performance (Kerzner, 2008; Atif, 2010). However, organisations find it difficult to select one type of methodology over another and to successfully implement those methodologies into practice. As well as the competency of PMs and project teams, there are other issues that also impact upon the implementation of Project Management Methodologies (PMMs).

Therefore, PRINCE2 and PMBoK are proposing the utilisation of the PMO as an effective tool and methodology to enforce the implementation of project management practices (Lano, 2014; Kurt et al, 2015). The investment of organisations in establishing a PMO will help to plan, control, assist, and implement certain procedures, templates, and techniques for best PM practice. According to Tylor (2012), the PMO can tailor the PRINCE2 and PMBoK with the individual needs of the organisations. However, Aubry et al, (2008) suggest the difficulty of using either PMBoK or PRINCE2 in full and suggest that organisations need to develop their own methods. Therefore, organisations have to choose between different maturity levels of the PMO to specifically addressing their needs.

2.3 The meaning and purpose of KM

Knowledge Management (KM) is becoming one of the most significant assistants for any organisation and is considered to be a complement to various business activities (Wong & Fong, 2005; Hislop, 2009). Through the suitable adoption of different KM processes, organisations can increase the possibility of achieving competitive advantages and improve the organisational learning processes to enhance performance (Li & Gao, 2003; Ahmad & An, 2008). Egbu et al. (2001) and Tiwana (2002) address the growth of KM theory from the 1950's onwards in the form of different management philosophies that over time have been developed and modified. Current KM philosophies find their roots in many initiatives started in the late 1980's and early 1990's under different terms such as; knowledge engineering, expert systems and artificial intelligence.

The importance of implementing different KM processes and techniques can assist construction firms to prevent similar mistakes reoccurring and the reinvention of the wheel. The implementation of KM also improves the overall business performance and provides competitive advantage for the organisation. The existence of KM in today's construction projects can support individual knowledge to know the full story of the project instead of knowing only a bit. Kamara et al, (2003) suggest the reassignment of staff or even the complete transformation of project teams into another project can represent a good attempt to transform their valuable knowledge to the new project and address the turnover of professional staffing.

2.3.1 Definition and nature of KM

The definition of KM is still being debated in academic circles, with no accepted definition currently emerging (Alavi and Leidner, 2001; Hicks et al., 2006; Hislop, 2009) There are still some issues in line with the diversity of the theoretical base and the gap between theory and practical application. However, definitions have been proposed by seminal authors such as Egbu *et al.* (2001) who define KM as a process of ‘identifying, optimizing and actively managing intellectual assets that: create value, increase productivity and enhance competitive advantage’. Advancing this definition, Carrillo et al. (2004) suggest knowledge management is a process that seeks to generate, transfer, locate, access, maintain and modify existing knowledge within the organisation. Carrillo *et al.*, (2004) further espouse that KM is a cyclic process that can be used to improve business performance. Advancing these definitions, Alhamoudi (2010) identified a further twelve potential alternative definitions for KM, these are shown in table 2.3.

Reference	Definition of Knowledge
Alavi and Leidner (1999)	<i>justified personal belief that increases an individual’s capacity to take effective action.</i>
Zack (1999a)	<i>(That) which we come to believe and value on the basis of the meaningfully organised accumulation of information through experience, communication or inference.</i>
Wiig (2000)	<i>Knowledge consists of truths and beliefs, perspectives and concepts, judgments, and expectations, methodologies and know-how and is possessed by humans, or other active entities, and is used to receive information and to recognise, analyse, evaluate, synthesise, decide, implement, monitor, and adapt – i.e. to act more or less intelligently.</i>
Bollinger and Smith (2001)	<i>Knowledge is the understanding, awareness, or familiarity acquired through study, investigation, observation or experience over the course of time; it is an individual’s interpretation of information based on personal experiences, skills, and competencies.</i>
Grant (2007)	<i>Knowledge exists within the people, products, and processes.</i>
Davenport and Prusak (2000)	<i>KM is a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information.</i>

Beckman (1999)	<i>KM concerns the formalisation of and access to experience, knowledge, and expertise that creates new capabilities, enables superior performance, encourages innovation, and enhances customer value.</i>
Odell et al. (1998)	<i>KM can be viewed as strategies and methods of identifying, capturing, and leveraging knowledge to help a firm compete.</i>
Egbu (2004)	<i>The capability of an organisation to innovate and continuously improve depends upon the effective sharing and exploitation of its knowledge.</i>
Rao (2005)	<i>KM is a systematic discipline and set of approaches to enable information and knowledge to grow, flow and create value.</i>
Koskinen (2008)	<i>KM comprises a range of practices used by organisations to identify, create, represent and share knowledge for reuse and awareness.</i>
Madhoushi and Sadati (2010)	<i>KM is a planned, structured process to manage the creation and acquisition, sharing, transfer and application of explicit and tacit knowledge as an organisational asset to encourage innovation.</i>

Table 2.3: Definitions of Knowledge Management (Alhamoudi, 2010)

Davenport and Prusak (2000) divide KM into the following factors that provide a framework for the organisation: values, experience, and information. Beckman (1999) suggests that KM is the access to the previous factors to encourage the business performance. However, others including Madhoushi and Sadati (2010) and Koskinen and Pihlanto (2008) argue KM to be the structured process used to manage and apply the different types of knowledge to enhance organisational performance.

Nasimi et al., (2013) summarise the definition of KM as the result of human minds as it can be created, raised, and worked in relation to people's minds. The growth of knowledge is dependent upon the involvement of people to effectively distribute its processes. The immediate creation of KM cannot be possible as it requires gradual development. The accumulation of KM can form and support the existence of new knowledge based on the previous one.

2.3.1.1 Classification of Knowledge Management Tools

Many researchers and experts (Egbu et al., 2007; Alhamoudi, 2010; Madhoushi and Sadati, 2010) have worked on the classification of KM tools. Regardless of their different opinions, a unique view cannot be possible in this area. However, the utilisation of information technology is still an important element of KM. To facilitate understanding of different knowledge processes Nasimi et al., (2013) have divided the tools of KM into six important categories:

1. Using collaboration as a tool to bring individuals to work with other people or groups to achieve assigned tasks. This is used to break the distance barriers between new employees in different locations and experiences to perform work simultaneously.
2. Providing effective mapping tools for knowledge to addresses the unstructured knowledge and be converted into suitable standard groups.
3. Considering how to retrieve information as a tool in order to allow users from personal computer to easily search for knowledge.
4. Making training and coaching sessions available whether online or physically attended to provide effective educational content.
5. Finding ways to facilitate the document management system or department to reduce the overall costs of documents distribution and improving its access and control.
6. Investing on the organisation memory tools to differentiate the organisation from its competitors such as: lessons learned, strategies, and policies.

2.3.1.2 Barriers and Challenges of Knowledge Management

The KM content needs to constantly updated (Egbu et al., 2007; Madhoushi and Sadati, 2010). The efforts of KM cannot be effective if the work of other dimensions in the organisation are not working effectively. Investment in KM might be not necessarily making huge profits therefore KM must not be measured only in terms of financial gains. Nasimi et al., (2014) and Alhamoudi (2010) assert that the effectiveness of the employees' participation can be a big challenge in how the organisation can successfully implement KM. If employees can interact and understand their importance as a complementary aspect to KM, this challenge can be reduced. However, the proper establishment of KM requires the company to spend sufficient time to get results. In addition, there is a difficulty in determining knowledge value. Organisations should adopt criteria to evaluate its productivity rather than waiting for the final

results. The focus on knowledge activity cannot figure out the accuracy, values, and efficiency contributed by the human factor.

Modeling of KM is currently used to deal with implementation challenges as it helps to increase the creation of power. Egbu et al, (2007) and Nasimi et al, (2013) propose organisations to have a strong determination on their existing barriers of KM and to find suitable ways to increase its success. The belief in KM effectiveness by all practitioners whether employees, managers within the organisation can maximise its roles. Nasimi et al., (2013) have divided the major barriers of KM into the following five categories:

1. Human factors play many important roles on the development of KM as it mainly depends upon effective communication and interaction between people. Organisations should increase and communicate KM importance to avoid the resistance of people to not sharing their knowledge.
2. Cultural factors can produce some negative impact on KM effectiveness. This can happen if people are not excited about the benefits of KM to their experiences.
3. Political obstacles and unstable political atmospheres. Political factors need to be considered to avoid the introduction of any new roles of government immigration or regulations.
4. Technology can have a negative impact on organisational knowledge. If the company do not have in place a suitable centre or identified reference for maintaining knowledge, KM might not be achievable.
5. Organisational factors can have a direct role on the success of KM. This can be seen in five different factors as proposed by Nasimi et al. (2013) namely, structure, management, job, salary, and training. However, to succeed with KM, the consideration of previous factors should be available, beginning from gaining the support level from top management to the provision of effective training programs to increase the loyalty of employees.

2.3.2 The Knowledge Hierarchy

According to both Awad & Ghaziri (2004) and Tserng & Lin (2004) knowledge can be described as skills, and facts, which can be accessed through experience or learning. Awad and

Ghaziri (2004) and Ahmad et al., (2008) suggest that different types of data, information and knowledge carry various attributes, as illustrated in figure 2.4.

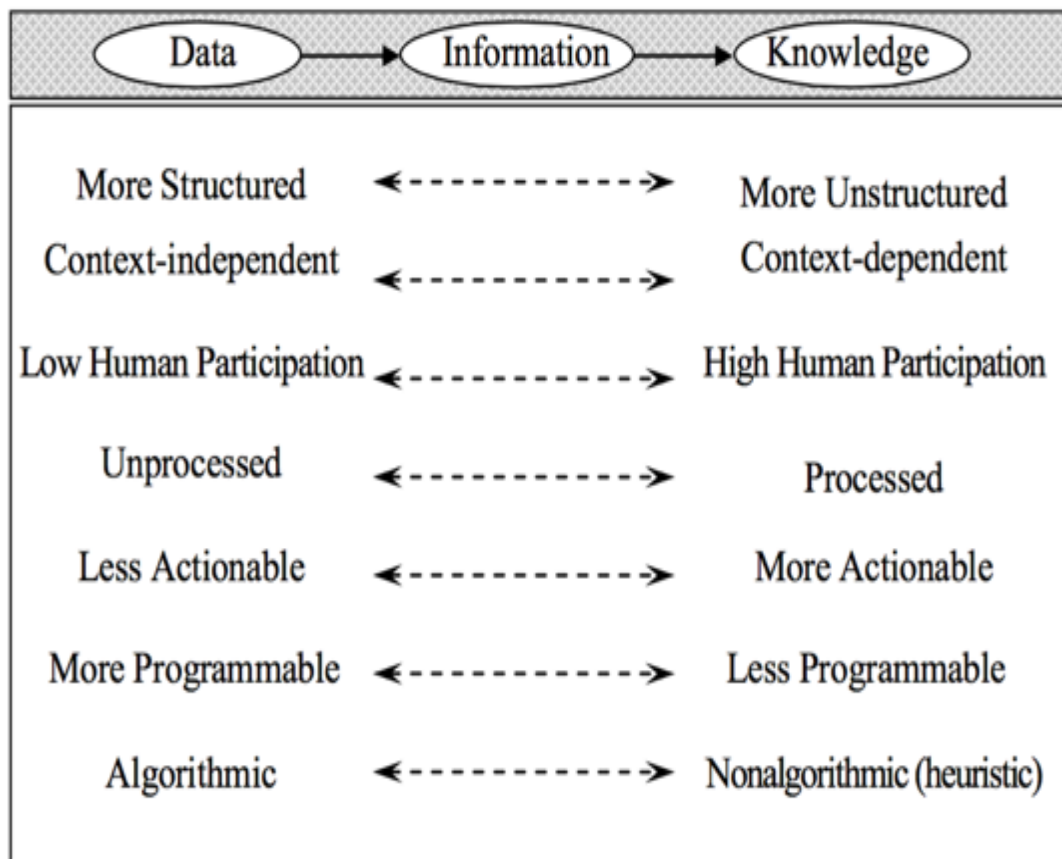


Figure 2.4: Data, information, knowledge (Ahmad et al, 2008)

The nature of data can be referred to as raw facts that do not consist of any analysis, organisation, or processing. Information includes types of data that have been shaped and processed to contain more meaning to users. However, knowledge is considered to be a more useful form of contents than data and information, which has more potential to solve problems and support decision making. The Knowledge Hierarchy proposed by Bagshaw (2000) and highlighted in figure 2.5 highlights the important distinction between data, information and knowledge.

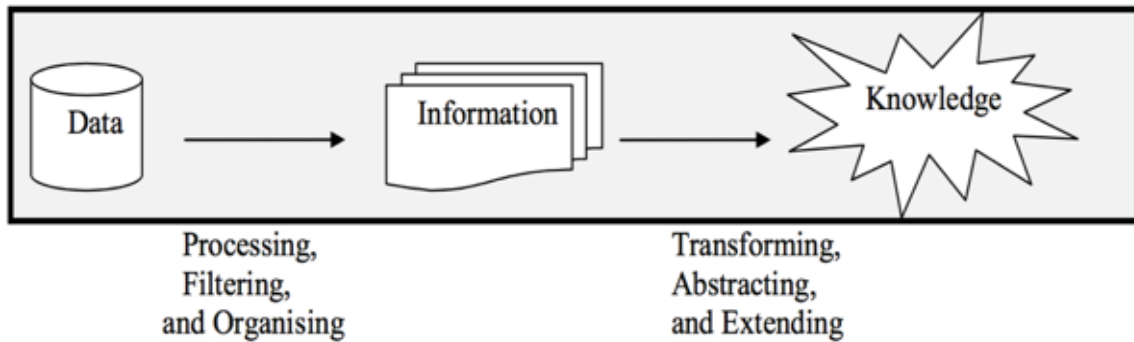


Figure 2.5: The knowledge hierarchy (Bagshaw, 2000)

While data represents unprocessed words and figures, information organises and processes data, whereas knowledge requires the application of people’s experience to represent data and information. The availability of information technology can assist the transfer of data and information, but the transfer of project knowledge requires the participation of people in addition to the existence of information technology. This can maximise the modification and development of KM in the organisation.

2.3.3 Types of Knowledge Management

The majority of KM studies within the literature adopt Nonaka's definition of knowledge, separating it into two fundamental types namely: explicit and tacit knowledge (Egbu, 2004; Keong et. al, 2006). Explicit knowledge is knowledge that can be easily shared within the organisation. This type of knowledge typically takes the form of data, operational manuals, drawings, specifications and other procedural guidance. By contrast, tacit knowledge is both difficult to formalise and hard to share with others in the organisation. Tacit knowledge is considered to be highly personal knowledge that has been constructed from social interaction and experience. Such knowledge is thus rooted in actions, ideas, emotions, values, and experiences (Nonaka, 2000). Yet Robinson et al (2001); Egbu et al (2003) and Pathirage (2007) argue that tacit knowledge needs to receive more attention in construction markets, as construction firms are experiencing low productivity levels and huge labour, material, and management energy waste.

2.3.3.1 (Explicit Vs. Tacit Knowledge)

The type and dimension of knowledge is the most important factor when adopting KM in the organisation. The presence and availability of knowledge can be categorised into two main types as shown in table 2.4.

Tacit Knowledge	Explicit Knowledge
Inexpressible in a modifiable form	Codifiable
Subjective	Objective
Personal	Impersonal
Context-specific	Context-independent
Difficult to share	Easy to share

Table 2.4: Tacit knowledge Vs. Explicit knowledge (Hislop, 2009: 23)

The difficulty can be seen to be that tacit knowledge is personal and hard to disembodify and codify. However, explicit knowledge can be seen in formal language as the “know-what”, and is usually documented (Misci and Uzunoglu, 2008). Herrgard (2000) suggests tacit knowledge be divided into cognitive and technical knowledge. Cognitive knowledge can be expressed in beliefs, values, and mental models, whereas technical knowledge consists of expertise and information related to knowhow, such as the sequencing of work (Gore, 2000). Adopting these different sub-divisions of knowledge, Salomon (2003) argues that explicit knowledge provides the core building blocks, whilst tacit knowledge provides the glue and integrating knowledge mechanism. Thus, both are needed for any project or operation to be successful.

2.3.4 Important Components to KM Implementation

Many researchers (Desouza and Paquette, 2011; Omotayo, 2015) have realised that to manage knowledge properly, consideration should be paid to three key components: People,

Technology, and Processes. The focus of KM should be used to connect these three components for leveraging organisational knowledge. Desouza (2011) categorises the relation between KM components into three classes; as shown in figure 2.6.

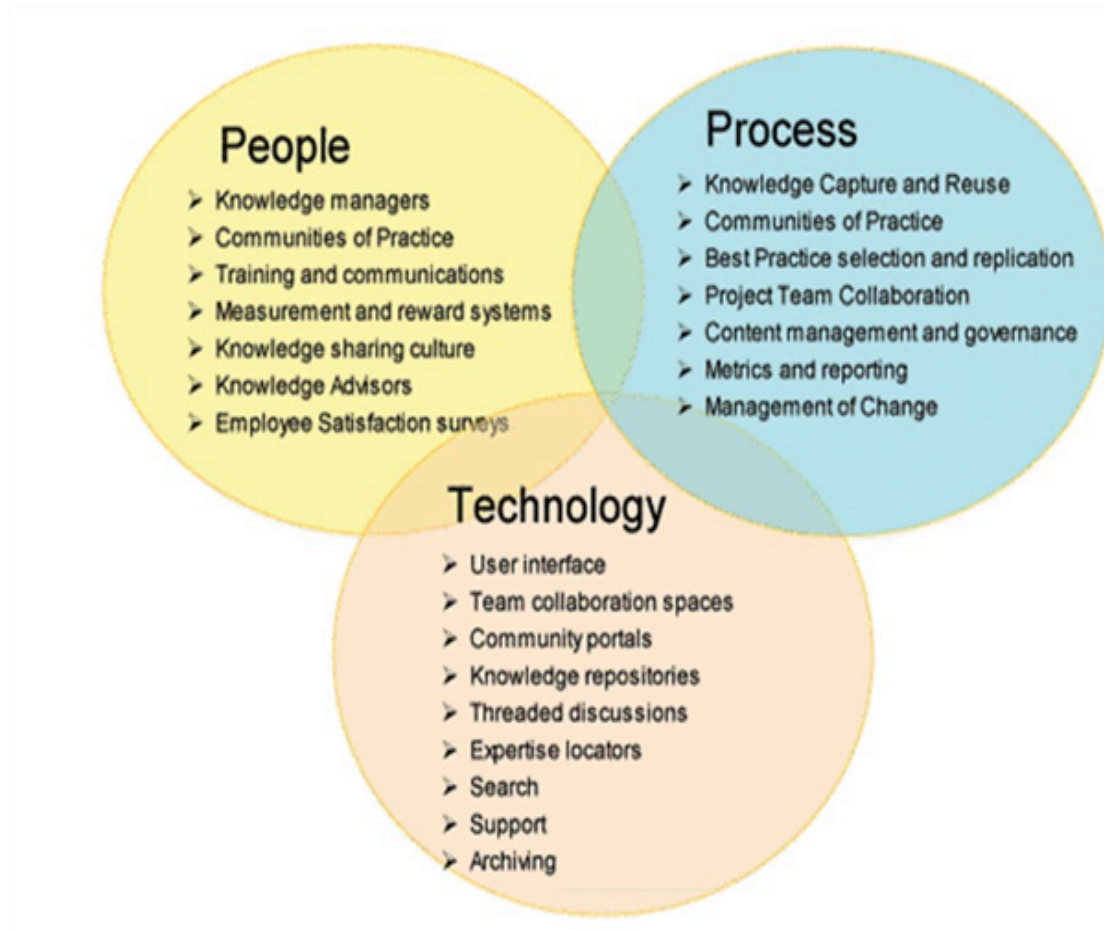


Figure 2.6: Components of KM (Desouza, 2011)

Applying these components is critical for improving business performance and achieving effective results from KM. However, Bhajaraju (2005) suggests the difficulty of putting the people component into action. To enable people to participate fully in KM processes such as collaboration and knowledge sharing, the organisation is required to change the traditional culture from keeping knowledge hidden or private to encouraging the sharing of knowledge. Wang and Noe (2010) argued that to encourage people to share their knowledge effectively, organisations must pay attention to building strong atmospheres of trust. The combination of motivation and rewards system should leverage people's expertise into business success. Eplimhin and Ekundau (2011) define people as the sources of knowledge; therefore, the process of KM must begin and revolve around human interaction.

The second component of KM is the process, which need to be as simple, clear, well defined and understood by people among all departments (Baloh et al., 2011). This is true both if the process is run by people, or executed by machines, or if it combines both. Therefore, it is important to define various work processes to map them properly. Mapping processes efficiently and effectively can assist the organisation to understand what is going on and how various projects are being accomplished. The process component might include various levels and phases. For example, to capture, transfer, maintain, and reuse knowledge (Desouza, 2011).

The third knowledge component is technology. Sun and Scott (2005) illustrate that technology in itself does not make the share of knowledge available to the entire organisation, but the scope and reach of such knowledge can be increased and supported through the presence of technology. Putting in place a system or a type of department or office to be responsible for taking account of KM can overcome some issues such as the people concerns of losing some power in their jobs if they share valuable knowledge, the conflict between staff, the awareness of time spending, and the level of trust between individuals and teams (Spender, 2008). However, by using advanced and professional technology systems, KM can easily be attained. Marr (2003) and Shadbolt et al. (2003) suggest that the functionality of KM technology mainly supports and encourages workflow, collaboration, and knowledge sharing processes. Through selecting a suitable technology option, the organisation can achieve its KM investment plan and objectives. Employees among the organisation can exchange information that is needed and get involved in guiding each other through a secure central space to allow better decisions to be made.

2.3.5 Important Processes to KM Implementation

The process of KM can be defined as the creation of an effective process to create, interact, and share by individuals and/or teams (Sanchez and Palacios, 2008). The comprehensive KM concept view is to manage and identifying the involvement of all processes (Yang and Wan, 2004). The effective utilisation of KM processes and the availability of suitable organisational environments should contribute to an increase in the overall organisational quality and in the quantity of individuals and teams who benefit from both explicit and tacit knowledge (Palacios, 2008). However, different researchers in identifying a unique KM process model are using

different terms. Each model can represent different levels of detail and focus to differentiate their perspectives from others. The majority of literatures from overseas have different terms for the proposed processes of KM, which can be illustrated in the table 2.5:

Researchers	Type of Process
Fong and Choi (2009)	<i>Knowledge acquisition, knowledge creation, knowledge storage, knowledge distribution, knowledge use, knowledge maintaining.</i>
Zaim et al (2007)	<i>Knowledge generation and development; knowledge codification and storage; knowledge transfer and sharing; and knowledge utilization.</i>
Zack et al (2009)	<i>Knowledge location and sharing; Knowledge experimental and creation.</i>
Singh and Soltani (2010)	<i>Knowledge creation, knowledge use, knowledge transfer, Knowledge protection.</i>
Alavi and Leidner (2001)	<i>Knowledge creation, knowledge sharing, knowledge distribution.</i>
Mills and Smith (2011)	<i>Knowledge creation, knowledge acquisition.</i>
Mishra and Bhaskar (2011)	<i>Knowledge creation, transfer, storage.</i>

Table 2.5: Types of KM processes

Table 2.5 shows the importance of knowledge creation as the researchers all agree that it is the main KM process. It can be seen that knowledge creation should be the first stage of the whole process. Zaim et al (2007) argue that experiential knowledge should be in place to examine the type of knowledge that has been used. In contrast, Mills and Smith (2011) and Mishra and Bhaskar (2011) see the KM process as consisting of one or two processes, which can limit the value of knowledge and reduce its effectiveness. The contribution of this research will focus on the following four processes of KM: creation, reuse, transfer, and capture. Other processes, such as knowledge maintaining, and sharing will be found within these four main processes.

2.3.5.1 Knowledge Creation and the Activation Process

Mitchell and Boyle (2010) have defined knowledge creation as a type of process that can be referred to as the various activities and initiatives that are undertaken to generate a number of objectives or ideas. Knowledge can be created internally through the organisation’s workers or externally by evaluating other factors such as policies and conditions. Bergeron (2003) explains that the expectation of knowledge creation is positively related to the performance of an organisation through documentation, self-reporting, networks, and types of knowledge engineering. The organisation needs to acquire knowledge about suppliers and customers and to disseminate knowledge across the organisation and to generate from existing knowledge some types of new knowledge (Bergeron, 2003).

Nonaka and Takeuchi (2011) propose the following model to classify the creation of knowledge: Externalisation, Socialisation, Combination, and Internalisation. However, Sharma (2014) developed and connect the relationship between the previous factors as illustrated in figure 2.6.

Knowledge Creation Sub Processes	Practices for Knowledge Creation	
Socialisation	<ul style="list-style-type: none"> • Formal and informal event 	<ul style="list-style-type: none"> • Workshops & seminar • Community of practices
Externalization	<ul style="list-style-type: none"> • Workshops & seminar • Deductive & Inductive thinking 	<ul style="list-style-type: none"> • Experts system • Experience Report • Community of practices
Combination	<ul style="list-style-type: none"> • Community of practices • Best Practice Cases 	<ul style="list-style-type: none"> • Knowledge Broker • Data mining • Documentation search
Internalization	<ul style="list-style-type: none"> • Research services • Simulation 	<ul style="list-style-type: none"> • Experimentation

Table 2.6: Knowledge creation processes (Sharma, 2014)

2.3.5.2 Knowledge Sharing and the Transferring Process

Knowledge transfer can be defined as: *“a process of exchange of explicit or tacit knowledge between two agents, during which one agent purposefully receives and uses the knowledge provided by another”* (Kumar and Ganesh, 2009:163). Bergeron (2003) agrees that, in order

for companies to have the level of information that is needed to enable knowledge sharing, the knowledge transfer process needs to be enabled in order to allow information to be transferred freely. Organisations need to have a specific process for organising and filtering knowledge, to transfer explicit knowledge to individuals, and to collect tacit knowledge from individuals and incorporate this into the organisation (Bergeron, 2003). Ajmal et al., (2010) propose some practices to facilitate both the distribution and sharing of knowledge under the main heading of knowledge transferring processes; as in table 2.7:

Knowledge Transferring Sub Processes	Practices for Knowledge Transferring	
Knowledge Distribution and forwarding	<ul style="list-style-type: none"> • Project bulletin and reports • Communication channels • Knowledge list 	<ul style="list-style-type: none"> • Video and Tele Conference meeting • Yellow page • Intranet • Data base
Knowledge Sharing	<ul style="list-style-type: none"> • Knowledge map • Formal and informal events 	<ul style="list-style-type: none"> • Training • Mentoring

Table: 2.7: Knowledge transferring processes (Ajmal et al., 2010)

2.3.5.3 Knowledge Application and the Reusing Process

The relevance and activeness of creating knowledge for the organisation depends upon knowledge values, application, and sharing (Bhutt, 2001). The ultimate goal of the knowledge use process is to access the right type of knowledge for the right staff members at the right time. Bergeron (2003) suggests that the following tools assist the positive use of knowledge: tracking systems, feedback, search technologies, and dissemination technology. The existence of KM should improve efficiency by matching problems and challenges to the source of knowledge and the development of new services, policies, and strategies should be based on the knowledge gained (Bergeron, 2003). Feng (2006) and Morales et al., (2010) identify practices for supporting the reusing processes. It can be seen that there is a similarity between the reusing practices and the transferring or capturing practices. The contribution of some practices might be applied to more than one process of KM; as illustrated by Sharm (2014) in table 2.8

Knowledge Reusing Sub Processes	Practices for Knowledge Reusing	
Knowledge Adapting	<ul style="list-style-type: none"> • Electronic notice board • Documents management system (DMS) • Intranet 	<ul style="list-style-type: none"> • Data base • Yellow page • Knowledge detection tools • Formal or informal events
Knowledge Applying	<ul style="list-style-type: none"> • Expert systems 	<ul style="list-style-type: none"> • DMS
Knowledge Integrating	<ul style="list-style-type: none"> • Knowledge map 	<ul style="list-style-type: none"> • Data mining

Table 2.8: Knowledge reusing processes (Sharma, 2014)

2.3.5.4 Knowledge Capturing and the Classification Process

The danger of losing gained knowledge in today's construction market is high. The utilisation of an appropriate form of knowledge capture that has the required security level will allow access to valuable information to help companies to perform positively in future projects (Mitchell and Boyle, 2010). Bergeron (2003) propose these practices to capture knowledge as written documents, electronic databases, and controlled environments. There is a need to protect and classify knowledge from inappropriate use inside and outside the organisation; the organisation should have in place effective policies and procedures to protect its trade secrets (Bergeron, 2003). Owen (2005) suggest the following effective practices to support knowledge capturing and classification processes as shown in table 2.9.

Knowledge Capturing Sub Processes	Practices for Knowledge Capturing	
Knowledge Identification	<ul style="list-style-type: none"> • Expert locator • Knowledge repositories 	<ul style="list-style-type: none"> • Knowledge detection tools • Formal and informal event
Knowledge Storing	<ul style="list-style-type: none"> • Data base • Formal and informal event 	<ul style="list-style-type: none"> • Document Management System (DMS)
Knowledge Classification	<ul style="list-style-type: none"> • DMS • Frequently ask questions (FAQ) • File management system 	<ul style="list-style-type: none"> • Management information system (MIS) • Intranet
Knowledge Selection	<ul style="list-style-type: none"> • Knowledge inquiry system 	<ul style="list-style-type: none"> • Data base • Frequently ask questions (FAQ)

Table 2.9: Knowledge capturing processes (Owen, 2005)

Owen et al. (2005) summarise the KM processes into the following model as represented in figure 2.8, which will be adopted and considered for the development of the research framework. Owen's model has been divided into four main processes; namely: Creation,

Capturing, Reusing, and Transferring to manage knowledge in the organisation. There is a strong relationship between all processes: for example, to create or reuse a type of knowledge it is important to have proper knowledge transferring in place. Otherwise, as a result of the previous discussion in this section, there are some sub-processes and practices of KM that needs to be considered under the previous main processes. These practices of KM can be defined as the suitable activities and methods, which are used for facilitating and supporting the different processes of KM (Bredillet, 2008; Ajmal et al., 2010). However, the sub-processes of KM are used to connect the similar practices of KM to its effective processes.

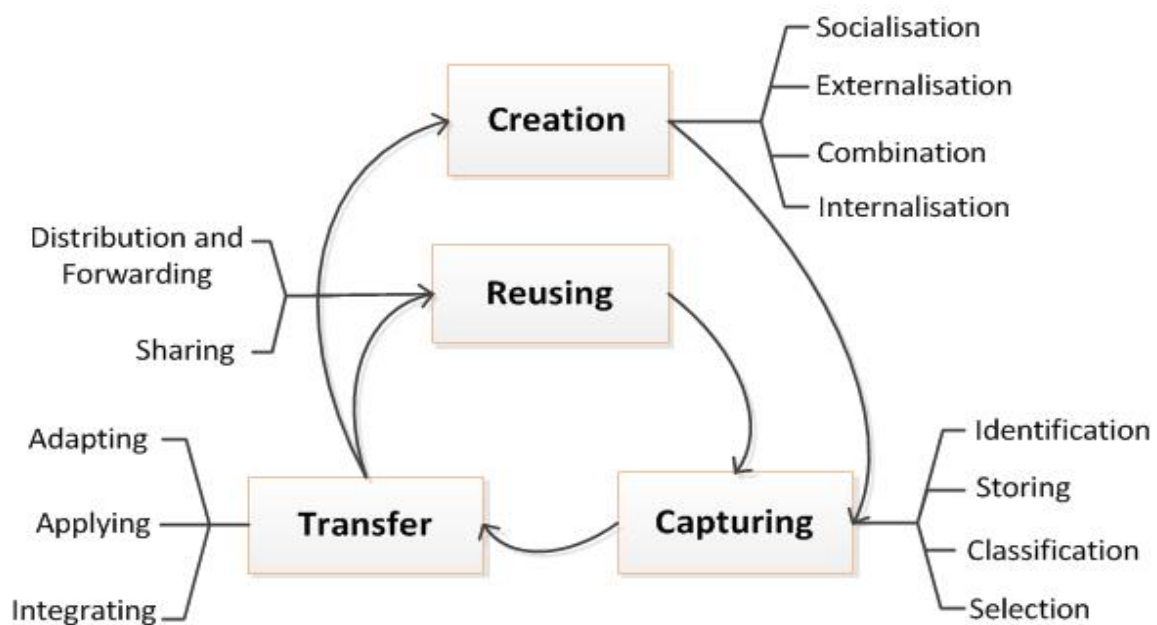


Figure 2.8: Model of KM processes (Owen, 2005)

2.3.6 The Management of Knowledge in Construction

The temporary nature of construction firms is unique and complex; it involves multidisciplinary organisations and multinational people with different expertise and specialties. During the duration of projects most of the knowledge is generated to achieve the client’s needs and business objectives. The construction industry recognises the benefits of implementing KM in their strategy. Evidence to support this can be found by Egbu (2002) who conducted a study on project-based organisations in the UK: 80% of respondents confirmed that KM had a positive impact on the organisation’s performance by providing new processes, technologies, and opportunities. Furthermore, the findings of this survey also showed that around 40% of construction firms in the UK already had KM procedures, whereas around 41%

planned to implement KM strategy. However, Kamara et al, (2003) suggest that the limitations of current KM practice within the construction industry are decreasing its development. The shortcomings of current practice need a suitable methodology to encourage and support KM.

Integrating strong KM processes into the construction market will provide greater value for money through the achievement of instilling learning within construction organisations (Murray and Langford 2003). The existing research discussed previously shows that construction firms are experiencing low productivity levels and huge labour, material, and management energy waste. The adoption of traditional construction management approaches is not a solution to current problems within the construction industry and is unlikely to improve the industry's productivity and profitability. Construction organisations are becoming increasingly aware of the importance of KM for improving their competitiveness by integrating knowledge to reduce time and cost factors (Bergeron, 2003; Ahmad et al., 2007). This can be done through sharing and reusing previous experience, whether successful or unsuccessful. Employees can begin to find solutions for their problems without spending more effort, time, and cost by reinventing the type of solution that can be found and accessed elsewhere in the company.

Koskela *et al*, (2009) confirmed that construction projects are unique as in each phase of the project lifecycle more potential and opportunities of different knowledge can be captured. Egbu (2004) and Otra (2005) have all identified KM as an important resource for construction organisations, as KM has the ability to contribute to organisational innovations and project success whilst also providing market leverage. The availability of KM enables an organisation to become a learning organisation by identifying competencies and learning from its corporate memory. Bishop et al, (2008) suggest that there must be understanding across the organisation relating to both the meaning and definition of KM, and how KM can be applied within the specific context. However, before specifying the KM models, Kanapeckiene (2010) and Kaklauskas (2010) proposed the following factors to be considered when applying KM in construction projects including PM aspects as illustrated in figure 2.9:

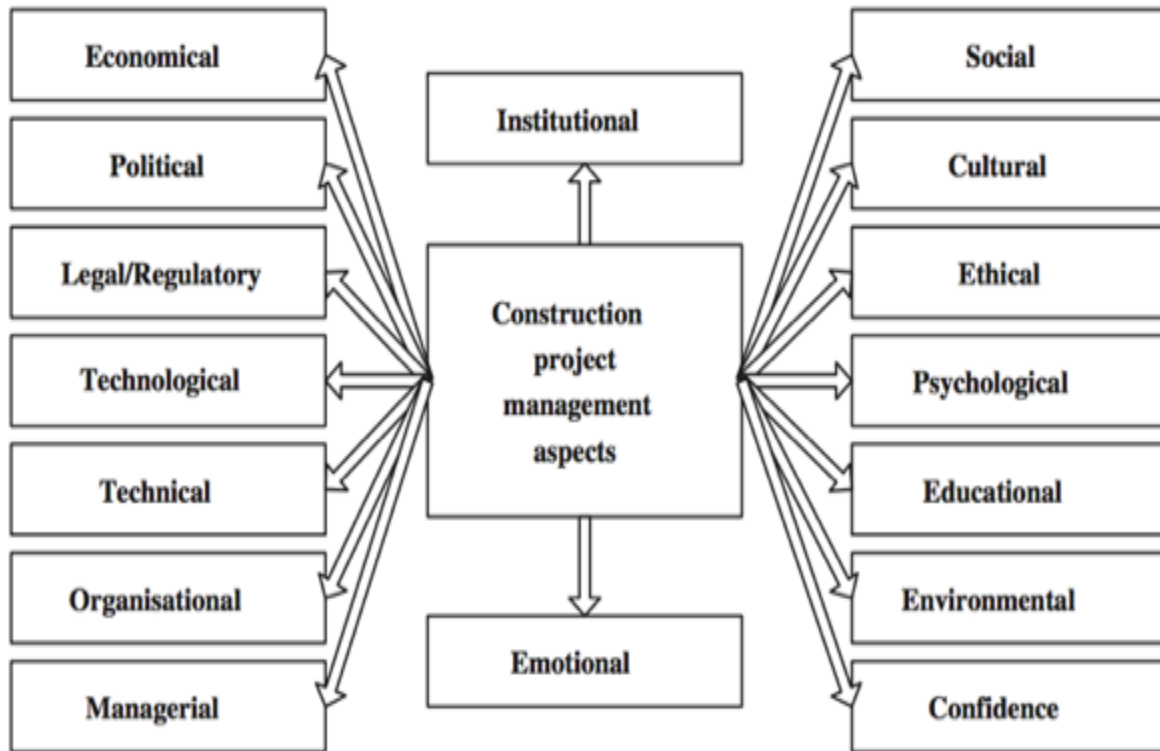


Figure 2.9: Construction project management aspects. (Kanapeckiene, 2010)

The national economic situation and environment have a direct influence on construction. Many factors such as capital movement, the environment of investment, and interest rates impact upon the construction industry. Cultural and social factors, including human personalities, social values, and views, also need to be taken into account. Furthermore, technology changes rapidly, and if KM is not in place, a company can fail to foresee how a technological change might impact upon the retention of knowledge.

However, the cost of retaining talented employees is expensive; this will put more pressure on companies to lose skilled people and a knowledgeable workforce. Researchers (Bahra, 2001; Kamara et al., 2002) believe that the powerful tools for encouraging KM are found in systematic identification to ensure the best KM practices can be utilised and distributed. To present the KM model, some elements need to be considered by finding hybrid solutions to incorporate both people and technology.

The construction projects scenario has become more dynamic, interactive, and complicated. Suggested KM models are noted to be important factors in enhancing the competitive advantage for organisations. For instance, Kanapeckiene (2010), Kaklauskas (2010), and

Zavadskos (2010) propose the following model, found in an engineering applications journal published in 2010, based on a case study that was conducted on seven massive construction companies in Lithuania. The models aimed to integrate a KM model for construction projects and concluded with the model shown in figure 2.10.

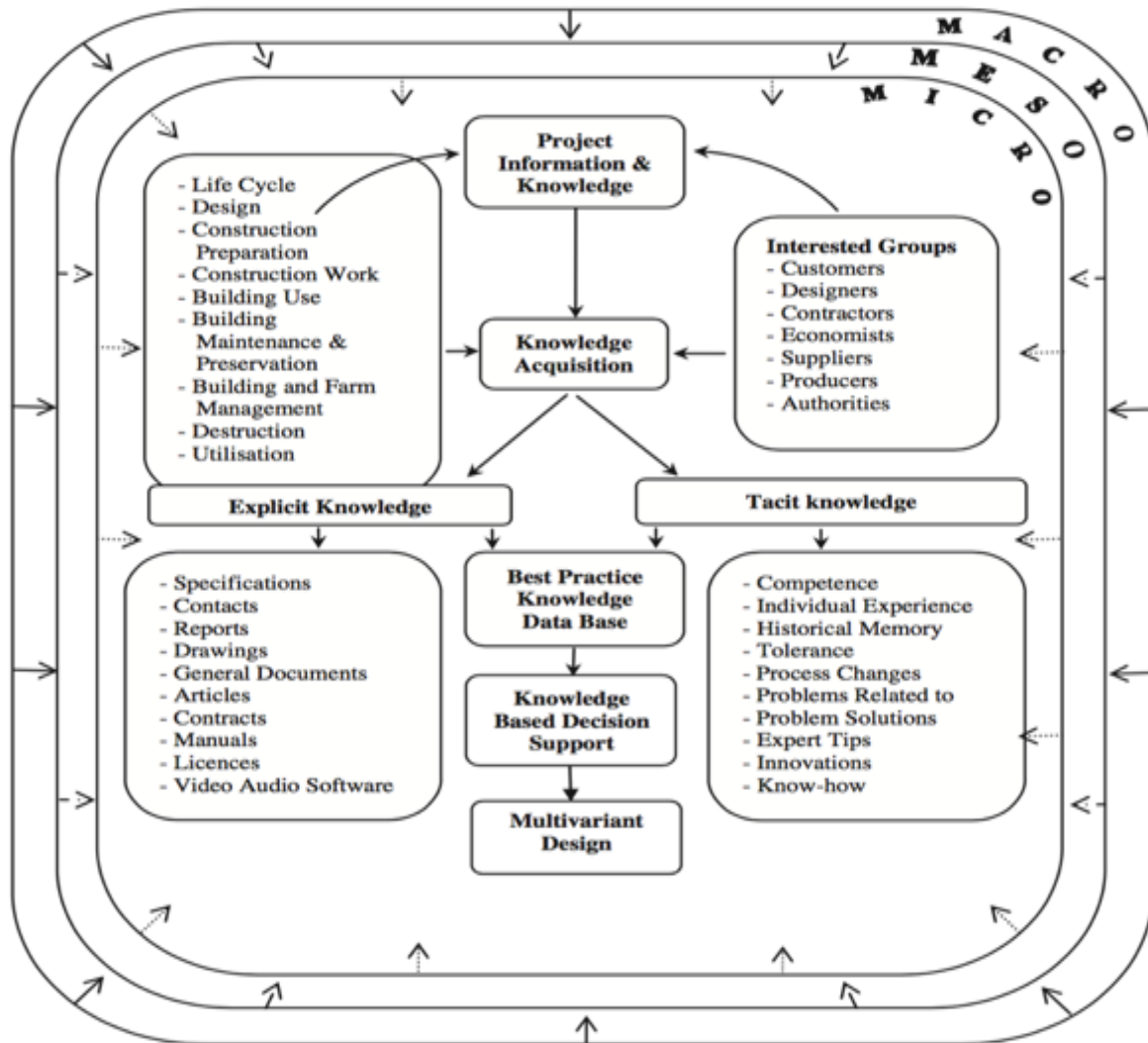


Figure 2.10: Integrated KM Model for Construction Projects (Kanapeckiene, 2010)

The previous model (shown in figure 2.10) illustrates the need to have an integrated analysis that considers the project's whole lifecycle and emphasises both types of knowledge, explicit and tacit. The authors of this model consider the combined effects of the macro-level that were discussed in the previous section. This model explains in more detail the factors of knowledge that can be found under each type of knowledge. The interested groups of this model, not mention the involvement of the top management, which can decrease its effectiveness as well

as imply who will be in charge to monitor and control these various aspects. In this research, the PMO group will be in place as a platform to ensure knowledge can flow more efficiently.

2.3.7 Knowledge Management Impact on Organisational Performance

Competitive advantage seems to be one of the main benefits of gaining effective knowledge, which is based on intellectual assets rather than physical assets (Rabiu, 2009; Ekeke, 2011; Paqutte and Desouza, 2011). When employees leave the organisation, their information, ideas, experiences, and insights will be lost if there is no clear attempt made to save the information. Researchers such as Ekandayo (2011), Nwafor (2012), and Epetimehin, and Amayah (2013) have described knowledge sharing as a key activity of knowledge management. KM, in order to be utilised, needs to be transferred and stored in the company's memory; it needs to show its effective contribution to improving business performance.

Both Ward and Aurum (2004) and King (2009) explore the idea that KM has a direct impact on collaborative decision making, innovation, and individual and collective learning, which in turn acts to improve organisational performance. The benefits of KM for construction companies are considered to be high. Plessis (2005) and Elmahdee *et al.* (2014) argue that KM can offer many benefits, such as taking advantage of cost savings, facilitating collaboration, increasing employee productivity and solving problems faster based on previous knowledge.

The nature of construction projects requires various parties to be involved in project tasks. The smooth flow of effective knowledge can be difficult and raises some issues, such as cost and time overruns, disputes, and extensive reworks. However, Koskela *et al.* (2009) propose that KM plays a key role in clarifying and facilitating knowledge transfer among different phases of the project. Others are seeing the existence of KM in construction as being summarised into these benefits: activity improvement, best practice gathering, productive collaboration, intelligence enhancement, productive information use, and intellectual capital storage (Kamara et al, 2002; Love et al, 2003; Robinson, 2005).

Carrillo et al. (2004) propose that the investment in KM can lead to:

- Avoiding rework and creating new business opportunities.
- Improving the decision-making process and productivity.
- Reduction of cost, time, and responding faster to major project issues.

- Achieving best practice and better retention of qualified candidates.
- Providing a unique competitive advantage and organisational learning.

However, there are other factors that prevent KM to achieve its full leverage of previous benefits as discussed by Tan et al. (2010); as follows:

- Ineffective organisational culture or structure to support the existence of KM.
- Difficulty in providing enough time and money.
- Resistance to change by employees.
- Poor availability of effective KM tools whether techniques or technologies.
- Low level of support and the lack of commitment from top management

2.4 Kingdom of Saudi Arabia (KSA)

2.4.1 Construction Sector in KSA

The KSA government has set out to support the execution of a large number of projects over the coming years in order to deal with the large population increase, with an estimated annual increase of 2.7 percent (Ccdos, 2013). The KSA construction market will therefore become one of the largest emerging markets in the Middle East, with the KSA government set to increase its spending to \$385 billion in the next ten years (Khatib, 2016; Bakkah, 2016). In order to benefit from this, KSA construction firms are beginning to execute more than one project at the same time. As a result, companies are engaging in more types of projects than is usual for their size, or with insufficient experienced professionals to lead their specific types of projects. Organisations are finding that PMOs should be applied to meet these challenges (Alnahj, 2012; Halawah, 2013; Alsahli, 2013).

However, the adoption of PMOs is not without challenge (Singh *et al.*, 2009; Cunha *et al.*, 2011; Anantatmula, 2012; Shahram *et al.*, 2014). The biggest challenge currently facing the Kingdom of Saudi Arabia's (KSA's) construction firms is the introduction of immigration controls, in 2012, which state that a maximum of 50% of employees can originate from outside the KSA (Diry, 2012; Ajmal *et al.*, 2012; Alsahli, 2013). Given that most project management staff are either European or American citizens, this, together with the temporary and transient nature of construction projects, is causing a significant challenge to most medium to large construction firms operating in the KSA. As a result, the KSA's construction firms are now

facing a skills and knowledge drain as project management staff leave both the organisation and country (Emcanat, 2011; Halwah, 2013; Deemah, 2014). Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival.

The Ministry of Labour and Social Development in the KSA introduced the Ranges program at the beginning of 2012. This program works to implement a package of reforms in the private sector to cope with the 2030 vision. It aims to improve the private sector by raising the quality of employment, creating new jobs, giving opportunities for Saudi nationals, and increasing the level of knowledge by benefiting from the availability of professional staff from outside the KSA. The program divides the organisation into three categories according to the number of employees and the number of projects they have: small, medium, and large organisations (HADF, 2014). The program is directly associated with immigration control and not allowing firms to have high rates of foreign employment, especially in the administrative departments, so that the participation of Saudi nationals with foreign cadres is being encouraged as a means of raising the levels of Saudi knowledge. Firms are classified into six categories based on the percentages of Saudi Arabian staff. The highest appropriate ratios of those in employment is up to 65% (Alsahli, 2013). The ministry encourages companies to reach these percentages by giving them competitive advantages, such as facilitating the process of applying for new visas, cutting costs, reducing government requirements, giving priority to winning new tenders, and accelerating the payment process from the government (Halwah, 2013; Deemah, 2014).

2.4.2 Saudi Economic Setting

The discovery of oil in 1938 significantly affected the economic setting of the KSA. This discovery gives the KSA a flourishing economy. Oil wealth in KSA is the largest in the world for producing and exporting oil. As the oil has transformed the KSA into one of the wealthy nations, this enables the government to increase spending in all areas, such as industry, construction, power, and infrastructure. As a result, new factories, hospitals, housing projects, and schools have been completed in few years (Ministry of Information, 2009). The beginning of 2016 witnessed the launch of Saudi Arabia's vision (2030) as an initiative plan by the KSA government to increase the Saudi economic efficiency and to not rely on oil as the only source of income for the state (Diry, 2011; Bakkah, 2016). This long-term planning was adopted to meet the growing population. However, the competency and knowledge of Saudi manpower

needs to satisfy the requirements of the 2030' vision. The construction market will then require more participation by the Saudi manpower to improve their productivity and ability in the labour market.

2.4.3 The KSA's Vision (2030)

The KSA government adopted "Saudi Arabia's Vision" to increase its economic and developmental success. This vision is used as a roadmap and methodology to identify the general policies, direction, goals, and objectives, which aims to gain the KSA a leading position in all sectors. The KSA ministers, government entities, and institutions have had to restructure their processes and align them with the vision. The outcome would enable beneficiaries to expand their competencies, enhance the level and quality of services and achieve sustainable development (Khatib, 2016; Fattah and Nereim, 2016).

The Council of Economic and Development Affairs has been selected by the Council of Ministers to establish and control the mechanisms of the "Saudi Arabia's Vision 2030". The Council has established an effective governance model, which aims to translate the vision into different implementation programs. To accomplish its directions and services, a number of bodies have been established to support, enable, monitor, and evaluate these programs. These bodies include the project management office "PMO" (Argaam, 2016; Bakkah, 2016).

The PMO was established to promote within government agencies efficient planning and coordination to gain common national goals. The PMO also aims to guarantee the speedy completion of all initiatives and projects and to obtain sustainable action. Through regular implementation reviews and performance evaluation the PMO can identify opportunities and challenges and adopt effective planning tools. To insure a solid foundation for follow-up methods and government action, the PMO determines the interim targets for the strategic objectives of the vision.

2.4.4 Knowledge Management in KSA

So far, most studies on KM in the KSA, (Alyoubi *et al*, 2012; Nafei, 2013; Almuayqil, 2015) have focused only on part of the KM perspectives or stages and have not been empirical. In Alhamoudi's (2010) research study on the Knowledge Management System in the Public

Sector in Saudi Arabia, the following gaps and weaknesses have been identified as in need of further study: the involvement of top management is insufficient, the access to different types of knowledge is missing, there is no form of learning resource centre, and the management of knowledge resources seems to be poor. Others, including Zakeyah (2007), Yasser (2011) and Sami (2013), have focused on the importance of KM as a modern principle for showing its effectiveness in developing the organisational performance. Maged and Salah (2012) emphasise the problem of identifying the processes of KM and their relation to business development. As table 2.10 evidences, the title of KM in the management of construction projects have not been used yet in the literatures of KSA area.

Authors	Title of Journal
Sami (2013)	<i>Knowledge management processes and their relation to the development of organisational performance</i>
Yasser (2011)	<i>Knowledge Management and its Application in Saudi Universities: An Applied Study on Umm Al-Qura University.</i>
Zakeyah (2007)	<i>Knowledge Management: Its Importance and the Extent of Applying its Processes from the own Point of View of The Educational Administration Directresses and The Administrative Female Supervisor in Makkah and Jeddah.</i>
Alhamoudi (2010)	<i>Knowledge Management System in the Public Sector in Saudi Arabia.</i>
Alyoubi <i>et al.</i> (2012)	<i>The KM perspectives.</i>
Almuayqil (2015)	<i>Knowledge Management Framework for E-Healthcare in Saudi Arabia</i>
Maged and Salah (2012)	<i>A Proposed Knowledge Management System in SOFCON: Saudi Arabia Perspectives</i>
Nafei (2013)	<i>Knowledge Management and Organizational Learning from the Employee Perspectives: A Study from Saudi Arabia Context.</i>
Alrowaily and Alsadhan (2012)	<i>Integration of Knowledge Management system in Telecommunication: A case Study of Saudi Telecom.</i>
Abdulmajid <i>et al.</i> (2008)	<i>Opportunities and challenges of the knowledge management application.</i>
Alshanbri (2015)	<i>Knowledge Management and Human Recourse Management: A Case of Nitaqat Program.</i>

Table 2.10: Secondary sources of KM in the KSA

2.4.5 The Reasons and Challenges Behind Failing and Abandoned Projects in the KSA

The majority of government projects in the KSA are suffering from the problem of faltering and delayed projects (Deemah, 2014; Magdad, 2011). Several government agencies spotted a large number of faltering projects that have been diagnosed since the establishment of the National Anti-Corruption Commission in 2011. A number of 1526 of projects were executed in different fields in the last five years and a number of projects (672) faltered and were abandoned, at a percentage of 44% (NACC, 2016). The reasons for projects to be abandoned in the KSA can vary. NACC (2016) identified four major factors that cause delay and failure in many projects: lack of planning, lack of visibility during the studies and design stage, deficiencies in study of the project's nature, and the lack of the existence of a project management office (PMO) in large companies. Recently, it has been disclosed that the value of non-performing government projects is estimated to be 100 billion Riyals (Diry, 2011; Thigah, 2012).

It can be seen that this trend of huge spending by KSA government has great potential to improve this situation, but there are still many projects that are stalling. Recent official reports, according to the seventh annual conference held at the Institute of Public Administration at Riyadh in 2013, propose the following reasons for the faltering of projects and suggest ways to address them, as illustrated in figure 2.11:

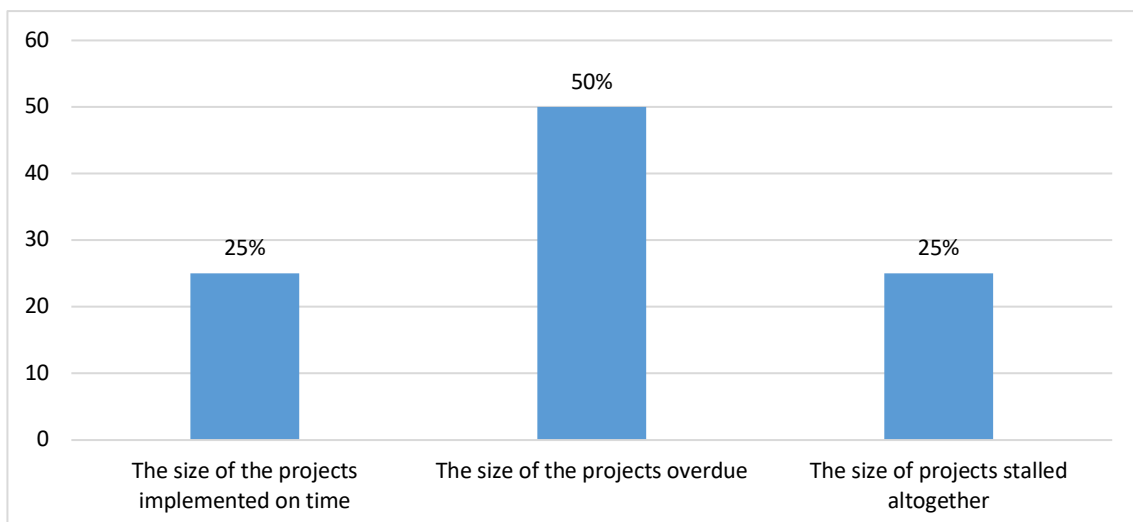


Figure 2.11: Projects Delivery Rate in KSA (IPA, 2013)

This does not give a good impression about how these projects are being managed and supervised; it suggests the poor PM of rehabilitation workers, as well as the existence of many limitations in the capacity of technical, regulatory and administrative obstacles. A study prepared by Al-Watan organisations (2014) conducted a questionnaire, which was distributed to more than 300 PMs in KSA, on the reasons for the faltering of projects. The study found that, firstly, 21% of Project Managers (PMs) do not work on the use of information systems in the management of construction projects, which oversee the implementation clearly. Secondly, 75% of construction projects do not adhere to any specific programs for the implementation of construction projects and leave this task for personal jurisprudence. This large proportion gives a clear indication that there is a significant slow transmission of information between the different sections of the company.

Table 2.11 indicates that the management of construction projects in the KSA are facing many challenges and difficulties. Several researchers have discovered that there are a lot of factors that cause delays and increase project failure rates. For example, Halawah (2013) and Alnahj (2012) both focus on the lack of coordination and communication between all parties and the inability to take advantage of past experiences obtained by the company in the implementation of previous projects. In contrast, other researchers focus on the weakness of support from the administration and training programmes that were supposedly established in many companies, according to their needs and requirements.

Going into more in-depth analysis of the table, many researchers ask about the key aspects of project failure. Firstly, there is a failure to fully acknowledge the importance of having a good communication system and knowledge sharing among projects (Emcanat, 2011; Halwah, 2013; Alsahli, 2013; Majmah, 2013). It would be effective for construction organisations to connect all projects as one whole unit. Secondly, all define the most serious limitation, which can easily increase the percentages of project failures, as the lack of implementing PM practice (Majmah, 2013; Thigah, 2012). One question that might need to be asked is how companies are making decisions and implementing their projects.

Thirdly, evidence to support this can be found in the work of both Majmah (2013) and Amanah (2013) who explained that the majority of the KSA's organisations make decisions individually. This would not be appropriate in situations where there are no qualified PMs who can deal with all project aspects, as presented by Kacst (2012) and Alnahj (2012). Fourthly,

Thiqah (2012) and Halwah (2013) have challenged this on the ground that poor coordination among various departments results in not taking advantage of previous projects.

Emcanat (2011) and Majmah (2013) have both criticized the lack of adequate reporting systems in the current management approach adopted by KSA construction firms. Espousing this presents difficulties in practice. For example, how the senior management or PMs can follow up on all project procedures? This section provides a comparison between different practitioners, researchers, and organisations in the KSA in terms of how they see the reasons for failing and stalled construction projects. This is shown in the following table 2.11:

	HALAWAH (2013)	EMCANAT (2011)	MAJMAH (2013)	KACST (2012)	THIQAH (2012)	AMANAH (2013)	ALNAHJ (2012)	ALSAHLI (2013)	MAGDAD (2011)
1	<i>Poor coordination</i>	<i>Weakness of rehabilitation and training of various factors</i>	<i>Lack of project management culture among workers</i>	<i>Lack of supervision and audit process on the project data</i>	<i>Not benefit from the successful experiences and the experiences of others</i>	<i>Poor performance in project implementation (time - quality - costs)</i>	<i>Lack of knowledge of the necessary resources properly</i>	<i>Focus on artwork and construction only</i>	<i>PM do not work as desired</i>
2	<i>Modest performance for project managers and teamwork</i>	<i>Lack of uniform procedures for project management</i>	<i>Make decisions individually</i>	<i>Failure to provide project managers with the required reports</i>	<i>Not to put specific methods for project management</i>	<i>Insufficient information available about the project</i>	<i>Failure to find advanced methods in project management</i>	<i>Lack of strategy and clear objectives</i>	<i>Weak reports system for doing tasks</i>
3	<i>Loss of business documentation</i>	<i>Lack of support levels</i>	<i>Environment project management is not effective</i>	<i>Lack of training project managers on how to deal with the management system documentation</i>	<i>The selection of projects to suit the potential of the company</i>	<i>Coordination random and unorganized</i>	<i>Non-management mode for each individual risk and common to all projects</i>	<i>The lack of criteria and indicators to measure</i>	<i>Database seems to be missing</i>
4	<i>The lack of reports on a regular basis and accurate</i>	<i>Regulatory options do not work properly</i>	<i>Lack of knowledge of the key actions for project management</i>	<i>The lack of updated information on a regular basis for previous projects</i>	<i>Not to take advantage from project management practices necessary</i>	<i>Poor communication and lack of coordination of activities</i>	<i>Lack of central coordination to manage communications across different projects</i>	<i>Little attention in the planning</i>	<i>PMs are not qualified</i>
5	<i>Lack of knowledge of the various procedures of the project</i>	<i>Knowledge gained from previous projects missing</i>	<i>Lack of reporting and not completed as required</i>	<i>Do not put a specific system for the management of rewards for workers</i>		<i>Repeat failure with an inability to avoid them</i>	<i>The absence of base and supervisory guidelines for project managers</i>	<i>Lack of transparency and clear</i>	<i>Poor coordination and communication between all parties</i>
6	<i>Not to take advantage from previous projects</i>					<i>Slow in issuing decisions</i>	<i>Weakness of oversight of all schedules</i>		<i>Entry in some type of projects outside their possibilities</i>
7	<i>Increasing the size and type of project possibilities</i>						<i>Weak oversight of the financial aspects of the project budgets</i>		

Table 2.11: The reasons and challenges behind failing and abandoned projects in the KSA

The contribution of this research is that it aims to identify the major causes of project failure in the KSA, in order to come up with a new model based on creating the effective relationship between PMO as a tool and KM as a concept to deal with these issues. It is possible to identify the similar factors that affect the implementation of construction projects in KSA, as illustrated in table 2.12.

References	The reasons and challenges behind failing and abandoned projects in the KSA
(Majmah, 2013; Thiqah, 2012; Alnahj, 2012; Magdad, 2011)	<i>Best practices of PM do not work as desired.</i>
(Halawah, 2013; Amanah, 2013; Thiqah, 2012; Magdad, 2011)	<i>Lack of access to the database and not benefit from the successful experiences and the experiences of others.</i>
(Halawah, 2013; Amanah, 2013; Alsahli, 2013; Thiqah, 2012)	<i>Entry in the competition without knowing how they are compatible with the possibilities.</i>
(Majmah, 2013; Alnahj, 2012; Magdad, 2011; Emcanat, 2011)	<i>Knowledge gained from previous projects is missing.</i>
(Amanah, 2013; Halawah, 2013; Alnahj, 2012)	<i>Poor coordination among various projects to link them as one whole project unit to deliver the entire organisation' needs.</i>
(Majmah, 2013; Kacst, 2012; Magdad, 2011)	<i>Modest performance of PMs as to make decision individually and teamwork's are not directed correctly.</i>
(Amanah, 2013; Alnahj, 2012; Magdad, 2011; Emcanat, 2011)	<i>Communication system and Knowledge sharing among projects is missing.</i>
(Halawah, 2013; Majmah, 2013; Alsahli, 2013; Kacst, 2012)	<i>Failure to provide senior management with the required project status reports.</i>

Table 2.12: The reasons and challenges behind failing and abandoned projects in the KSA

2.5 Summary

The literature review has revealed that the application by the PMO is extremely important for the existence and development of both PM and KM. It is evident that the PMO can be the practical side of the PM. Similarly, giving many powers to the PMO office for carrying out the most possible number of PM practices is important. Additionally, the importance of finding out the real differences imposed by the management of construction projects can provide a good opportunity for the office to focus on this aspect rather than going on the large number of general approaches. At the same time, researchers have shown how the KSA construction market is suffering from not having appropriate practices in KM. Previous sections in chapter two identified the increased availability of financial liquidity and the number of new projects by the KSA government. Finally, the reasons behind projects faltering and being delayed can illustrate how important it is for the KSA construction firms to have some new approaches as PMOs can assist in overcoming current flaws.

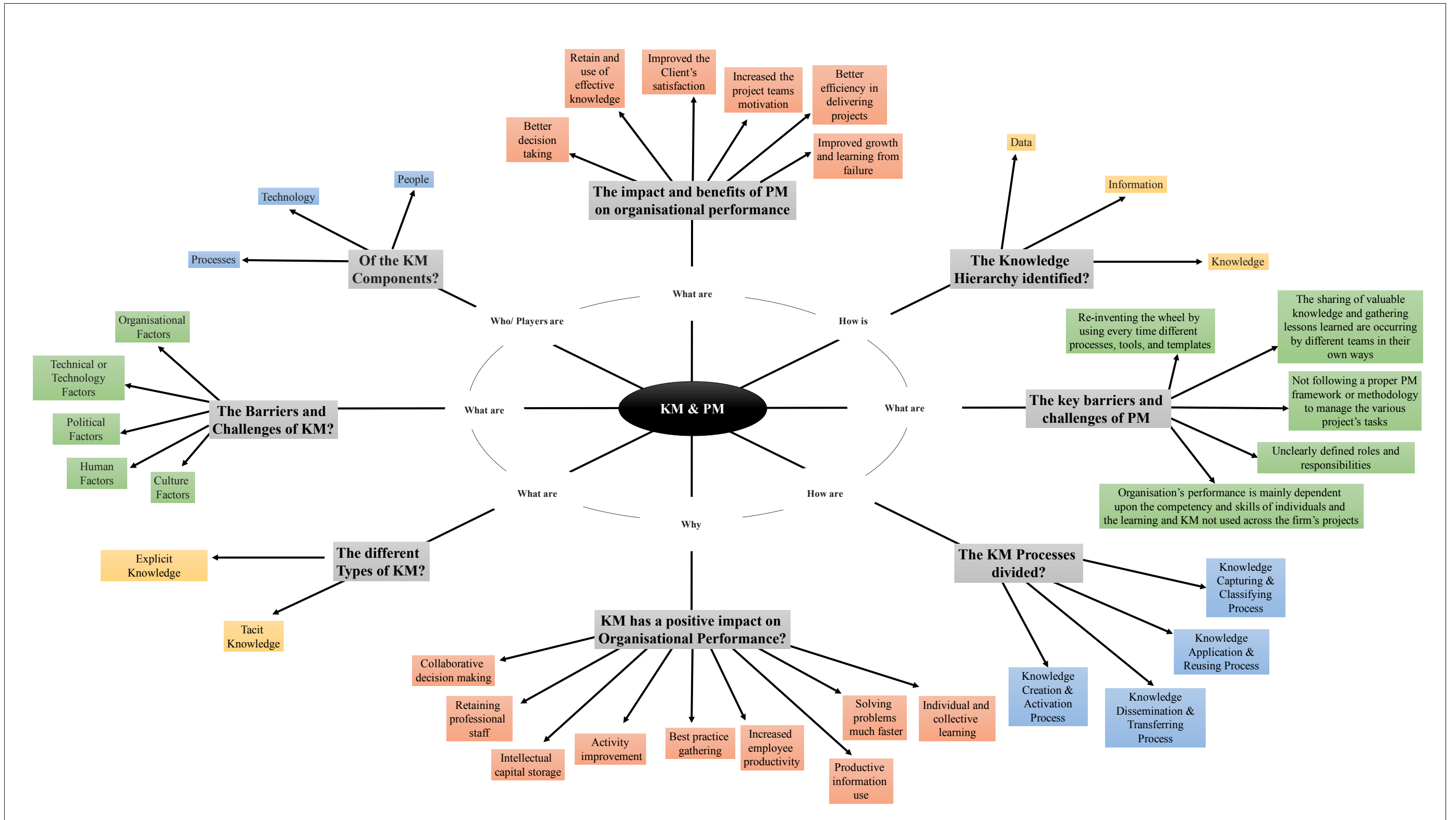


Figure 2.12: Synthesis – PM, KM, and KSA’s Construction Market

Chapter Three:

LITERATURE REVIEW OF PMO AND ITS FUNCTIONS ON BOTH PM AND KM

3.1 Introduction

Nowadays, it is important for organisations to improve business performance and overcome their various challenges and difficulties, trying to create value by utilising their resources properly. To stay competitive within the construction sector, the availability of knowledge needs to be managed. In this context, the PMO is an effective tool that allows organisations to enforce PM, encourage knowledge transfer and translate knowledge into action.

The main purpose of this chapter is to provide a review of the relevant literature by examining various international literatures in the research area. This chapter is divided into three main sections. The first focuses on the PMO concept and the application of PMOs in improving business performance. The second and third sections focus on the effective roles and functions of PMO to encourage best practices of both PM and KM. This chapter concludes with a synopsis chart that summarises the outcomes of the literature review.

3.2 The meaning and purpose of PMOs

3.2.1 Definition and nature of PMOs

According to the majority of researchers and practitioners (Hobbs & Aubry, 2007; Valle et al, 2008; APM, 2008; Alsadeq *et al*, 2011; Taylor, 2011; Almagrabi, 2012; PMI, 2012 Andrew, 2013; Rouse, 2014) PMO is one of the most complex concepts within construction sector. It is hard to find a uniform definition that can be used by all organisations due to their different business needs. However, PMI (2012) suggested that PMOs can be considered a group of experts or departments that include a number of people from different areas within an organisation, which works on a daily basis to define and maintain standards for applying best

PM practices for the whole company. Hobbs & Aubry (2007) further develop this definition, noting that the PMO will often coordinate multiple projects within the same organisation. Secondly, the PMO will act as a centre of excellence by supporting best practice. Finally, the PMO will aim to improve business performance by encouraging knowledge sharing across the organisation. PMO can also be seen as *"A management structure that standardizes the project-related governance process and facilitates the resources, methodologies, tools, and techniques of the organisation"* (APM, 2008:11).

However, regarding to the nature of construction projects that includes variety of processes, policies, and procedures; the PMO mainly used in construction sector as coordination centre to bridge the gap between projects that are currently being implemented with their senior management (Valle et al, 2008; Taylor, 2011; Almagrabi, 2012; Andrew, 2013).

PMOs started to become more popular in the late 1990s (Hobbs and Aubry, 2010). The PMO can be a specialised set of people who work with a group of projects to run and fill a number of functions and roles to reflect on an organisation's performance. Gurtu (2010:2) suggest that *"An organization can maximize the value of PM by standardizing the practices and consolidating the initiatives across the enterprise"*. The concept of PMO is dramatically expanded by taking into consideration the fact that organisation's cannot spend large amounts of money or time without a clear function of PMO. Thus, this can open new directions for PMO to be more effective in encouraging KM approaches. It can provide an effective model to increase the maturity level of the organisation that can work side by side with its services.

3.2.1.1 The role of the PMO

The PMO is a strategic, management orientated concept designed to manage business processes orientated towards construction rather than being designed to manage construction projects (Obrochta et al., 2011; ESI International, 2013). The PMO maintains a list of PM best practices and provides effective guidance for instruments and expertise in PM. This can lead to the improvement of using a formalised PM process (Hobbs and Aubry, 2007; Kendrick, 2009). The PMO provides support, mentoring, and direction for different project participants across the entire organisation when it can achieve its objective of consistent PM process, methodologies, and metrics (Hobbs, 2007). The involvement of PMOs in construction projects may provide consultation services to promote better knowledge to be shared across the whole

organisation (Desouza & Evaristo, 2006; Koskinen & Pihlanto, 2008).

The PMO is, to a large extent, about improving business performance. It should work as an agent for spreading PM standards, practices, and culture throughout the organisation (Obrochta & Finch, 2011; Thiqah, 2013). However, by recognising the reasons behind a project's failure, the PMO can also increase the organisation's maturity level, project efficiency, and help in quantifying what impacts on the project's success (Kendrick, 2009; ESI International, 2013). Dawson *et al.*, (2012) identified the following four fundamentals goals for organisations looking to implement a PMO:

- Standardisation of project management methodology;
- Alignment of projects with organisational strategies;
- Provision for training, mentoring, and consultation;
- Compilation of project performance metrics.

3.2.1.2 The usage of the PMO

PMOs can be used for anything required by the organisation. Hobbs & Aubry (2007) identify the following important tasks for PMOs: firstly, to coordinate multiple projects under the same company; secondly, to act as a centre of a wide range of best PM practices; thirdly, to improve business performance by encouraging sharing effective knowledge across various projects. Kendrick (2009) and Nehme (2014) argue that there are two significant factors as to why PMOs are required. The first is to provide Project Managers (PMs) with a good administrative assistant to allow them to have more time to focus on critical tasks by eliminating their minor responsibilities. The second is to control and support one or more projects from the inception date to completion. However, Tylor (2011, p.7) poses the following question to confirm the needs for establishing the PMO "*What is the department or group that defines and maintains the standards of process, generally related to project management, within an organization?*". In general, the main role of PMOs in today's construction firms is to be the department that provides the quickest response to project-related issues. In particular, Tylor (2011) suggests PMO's can be designed for:

- The community of PM-wide practices and methodologies.
- Training, coaching, and certification.

- The process of decision-making and the project-selection process.
- The reporting system and management activities.
- Supporting, mentoring, and following up on financial aspects.

Dawson (2012) and Rouse (2014) discuss the primary roles of PMOs as being metrics for improving PM practices, providing a source of guidance and documentation for the process of implementing more projects within the same organisation. However, PMOs are also used to connect organisations with their projects and people to provide the level of support they need. The following (figure 3.1) illustrate these relationships and show how PMOs work.



Figure 3.1: How does a PMO work (Rouse, 2014)

3.2.2 PMOs and the global construction market

For decades, several researchers (APM, 2006; Hobbs and Aubry, 2010; PM Solutions, 2010; PMI, 2013; ESI, 2013) have been trying to grapple with the concept of the PMO and how it works to improve a business' overall performance. As project management (PM) has become integral across all industries and sectors, the PMO plays a vital role in offering strategic, technical or operational guidance in day-to-day business through its involvement in project delivery.

Around the globe, PMOs are dramatically increasing in number and becoming popular due to their effectiveness in boosting organisational levels of success. ESI (2013) conducted a survey with a sample of 2,300 respondents from around the world to form a global PMO map. The sample was taken from various industries including manufacturing, construction and IT. The research also sought to stratify the sample based on respondent job titles, these included: PMO Administration (3%), PMO Heads (16%), Business/ functional role (20%), and Project managers (62%). The result can be shown in figure 3.2:

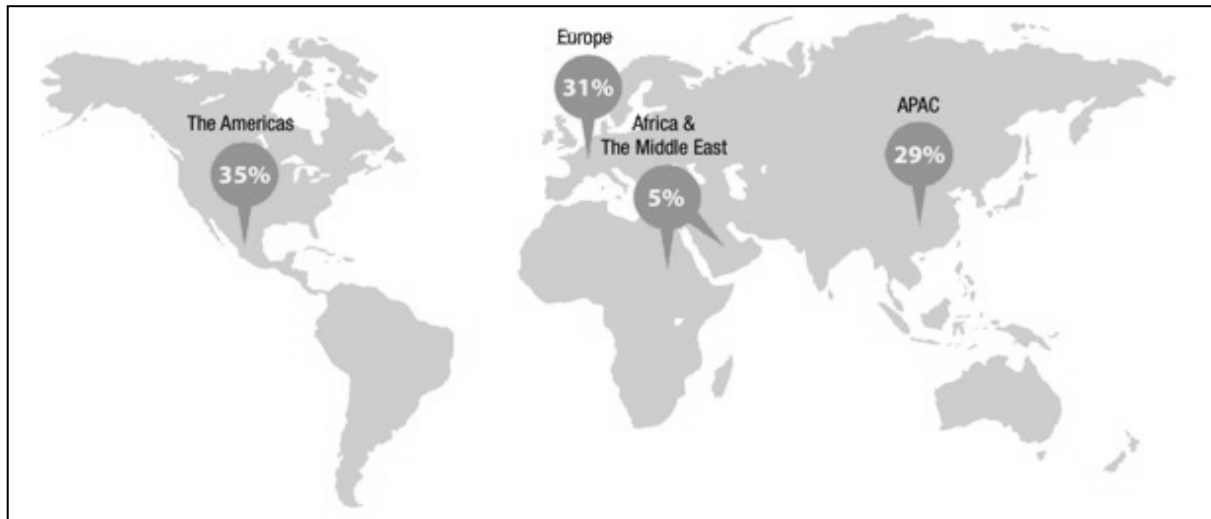


Figure 3.2: The worldwide map of PMOs (ESI, 2013)

From the findings, the Middle East and Africa have the lowest percentages, with only 5 percent of firms having PMOs. This reveals that location is weak when investigating the existence of PMOs. This seems to indicate that Middle Eastern firms are not benefiting from the latest approaches and tools of PMO. This area also illustrates that the adoption of PMO should follow the developed countries as their experience of applying PMOs have been used for a number of years. For instance, the previous sample demonstrates that US and European firms have the highest percentages of PMOs - 35 percent and 31 percent, respectively.

This indicates that the developed countries have found that the usage of PMOs can increase their performances and ability to face the current difficulties of construction projects. ESI (2013) further concluded their investigations into PMOs by suggesting that, the more investment is made in the preparation of PMO's teams, the more valuable adoption of this concept can be achieved. However, PM solution (2010) stated that the percentage of PMOs has increased dramatically worldwide, from 47 percent in 2000 to 84 percent in 2010. These figures indicate that companies are becoming more aware that there should be no room for projects to

fail, given the recent global recession, which has affected the ability of a number of countries to launch new projects. In other research, Hobbs and Aubry in (2010) conducted surveys on nearly 500 PMOs in different countries to define how many names have been used to describe the same orientation and purposes of PMOs; they identified the following seven different names:

- 1- Project Management Office
- 2- Project Management Oversight
- 3- Project Office
- 4- Project Support Office
- 5- Project Management Support Office
- 6- Program Office
- 7- Central Project Office

Due to the name of PMO being recognized by the majority of organizations around the world; this research project chooses to use the term PMO (Desouza & Evaristo, 2006; Alsadeq et al, 2011; Tylore, 2011; Daptiv, 2013).

3.2.2.1 The key challenges of PMOs

An international organisation called Fortes (2015) developed a map for the state of PMO in 2015 and proposed its state in 2020 (see figure 3.3). The existence of the PMO depending on the organisation's size is ranged between 61% for small organisation to 90% for the large one. This percentage shows that large organisations can benefit from PMOs more as the PMO contributes mainly to coordinate and mentor various projects. The average of PMO group propose to be eight people. This can be difficult to apply in large organisation in regard to the number of roles of PMOs needs to be delivered. However, according to the PMO responsibility; it is significantly important that the PMO group are considered to have more experienced years than others sister department as it has a direct impact on the whole organisation.

The figure 3.3 also identified the key challenges of the future of the PMO. Firstly, it indicates the difficulty of attracting and retaining well qualified PMO staff as they often leave the company or even the country. Secondly, companies can face resistance to change from people, which requires that the PMO gains full support from top management before the implementation processes. Thirdly, the future roles of the PMO are expected to move from having more operational roles towards more directive and active PMO roles.

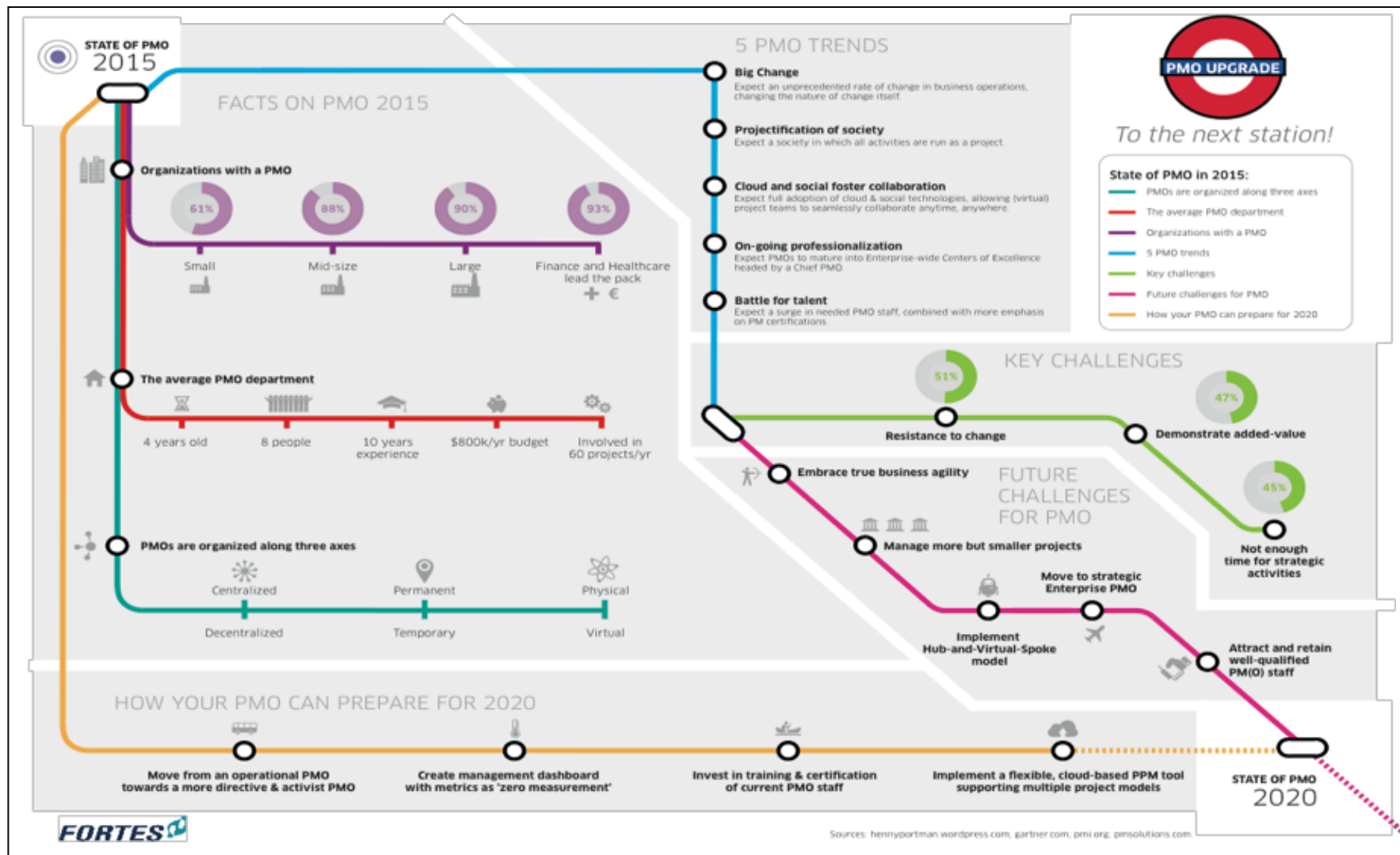


Figure 3.3: The state of PMO 2015- 2020 (Fortes, 2015)

3.2.3 The Value Added by the PMO and Its Principles: Improving Organisational Performance and Increasing Project Success

A great number of organisations are trying to find modern methods to use in managing business within construction projects (Obrochta and Finch, 2011; Dawson, 2012; Thiqah, 2013). As a result of applying those types of methodologies, companies are becoming more successful in achieving their desired goals. Similarly, PM intends to be more managerial; while this increases its number of practices and responsibilities, more suitable tools are needed to increase its impact as a 'PMO'. PMO can be defined as the real helm for various organisations that pursue different types of management across projects (Keyedin, 2012).

Equally importantly, PMOs need to demonstrate how they improve business performance by, for example, assisting and supporting an organisation to select the types and sizes of projects that are linked to their qualifications and the company potential. Several studies in this area (Visitacion, 2009; Godbole, 2014) suggest that when one or more construction projects deals with their management by some form of specialized department this means they are dealing with some form of PMO.

Likewise, a PMO helps to understand potential risks in advance that may face the various phases of the project. Moreover, the PMO heightens the possibility of rehabilitation and preparation of qualified people to successfully implement the project based on its schedule and in line with its budget. Sheaff (2011) reports the benefits of using a PMO in different organisations as highlighted in table 3.1:

Reduce Risk	Keep Projects on Budget	Keep Projects on Time	Ensures Improved Project Quality
Centralized repository for shared risk	Coordinates overall resources	Sets overall policies and procedures	Operates and manages overall project tools
Centralized proactive management initiative to combat project risk	Enterprise management of budget resources	Provides universal templates and documentation	Centralized communication management
		Enterprise management of project timelines	Provides mentoring and skill development

Table 3.1: Main Benefits of PMO in Organisations (Sheaff, 2011)

Regardless of the way in which researchers and experts emphasise different factors in how the PMO successfully improves business performance, its importance to the improvement of management in today's construction market is undoubtable. This research will discuss these ideas and going to more in-depth details, as follows:

1. The existence of PMOs should be used to establish clarity in the decision-making process (Almaghrabi, 2011; ESI International, 2013; Godbole, 2014). This can benefit from the availability of regular reports that monitor various project statuses. By considering the fact that in today's work environment, there is a huge need for transparency in order to make the right decision, PMOs increase the level of clarity needed to ensure the efficiency of project work. PMOs nowadays are supporting the Project Managers (PMs) by integrating most of the decisions. PMs must report to the PMO team; they cannot have more responsibility and power than the PMO's managers (Hobbs, 2007). Alnahj (2012) suggests that the PMO is important because it gives a wealth of information to the senior management and provides continuous improvement as well as satisfying the PMs and staff.
2. PMOs can offer the more effective management of human resources, technical and financial aspects, as well as the variety of resources that will be administrated and

coordinated by the office (Kendrick, 2009; Sheaff, 2011; Alsahli, 2013). However, managing resources is a big challenge currently faced by most organisations. The progress of construction projects can be affected through the shortages or conflicts of resources. PMOs in this regard are working to balance demand by understanding the organisation's resource capacity and disseminating resources at the right time. Effective utilisation of resources will no longer be a big obstacle, as the PMO team should be ready to receive orders from different projects and then apply their roles to deal with these orders in regard to the entire organisation's needs.

3. PMOs can serve the organisation by spreading the PM culture and knowledge competencies, unifying, building, and confirming the quality of the implementation of PM practices (Obrochta & Finch, 2011; Kacst, 2012; Majmah, 2013). It needs to achieve a suitable balance in the process of choosing the right PM practices, delivering company needs, and ensuring its implementation. The office should find methods, standards, and procedures for improving the PM process. Nowadays, companies are struggling to develop the right PM methodologies and best practices as there so many approaches and some might not work properly for particular organisations. Over time, PMOs will become the source of knowledge for assisting various projects.
4. The presence of PMOs can achieve the necessary levels of support and provide current project information to senior management (Emcanat, 2011; Keyedin, 2012; Dawson, 2012; PMI, 2012). The process of providing accurate reports on a regular basis will support the achievement of this factor. Reporting should become one of the most crucial jobs that a PMO does in order to mentor and control their various projects. PMO teams need to understand to whom they should be reporting and to prepare various types of reports using different forms and styles depending on particular tasks. Supporting senior management with regular and accurate reports will increase the organisation's ability to be more successful.
5. PMOs should be in place to minimise expenses, costs, and time, and to give initial warnings in the event of risk issues (Hobbs, 2007; Sheaff, 2011; Almaghrabi, 2011; Alnahj, 2012). This will increase the accuracy of spending, return on investment, and save time overall. By considering that the establishment of PMOs will cost money, for instance in hiring staff, running the office, and maintaining its functions, one must also

think about whether a particular organisation is big enough to benefit from the way that common methodologies, templates, and processes can save time and money when applied over various projects; if the company only has one small project each year, there is no obvious need of having some form of a PMO as it might cost more money and time rather than achieving its success factors (PMI, 2012). By contrast, if a given organisation has number of projects that it delivers every year, a PMO will be a useful investment.

6. PMOs might be the right tool to increase the performance of individuals as PMs, boost levels of teamwork and increase the ability to implement future projects at high levels of efficiency (Visitacion, 2009; PM Solutions, 2013; Halwah, 2013). Construction firms are advised to benefit from previous lessons learned; a rehabilitation of competencies is required by the various departments by paying more attention to KM (Julian et al, 2008; Muller et al, 2013; Shahram et al, 2014). The analysis of project indicators to measure the performance can be a good way to ensure continuous improvement. A successful PMO needs to focus on its own operations and on improving its effectiveness by measuring the level of success that it adds to the firm. The adoption of PMOs should deal with each organisation as a unique one due to their differentiation in sizes and maturities (Visitacion, 2009). It is possible to say that there are some useful opportunities - "Quick Wins" - for improving and maintaining the overall performance by PMOs. Kmart suggests (2008) that the PMO's value needs to be measurable as it has to show its impact upon an organisation's success. PMOs should have a clear understanding of the overall firm's goals and strategies to be integrated directly with the business nature. The continuous improvement in the performance of various projects should be considered as one of the various success factors of PMOs.
7. The availability of PMOs should provide more transparency and clarity to various projects' policies, standards and procedures (Hobbs, 2007; Emcanat, 2011; Keyedin, 2012). The process of creating an environment that is considered to be more efficient to manage different projects should adopt some regularity options. However, as there are various models of PMOs in place, there is a new trend of simplifying KM approaches. There is increasing pressure on PMOs to share effective knowledge as a means of increasing the importance of PMOs as a tool. The clarity of policies, procedures, and knowledge gained will allow the PMOs to play a key factor to achieve

the entire organisation's needs. Jordan (2015) sees this orientation as a very positive improvement not only for the PMO's profession but also for standardising all policies and procedures in the construction market. Jordan concerns that the lack of KM approaches has not considered at the same time as many organisations are putting more efforts on the evolution of PMO itself. The next generation of PMOs should balance the significant roles played by both PMO and KM (Dawson et al., 2012).

In brief, it can be claimed that the PMO provides the bridge between defining PM practices and implementing them within the organisation. Alternatively, the PMO can be considered the reform of management issues and/or a real supporter of increased coordination and communication among all parties and/or projects. Because the PMO plays many roles in improving project management, it is important for organisations that have not establish a PMO to reconsider the importance of its presence, especially at this time. These are clear indications that investment in this area will have a positive impact on the business' performance. The following table 3.2 summarises the application of PMO in improving business performance based on, but not limited to, the previous literature:

References	The Value Added By the PMO And Its Principles To Improve Organisational Performance And Increasing Project Success
(Godbole, 2014; ESI International, 2013; Almaghrabi, 2011; Kendrick, 2009; NHS, 2008)	<i>The clarity of decision making process.</i>
Godbole, 2014; Majmah, 2013; Pwc, 2012; Kacst, 2012; Obrochta & Finch, 2011; Rouse, 2011)	<i>An effective tool to adopt PM practices.</i>
(Alsahli, 2013; Amanah, 2013; Dawson, 2012; Sheaff, 2011; Kendrick, 2009; PM Solution, 2009)	<i>Effective management of human resources, technical and financial aspects.</i>
(Shahram et al, 2014; Mysliviec, 2013; Muller et al, 2013; Villa, 2010; Hill, 2008; Julian et al, 2008; Desouza et al, 2006)	<i>The source of knowledge (center of excellence)</i>
(Scott, 2016; Keyedin, 2012; Dawson, 2012; PMI, 2012; Obrochta & Finch, 2011 Emcanat, 2011; NHS, 2008)	<i>Support and providing current project information (regular and accurate reports)</i>
(Alsahli, 2013; TenStep, 2013; Alnahj, 2012; PMI, 2012; Kacst, 2012; Sheaff, 2011; Almaghrabi, 2011; Kendrick, 2009; Hobbs, 2007)	<i>Minimizing the expenses, costs, time, and reducing risk factors.</i>
(PM Solutions, 2013; Majmah, 2013; Halwah, 2013; Alnahj, 2012; Obrochta, 2011; Visitacion, 2009)	<i>Increasing the performance of individuals, teamwork and the implementation of future projects.</i>
(Jordan, 2015; Dawson et al., 2012; Keyedin, 2012; Pwc, 2012; Emcanat, 2011; Hobbs, 2007)	<i>More transparency and clarity to various projects policies, standards and procedures.</i>

Table 3.2: The application of PMOs in improving business performance

3.2.4 Establishment of PMOs

After discussing the approaches and success factors of PMOs, there is an urgent demand for organisations to understand the right procedures for establishing or developing the office. It can be argued that certain factors are essential in raising awareness in order to avoid failure. Researchers have found that setting up the PMO correctly will protect it from closing. This section will explore percentages of failed PMOs as well as the reasons behind this failing. It will go on to explore a comparison table that establishes the right process of establishing PMOs.

Over the past years, there has been a wide range of approaches towards establishing the PMO (PMI, 2005; Alsadeq, 2011). Nowadays, setting up, or restructuring and running a PMO has become the main objective of both governmental and private sectors. Researchers such as Alsadeq (2011) suggest the importance of establishing PMOs need to be identified because the PMO cannot be worked as the answer to all project problems or as other companies have one in place.

3.2.4.1 How Construction Companies can set up PMOs in their Projects

Table 3.3, below outlines the various procedures and steps needed for the establishment of a PMO.

	PMI (2009)	NHS (2013)	CIO (2012)	ASPE (2012)	Wilkinson (2013)	Hizamul (2010)
1	<i>Identify the orientation of PMO</i>	<i>Identify what problems to be solved</i>	<i>Prepare the company for this new department</i>	<i>Define the mission-strategy-objectives</i>	<i>Define the purpose of establishing the PMO</i>	<i>Prepare a strong foundation for the PMO</i>
2	<i>Provide ongoing training</i>	<i>Identify the PMO vision</i>	<i>Identify the PMO type</i>	<i>Provide the PMO to support PM methodology</i>	<i>Support by senior management and/or stakeholders</i>	<i>Identify PMO roles</i>
3	<i>Provide the PMO process help desk</i>	<i>Define the objectives</i>	<i>Communication with stakeholders and senior management</i>	<i>Provide training & coaching</i>	<i>Define the PMO process & tools</i>	<i>Design PMO teams</i>
4	<i>Provide face-to-face meetings</i>	<i>Define how the PMO can be operated</i>	<i>Allow time for getting results</i>	<i>Design the PMO teams & common resources</i>	<i>Design the PMO group</i>	<i>Identify PMO policy & methodology</i>
5	<i>Provide communication between different parties</i>	<i>Identify teams & tools</i>	<i>Evaluate & communicate early wins</i>	<i>Update & develop PMO</i>	<i>Communication with all parties</i>	<i>Provide metrics for the evaluation of PMO work</i>
6	<i>Change PMO tasks as you go</i>		<i>Develop and change through time</i>	<i>Evaluate PMO work</i>	<i>Keep monthly face-to-face meetings</i>	
7	<i>Client involvement in each step</i>		<i>Provide training packages</i>		<i>Keep regular reports</i>	
8	<i>Evaluate PMO work</i>		<i>Design stages and delivery process</i>		<i>Evaluate PMO work</i>	
9			<i>Evaluate PMO work</i>			

Table 3.3: Procedures and steps of Establishing PMO

The most crucial point made so far is the full agreement by all that the first step of establishing the PMO should be used to identify and define the PMOs tasks. To build a strong foundation for this concept, a full knowledge of its objectives needs to be provided. Researchers (Hizamul, 2010; ASPE, 2012; NHS, 2013) not fully acknowledge the importance of involving both senior management and stakeholders. This will result in increased pressure on PMs to highlight the benefits from the office and to gain the necessary support. PMI, ASPE, and CIO believe that providing on-going training and coaching programs for PMs and staff will increase their interest and prepare the required competencies for the office. This would be appropriate in situations where this concept is prevalent. A good example can be the middle eastern region where the PMOs try to appear by many construction companies as discussed earlier in chapter 2. This could present difficulties in practice.

However, some researchers such as the CIO fail to identify the need of chosen suitable PMOs teams and to define efficiently its roles. This might provide some limitations with applying this in practice. An alternative explanation might be that Wilkinson processes have been more beneficial in this case by keeping monthly face-to-face meetings and regular reports. A further major criticism of all agreed that, the importance of PMOs to provide some procedures and processes to evaluate and update its roles. At this stage organisations should use the evaluation process as the final stage of establishing PMOs, which must be accompanied with the presence of the office. Briefly, it can be said that there is nothing wrong if the establishment of the PMO requires a few months or even years, particularly with regards to large construction companies. The most important thing is that stakeholders and/or senior management play a major role in establishing this new approach.

Moreover, according to Alsadeq (2011) PMO teams needs to respond to all projects issue and orders. On the whole, the establishment of the PMO is challenging because every project or organisation is attending to be a new story. There is no doubt that each company will find a different way to set up the PMO, because firms have their own particular needs. Nevertheless, implementing a PMO will look to establish "*quick wins, more flexibility, and business driven*" (Alsadeq, 2011:5). CIO (2010) suggests that for a successful establishing of the PMO the following considerations need to be at work:

- The creation of PMO should be treated as a project in itself.
- The PMO type needs to be defined and named correctly.

- The long-term strategy needs to be planned and the short-term successes need to be outlined.

As a result of discussion on this section, the following table 3.4 outlines six steps in the processes that are needed to implement a new PMO for construction firms:

References	Establishing PMO
(NHS, 2013; CIO,2012; Hizamul, 2010; PMI, 2009)	<i>Identify PMOs Objectives</i>
(Wilkinson, 2013; ASPE, 2012; PMI, 2009)	<i>Obtain the Necessary Support</i>
(ASPE, 2012; CIO,2012; PMI, 2009)	<i>Provide Training & Coaching</i>
(Wilkinson, 2013; NHS, 2013; ASPE, 2012; Hizamul, 2010)	<i>Define PMOs Process, Team, Tools</i>
(ASPE, 2012; PMI, 2009)	<i>Provide Regular Meetings and Reports</i>
(Wilkinson, 2013; ASPE, 2012; CIO,2012; Hizamul, 2010; PMI, 2009)	<i>Evaluate & Update PMOs</i>

Table 3.4: Procedures and steps of Establishing PMO

3.2.5 Evaluation of PMOs

The establishment of the office does not mean that there are no more steps to assess the performance and maintain the development of the PMO and achieve the greatest benefit out of it. The evaluation of PMOs can be provided to support the functions and reasons behind establishing this office. It will be shown that there are various metrics to evaluate PMO performance. However, there are some factors that should be used in achieving the best practice of PM. At the end, it is important to ask how the construction company can get the best of the current PM practices. The in-depth details of those points will be provided in this section.

3.2.5.1 Metrics to Evaluate PMO Performance

In today's construction market both the governmental and private sectors understand the advantages for setting up or restructuring and running PMOs (PMI, 2009; Almaghrabi, 2011; Wilkinson, 2013). A survey was conducted by PMI (2010) to illustrate the state of PMOs; it found that almost 84% of recognized companies have some form of PMO. However, according to PMI's survey focusing on the years of 2005 to 2010 and sampling 291 organisations, the percentages of failed PMOs are as illustrated in figure 3.5:

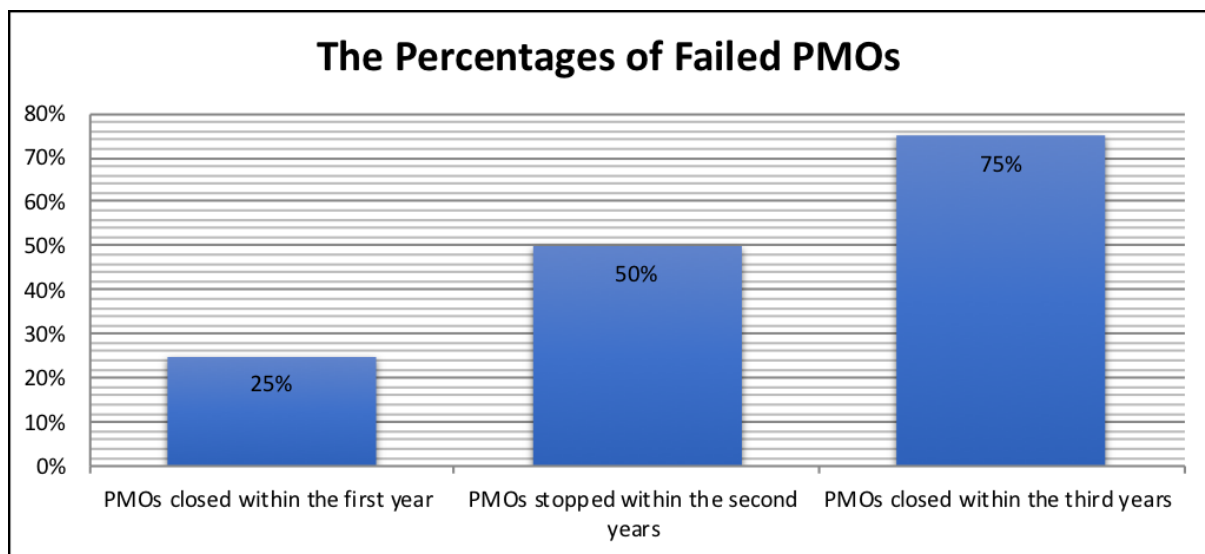


Figure 3.5: The Percentages of Failed PMOs (PMI, 2010)

The most crucial point made so far is that companies are advised to take a look at the factors and reasons affecting the spread of this concept. Perry (2014) outlines the following problems that can affect the establishment of the PMO:

- The lack of senior management to support PMO group.
- Resources, whether people or tools, are inappropriate.
- Objectives and roles are not identified clearly.
- Focused only on the short term rather than the long term.

PMOs cannot be the answer to all an organisation's problems or take the place of the work of other departments or sister companies that are already in place (Alsadeg, 2011; Mastering PM, 2012; Daptiv, 2013) The following section outlines certain considerations that need accounting for before the establishment of the PMO.

3.2.5.2 How construction firms can evaluate the performance of the PMO

It is significantly important to provide a number of steps and tools to evaluate PMO performance as well maintain its development (PMI, 2009; Hizamul, 2010; Almaghrabi, 2011; CIO, 2012; ASPE, 2012; Wilkinson, 2013). Organisations are advised to have a look at its achievement and noticing the great benefits out of it. The process of keeping this new orientation more accountable and showing its value can be achieved through certain methods to ensure that it is directly connecting to its objectives and strategies?

According to Eckerson (2006:11), “*you cannot manage what you cannot measure*”. Some practitioners of PMOs feel that while its establishment seems to be easy in theory, it is difficult in practice and not an easy task because it has to deal with multiple tasks and procedures, many of them in different locations (PMI, 2009; Hizamul, 2010). However, there are some metrics to evaluate PMO performance, which can be discussed in more detail in the following points:

1. The success percentages of a company's projects delivered over a particular time should be tested and evaluated (Hizamul, 2010; Mastering PM, 2012; Daptiv, 2013; KPI, 2014). The organisation needs to evaluate the success rates of project delivery by evaluating how far the organisation meets their objectives, the percentage of reduced utilisation, and the percentage of project success. A good way to adopt these factors can be illustrated by evaluating the estimated time Vs. the actual time. Therefore, the percentage of projects that are delivered on time and under the estimated budget is one important metric to test PMOs performance.
2. The better PM process that were used by PMO should be indicated within the project results (Hizamul, 2010; Mastering PM, 2012; Daptiv, 2013). The availability of PM practices should be linked to the organisational needs. There is no point in showing how many PM practices are used if these are not making an impact on the implementation of projects. For example, some companies might be seen that the quality management should be in place, while another one may feel this will rise more responsibility in the process of hiring unneeded staff and spend unfair money. The consideration of whether PM practices on site are implemented and whether they work across various projects will be a good tool to assist the performance of PMOs (Hizamul, 2010).

3. Gurta (2010), CIO (2012) and KPI (2014) provide a useful checklist for assessing the quick gains of the PMO. The optimal use of regular reports illustrating PMO responsibility will support the senior management to examine its existence (Mastering PM, 2012). However, this can be challenged on the basis that reporters not suitable to explain the wide map of PMOs performance. It is important to use the checklist form and to produce reports on a regular basis to allow the office to interact at the right time. Senior management should go back to the PMO's teams in case that the checklist forms not fully explained where is the PMO set now.
4. The evaluation of staff attitudes and knowledge gained can be used widely as a metric to evaluate PMO performance (Millhollum, 2009; CIO, 2012; Mastering PM, 2012; KPI, 2014). The evaluation of staff attitudes can be measured by using a short survey and through training programs. There are some tools that can be provided as an indication for reflecting its success. For instance; the feedback by PMs and project teams can easily ascertain whether a new approach will assist them or not. Some types of PMOs can be called centres of excellence (Wilkinson, 2013; PMI, 2009), this type should be the source of guidance to all PMs and project teams if they faced some difficulties or feeling they needs to improve their project knowledge.
5. Defining PMO missions, objectives, and strategies can establish a strong foundation for the office (NHS, 2008; Hizamul, 2010; CIO, 2012; ASPE, 2012). The entire organisation should be ready to adopt this new department because its functionality can affect all projects. The identification of which problems need to be solved or supported can be one of the biggest challenges. Identifying the PMO's vision, mission and objectives can be one of the most important processes for evaluating this office.
6. It is vital to involve the top management and/or stakeholders in the development of the PMO (PMI, 2009; Almaghrabi, 2011; Wilkinson, 2013). A particular weakness in implementing this concept can be seen as the failure to fully acknowledge the needs of senior management and/or the stakeholders. This will decrease its power by failing to gain the necessary support. However, this research maintains that senior management and the stakeholders should be involved from the early stages and at each step of the process.

However, the evaluation of PMOs must go through different stages in order to see how the office can deal with the various procedures of the project. However, the understanding of the right process of evaluating the PMOs is a key part in getting more accurate results. For instance, the improvement of PMs and PMO staff can test the PMO status. Factors such as evaluating success rates and how best the office can strongly deal with PM practices can give a good indication that the office has started to show positive features.

The results of this section of identifying factors and metrics to evaluate PMO performance can be summarised in table 3.5.

References	Metrics to Evaluate PMOs Performance
(KPI, 2014; Daptiv, 2013; Mastering PM, 2012; Hizamul, 2010)	<i>The success percentages of a company's projects that are delivered over time.</i>
(Daptiv, 2013; Mastering PM, 2012 and Hizamul, 2010)	<i>The availability of PM practices on site are implemented and work across various projects.</i>
KPI (2014) and CIO (2012) and Gurta (2010)	<i>Providing a check list form and regular reporting.</i>
(KPI, 2014; CIO, 2012; Mastering PM, 2012; Millhollum, 2009)	<i>The evaluation of staff attitudes, improvement and knowledge gained.</i>
(PMI, 2009; Wilkinson, 2013; Almaghrabi, 2011)	<i>Provide Regular Meetings and Reports.</i>

Table 3.5: Metrics to Evaluate PMOs Performance

3.2.6 The PMO and its existence in the KSA

Increasing the implementation of PMOs has been highlighted in the KSA government's strategic plan 'vision 2030' which articulates a series of reforms for government. One of these is the introduction of a national PMO, formed by the ministry of Economy and planning in 2015 (Khatib, 2016; Argaam, 2016; Bakkah, 2016; Fattah and Nereim, 2016). The national PMO will be used to review government projects to ensure their efficient implementation and consistent development by identifying needs and priorities as well as applying the latest PM approaches to public sector projects. The application of the PMO in government entities in the KSA can already be seen in different sectors such as the Jeddah Municipality, Majamah University, the national information centre, Ministry of Interior, and Ministry of Health (Bakkah, 2016; Fattah and Nereim, 2016).

However, the creation and implementation of PMOs in KSA construction organisations has also increased dramatically in the last few years (Amanah, 2013; Halwah, 2013; Emcanat, 2011). Indeed, Fahy (2015) and Argaam (2016) both note that the three largest construction companies in KSA are the Alarrab-contracting company, the Al-sief company, and the Saudi Oger group. All three have already implemented centralised PMOs in recent years. These same firms are now executing larger projects in different areas at the same time. Consequently, their individual turnover is now reported at upwards of 5 billion Riyal's per annum. This suggests that the PMO is critical to business growth, if performance is to be sustained (Fahy 2015; Argaam 2016).

3.2.7 Summary of the whole PMO's section

It can be claimed that the PMO is the real thinker to bridge the gap between defining the PM practices and implementing them within the organisation. Alternatively, the PMO can be seen as the reform of management and/or a real supporter of increased coordination and communication among all parties and/or projects. Otherwise, as the PMOs play many roles for improving project elements, it is important for organisations that have not established this office to reconsider the importance of its presence, especially for facing the current difficulty of construction market. Moreover, researchers Oakwood, 2010 and Tylor (2011) have suggested that the PMOs can improve business performance. These are clear indications that the investment in this area will have a positive impact on the future.

3.3 The Effect of PMOs Functions on the availability of PM practice

3.3.1 Factors in Achieving Best Practice by Implementing PMO

A large number of studies (Obrochta & Finch, 2011; Sheaff, 2011; Godbole, 2014) indicate that when organisations start to adopt best practices in their management, it becomes easier to define the appropriate types and sizes of projects they can undertake. Quite recently, considerable attention has been given to PMOs in order to deliver the best PM practices and winning the highest levels of project successes (Kendrick, 2009; Rouse, 2011; Almaghrabi, 2011; Dawson, 2012). Nowadays, PMOs are developing more areas of expertise, as illustrated by Oakwood (2010) in figure 3.6:



Figure 3.6: PM Best Practices (Oakwood, 2010)

It is important that organisations use only the type of practices they need PMOs to deal with. Therefore, this research project poses the following question: how can construction companies get the best current PM practices by PMOs? Hopefully, by going through some examples of using best practices by PMOs, a suitable answer can be found. Mastering PM (2012) have identified some important factors in this regard; firstly, they identify the need to give more attention to the management or project teams. This can be achieved by ensuring that people have sufficient time to do their tasks and by creating suitable training programs. Secondly, in order to support and control various projects, PMOs are needed to apply the latest technology tools as well as having in place mid-term and/or long-term strategies. Thirdly, in many cases, PMOs should implement a number of PM approaches and deliver them to all projects. In this regard, KM might be useful in encouraging a good type of work environment.

However, the discussions above omit a number of best practices such as; benefiting from getting accurate reports and learning from the experiences of projects completed but also projects that have failed. This research project maintains that important lessons can be learned by considering the opposite side; evaluating the worst practices of PM. For instance, Depitive (2010) identified ten worst practices associated with the use of PMOs. Here, two of these have been selected and will be explored in more detail. Firstly, Gathering Unnecessary Information: In today's PMO culture, a vast amount of data might be collected, some of which might be not useful in making decisions or improving business. Here this question should be asked, why is a particular type of data being collected? PMOs, in whatever forms, should be implemented to save the overall time and cost rather than paying attention to unnecessary tasks. Secondly, Lack of Executive Support: PMOs should not be created where there is no support from senior management and/or stakeholders. Basically, this will limit its life and affect the overall company's resources.

3.3.2 The Effect of PMOs Functions on the PM practice

The role of the Project Management (PM) is important to create a good environment for the PMOs to be launched. The PM is an urgent demand for the new construction market and its value can be seen from the commencing date through to completion. However, the management of construction projects is different in many aspects than the general PM approaches. Construction projects require an understanding of many aspects, such as

coordination of human and material resources, and executing orders according to an agreed plan.

Effective administration in all aspects is key to project success. There is an increasing interest within public and private sectors alike to implement and provide the highest levels of PM systems. For example, governments of developed or emerging countries support the application of PM and the development of many courses, conferences and workshops in order to raise and secure the economic benefits (Magdad, 2011; Diry; 2011). The use of PM systems to achieve organisational objectives dates back to the middle of the last century (Alsahli, 2013; Deemah, 2014) However, literature from around the world (PMI, 2008; APM,2012) suggests the difficulty of finding a specific concept of PM because each organisation works to have a unique system in PM, which is different from the rest.

There are almost 75 unique functions of using PMOs that have been recognized by Hobbs and Aubry (2007) from conducting a study on around 500 different organisations from around the world. The results indicated that identifying systematic patterns for PMO's functions is a big challenge (Aubry *et al*, 2007). However, despite such challenges, this research aims to identify the clear functions of PMOs. The following discussion will be focused more on the important functions that can be linked directly with the success factors of PMOs to improve business performance. The following table 3.6 highlights the similarities, differences, strengths, and limitations of PMO functions:

	APM (2006)	PMI (2009)	TPG (2012)	PA&E GLOBAL (2010)	IM (2013)	PM Solutions (2010)
1	Integration	Stakeholder/communication oversight	Projects Coordination	Communications Management & Approved Policy, Plans, & Procedures & IT Governance	Reporting	Project policies, procedures, templates implementation/management
2	–	Robust scope management/change control	Coaching Teamwork	Change Management & Assigned Roles & Responsibilities	Up-Skills of PMs & Manage People	PM coaching and mentoring & Change control and issue tracking
3	Human Resources & Standards Methods Process Tools	Coordinated resource management	Tool Selection	Resources Allocation	Identifying Tools & Resources Allocation	–
4	Scope	Comprehensive knowledge/recorders management	Operational Support & Standardization	Project Planning & Process Performance Evaluation	Support Processes	Governance process implementation/management & PM methodology Project/program closing & Project/program planning
5	Cost & Procurement	Structured progress tracking/forecasting & Expert work planning, estimating	Steering	–	Costs Control	Multi-project coordination
6	Risk	Value-adding risk/issue management	–	Risk Management	Risk Management	–

Table 3.6: Effect of PMOs Functions on the availability of PM practice

Table 3.3 has shown that PMOs nowadays play many important roles for developing and facing the challenges on the construction market. Additionally, identifying the functionality of the PMO is not an easy task, but the following discussion will be focused on the most important tasks by linking them with the factors that cause projects to fail, which is previously discussed in chapter 2. In addition, for the expansion of criticism it is possible to reach the following results:

Firstly, the majority of literature in the previous (table 3.6) is based on how to employ PM practice with the PMO. However, these approaches do not account for how exactly the PMO approaches will raise the PM functions. For that reason, this research at this stage needs to provide some details around each function. Secondly, while critics TPG (2012) and IM (2013) provide some positive outcomes, for instance using the office to benefit from sharing resources and controlling the overall cost, they offer no explanation for how the office will increase PM practice. Finally, what APM (2006) fails to do is not considering that the PMOs should be used to improve and train PMs and project teams. While a particular strength of PM Solutions (2010) and PA&E Global (2010) was to show how the office delivers useful culture change by providing training programs. This would be appropriate in cases where PMs and staff face many difficulties. As a result, the following chart 3.7 is used to summarise the most important functions by identifying the common functions of PMOs that carry the same meaning:

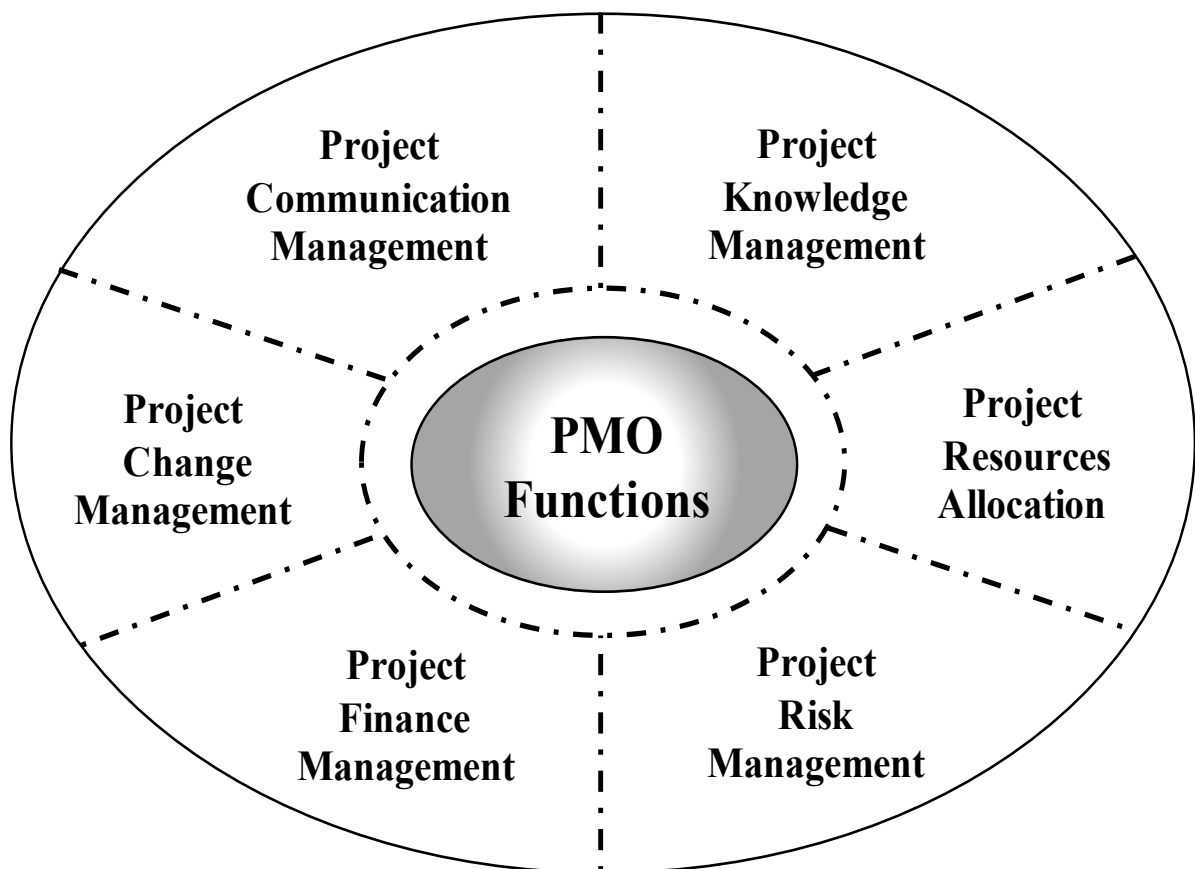


Figure 3.7: The Effect of PMOs Functions on the availability of PM practice

3.3.2.1 Supporting the Project Communication Management

Managing communication among different projects and parties is one of the most significant roles that can be performed under the PMO's capacity as suggested by Peansupap and Walker (2005), APM (2006), PMI (2009), and Mochal (2013). The process of joining all of a company's departments and projects to achieve organisational objectives cannot be done without first overcoming numerous difficulties such as the lack of communication between the PMO and senior management that could lead to the PMO's demise (Practical PMO, 2011). Consequently, the PMO must ensure it has processes in place that allow it to effectively communicate its services, targets, process and quick wins to senior management, this maximizing interaction with senior management whilst also enhancing collaborative work and trust within the organisation. To resolve this dilemma, organisations should follow the right process of a high level of communication by the PMO as stated in table 3.7 by Kingspace Group (2014):

One Page Overview of PMO Communications Management

KEY POINTS	POINTS TO CONSIDER						
GOOD PMO COMMUNICATIONS	AUDIENCE Know your audience to communicate in a manner appropriate to their knowledge and requirements • Business stakeholders • Project Managers • Leaders and Sponsor	COMMS OUTCOMES • Be clear on the comms outcomes you want • What do we expect your target audience to know or to be able to do as a result of your comms program?	COMMS MEDIUM • Use the proper medium to communicate the message that is appropriate for the message and the audience • What is the most effective and efficient way to package the message?	PAST APPROACHES • What approaches have worked in the past? • Was it received and did it have the desired impact? • What was the frequency? • What information was communicated?	COMMS QUALITY • How well are you communicating the messages? • How do you know?	COMMS IMPROVEMENT • How do you use the feedback from your comms to improve? • Do the improvements you make to your comms work? • Are comms evaluated and lessons learned are applied to future communications	COMMS METRICS • What are the factors for measuring effectiveness of messages, tools and channels?
PMO STAKEHOLDER ANALYSIS	STAKEHOLDERS Identify all the stakeholders effected by PMO	STAKEHOLDER ANALYSIS Perform a stakeholder mapping and analysis aimed to find and group the individual stakeholders	STAKEHOLDER INTEREST Assess stakeholder interests to the PMO and its impact to them and their organisation	IMPACT ANALYSIS FOR PMO Understand how these interests might impact the success and influence of the PMO	STAKEHOLDER MAP Develop a power / influence stakeholder map for PMO	STAKEHOLDER PLAN Use the stakeholder map to find the most effective way to tell stakeholders of PMO goals, roadmap and processes & achievements	STAKEHOLDER TOOLS Review stakeholder management tools that can assist activities involving interactions with stakeholders
PMO SERVICES	CONSISTENCY Increased consistency and predictability in project execution and reporting	GOVERNANCE Centralised governance • Portfolio management • Project reporting • Quality gates • Failing projects • Documentation	LEADERSHIP ADVISORS Providing advice and recommendations to senior leaders on project management best practices, risk management and resource management	MINIMUM REQUIREMENTS All projects meet minimum organisation requirements • Aligned with strategy • Valid business case • Project priority from portfolio governance	COMPLIANCE Providing audit trails for programs and projects to ensure compliance with regulatory compliance (industry and legal)	PORTFOLIO MANAGEMENT Portfolio management by identifying, selecting and prioritising new projects plus involvement in business cases & benefits reviews	COMPLIANCE AUDITS Performing and reporting on audit for regulatory and legal compliance
	STANDARDS • Providing standards, methodologies and a set of PM tools • Quality monitoring and policy enforcement	PROJECT DOCUMENTATION A central store for managing project documentation (business cases, project briefs, PIDs, status reports)	ADMIN SUPPORT A core PMO function to provide admin support for project managers	PM EXPERTISE Providing project management expertise to PMs (budgeting, scheduling, issue and risk management)	PROJECT PERFORMANCE Monitoring and reviewing project performance in scope, budget, schedule, deliverables and quality	BUSINESS CASE VALIDATION A viable PMO service is the ongoing validation of business cases	RESOURCE MANAGEMENT A PMO can play a key role in resource management in hiring, financial management and project prioritisation
PMO COMMUNICATIONS	STATUS REPORTS Collating and reporting project status to senior management • Project statuses • Raise issues and risks	PROJECT STATUS MEETINGS To facilitate and review the status of current projects • Identify issues and owners • Discuss risks • Decide any risk mitigations	MASTER SCHEDULE Creating a Master Schedule List to provide a big picture of projects' dependencies, & resource management	GOVERNANCE REPORTS A core PMO service is the monitoring, reviewing and reporting of projects performance and alignment with governance processes	PROJECT HEALTH CHECKS Conducting project health checks to ensure compliance with PMO standards and policies plus project management best practices	LESSONS LEARNED REPORTS Another PMO service is the facilitation, recording, analysing and reporting feedback from lessons learned meetings and PIRs	PMO PERFORMANCE Reporting on PMO performance, metrics, milestones and achievements
	PMO WEBSITE The future of project management is the web and the PMO should have a website as a central, single source of truth for project information & artifacts	PMO NEWSLETTER A PMO newsletter can provide information on: • PMO project successes • Portfolio Management processes • PM best practices • Projects progress status	PMO CENTRAL STORE A key value that a PMO can provide to an organisation is to create a central store for valuable PM documents that are easy to locate using standard naming and format conventions	PMO AWARENESS SESSIONS • Explain purpose, roles & responsibilities of the PMO and how it aims to improve the success of projects • Highlight the value & services that it wants to deliver to the organisation	PMO TRAINING A value added service a PMO can provide is developing competencies of PMO staff including training and mentoring for project managers	PMO CONSULTANCY • Offering advice and support to project stakeholders • Being a source of training, guidance and mentoring for project managers	PMO HANDBOOK A PMO handbook to orient new project managers and other stakeholders on PM and governance processes to set expectations and align activities to a set of standardised practices
PMO COMMUNICATION SUCCESS FACTORS	THE PMO PROJECT • The PMO should be treated as project with clear aligned goals, deliverables & metrics • It is a critical success factor for a PMO that there is a well defined & agreed comms plan in place and actioned	QUICK WINS Communicating 'quick wins' and PMO achievements • Project successes • Master schedule • Portfolio management in place to prioritise projects • Governance quality gates implemented & operating	PMO VALUE ADD SERVICES • Communicate a set of well defined value added PMO services & metrics • Beware of the logo and T-shirt marketing approach as it can be detrimental if there are no real substantial achievements to support it	GOOD PMO COMMS Effective communications in a medium and frequency appropriate to the needs of the different stakeholders • Customer surveys • Workshop feedback	PMO DELIVERABLES • No. of people trained • No. of projects with valid business cases • More projects with governance and quality • No. of failed projects • Central store of project documentation	COMMUNICATE PMO VALUE • Governance model • Centralised reporting • Project management best practices and artifacts • Training and consultancy • PIR's and Lessons Learned • Project management documentation is for purpose to help PMs	GOOD PMO STAFF Project management is 90% communication and it is critical that PMO staff are confident communicators who can present PMO value and achievement

Table 3.7: Overview of PMO Communications Management (Kingspace, 2014)

In agreement with the table 3.7, those developing and leading the PMO should consider certain key points such as the communication of PMO services, targets, process, and quick wins that in order to maximize the interaction of senior management and the trust from other parties. A PMO group must be ready to provide project status reports, meetings, schedules, training, and lessons learned.

3.3.2.2 Encouraging the Project Knowledge Management

Leveraging knowledge management can be defined as one of the most important factors that the construction firms are struggling with as they endeavor to transfer knowledge from their previous or current experience to the future (Desouza & Evaristo, 2006; Koskinen & Pihlanto, 2008). Ramaniah (2014:52) explains that “*The transfer of knowledge from existing human resources to their successors must be managed effectively to ensure business continuity and successful project execution*”. The existence of the PMO should support KM by providing a set of solutions in order to overcome any potential obstacles (PMI, 2009; Ajmal & Kekale, 2010; Anantatmula, 2012; Salameh, 2014). PMOs with effective knowledge and authority can be responsible for selecting the right people for the right task at the right time (Desouza & Evaristo, 2006; Koskinen & Pihlanto, 2008). APM (2013) have suggested that the PMO can enable the spread of knowledge through the whole organisation in the following ways:

- By allowing and advising people to share knowledge and learning with each other.
- By providing tools and techniques to collect knowledge and avoid their loss.
- PMOs should lead PMs to implement knowledge management to increase people's abilities to conduct matters more effectively.

3.3.2.3 Improving Project Change Management

Due to difficulties within the current construction market, companies are being advised to make huge changes in their old practices (Sun *et al.*, 2004; Motawa *et al.*, 2007). The adoption of PMOs is considered to be important in dealing with people, tools, and processes. However, the adoption of PMOs to improve change management should consider the importance of dealing with people, tools, and process as discussed by Wasseluk (2014) on figure 3.8:

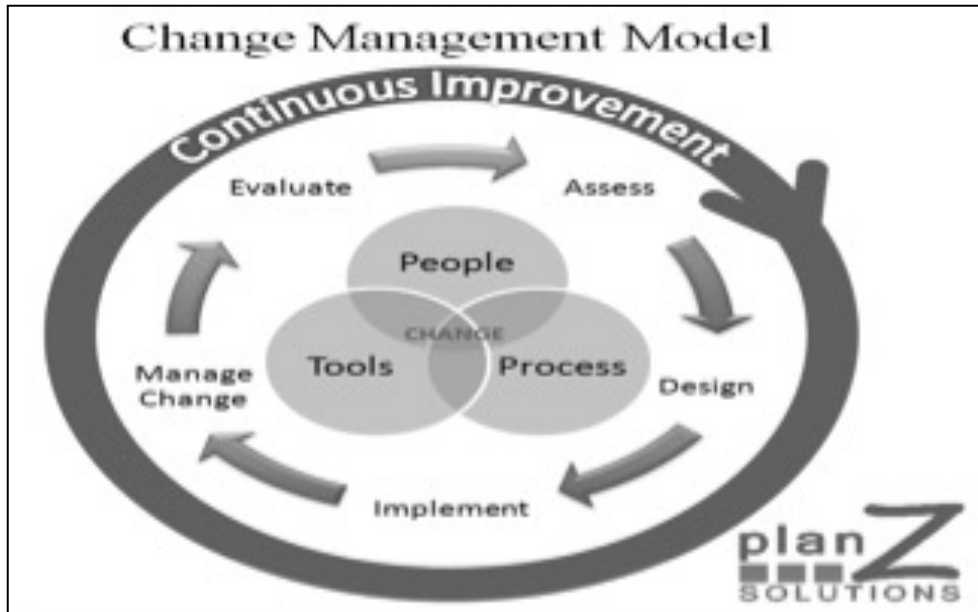


Figure 3.8: How PMOs Integrated in Change Management (Wasseluk, 2014)

Effective PMOs should be ready to provide training programs and coaching sessions for PMs and/or project teams (PA&E Global, 2010; PM Solutions, 2010; Wasseluk, 2014;). This can be beneficial to ensure PMs are well prepared to deal with all of a project's aspects and that they are best equipped to implement and change old policies.

3.3.2.4 Balancing the Project Resources Management

PMOs can be a good tool to manage tangible assets, materials and equipment, as well as intangible resources like business methodologies (APM, 2006; Hobbs and Aubry, 2007; PMI, 2009). A PMO team can communicate and coordinate resources among either single or multiple projects that are executed under the company's capacity. It can be useful to make these resources available upon request by any PM. Nowadays, in particular, in the execution of construction projects; there is a high demand for having a good resource management system (Doughty, 2005; Hobbs and Aubry, 2007). This can help to deal with the various types of resources that need to be managed properly. According to Hoffine (2013), resource management is the process of using the organisation's resources by priorities as illustrated in figure 3.9:

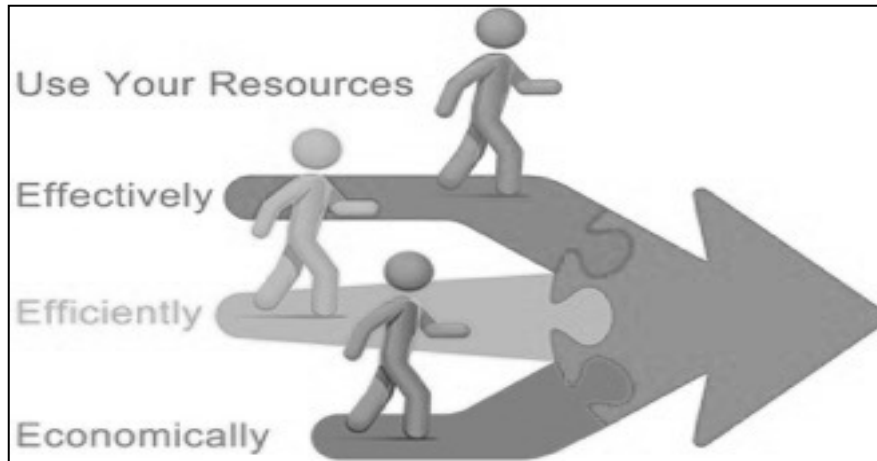


Figure 3.9: Resource Management Centres of Excellence (Hoffine, 2013)

A PMO should be worked to encourage sharing resources, skills, and knowledge (Doughty, 2005). In a more specific analysis, Planning Group (2012) suggested that companies looking to access the huge benefits of utilizing PMOs for sharing resources should consider the following points:

1. Looking for internal resources.
2. Creating a PMO group of those that are willing to interact with different departments.
3. The PMs should be available for negotiation processes.
4. Monitoring resources to see where and how they are used.

3.3.2.5 Promoting the Project Finance Management

It can be seen that companies are always aiming to win the maximum return on profits in every project. Organisations are becoming more aware of the important needs of financial management (Wolthenholme, 2009; Marttonen; 2014; Zayed, 2014). The achievement of gaining accurate accounting seems to be a big challenge for many companies. It is important to consider the interaction between the PMO's group and PMs. This can be used to ensure that each type of project can meet the estimated costs (APM, 2006; Elizabeth, 2008; Almaghrabi, 2011). Figuring out the financial aspects will also assist in the decision-making process. Elizabeth (2008) defines the process of PMO assistance to project finance management in the following figure 3.10:

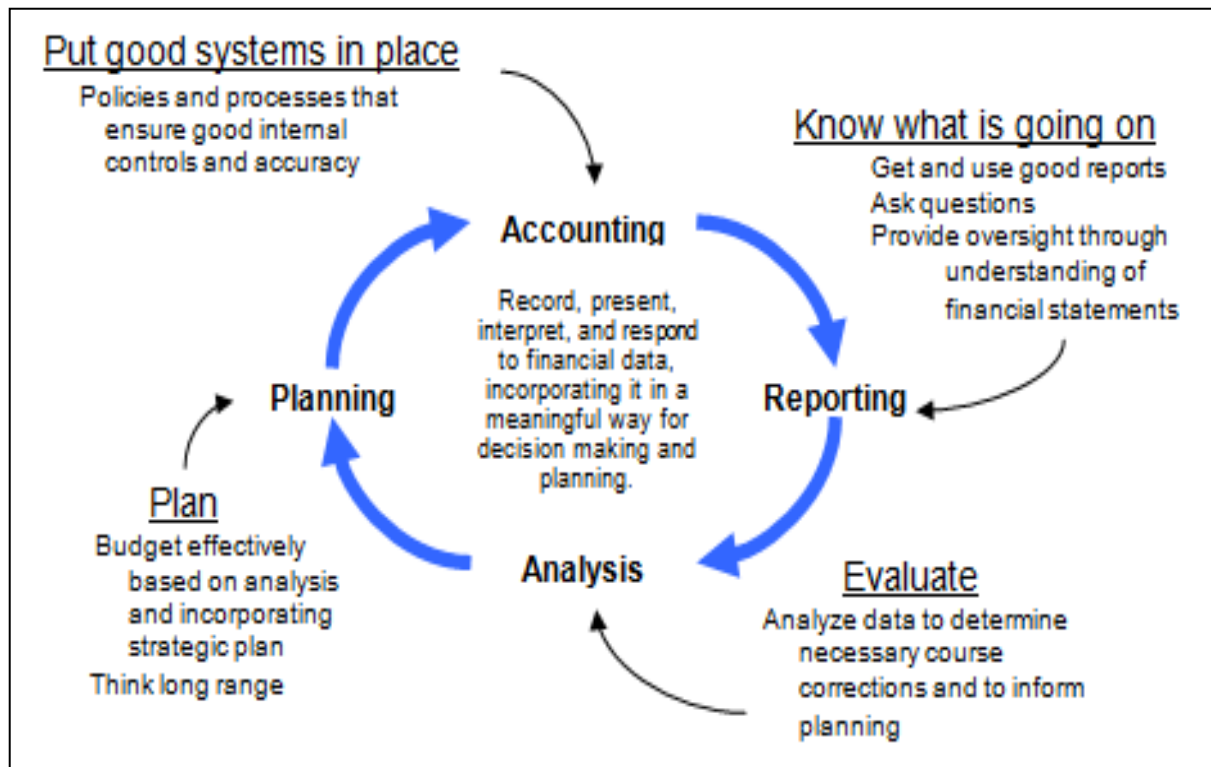


Figure 3.10: How PMOs assisting the finance management (Elizabeth, 2008)

Figure 3.10 illustrates that in order to promote project finance properly, the PMO needs to follow four processes. Firstly, regular reporting lines should explain what the status of each construction project is to allow senior management to support them directly. Secondly, the analysis of various project processes and procedures can determine the best course of action. Thirdly, in order to prepare well planned systems by the PMO team, it is necessary to have effective budget system and promoting strategies. Fourthly, enabling the PMO department to establish a good system to implement general policies and standards for the entire organisation can ensure efficient internal controls and accuracy. PMI (2010) suggests that the financial support enabled by PMOs can be seen in the following aspects:

- The percentages of failed projects will be reduced.
- The delivery of projects will be handled under the estimated budget.
- The accuracy of following the project schedule will increase the amount of cost savings.

3.3.2.6 Reducing and Identifying the Project Risk Management

It is argued that risk management can be one of the missing part of wider PM practices, which has a big impact on the majority of construction companies (Callahan et al., 2004; Levine et al., 2005; Malhotra *et al.*, 2009). Many companies within construction seem to deal with each project as a unique one, whereas the ability of construction firms to response to risks factors on time, can save major cost and completing the project as required. Stangligh (2010:37) suggests that “*Risk Management is the process of identifying, analysing and responding to risk factors throughout the life of a project and in the best interests of its objectives*”. By following some of professional procedures, companies can decrease or even avoid risks occurring, as illustrated in figure 3.11.



Figure 3.11: Risk Management processes (APM, 2014)

Risk management is one of the important roles that can be achieved by the PMO (APM, 2006; Stangligh, 2010; PA&E Global, 2010). The relevance of the PMO concept can be applied as a critical tool with various risks. For instance, sharing risks between similar projects that are executed in the same location.

Table 3.8 can summarise the effective functions of PMO in construction organisations, these functions are:

References	The effect of PMOs functions on the availability of PM practice
(Mochal, 2013; Practical PMO, 2011; PMI, 2009; APM, 2006; Peansupap & Walker, 2005; Egbu et al., 2001)	<i>Supporting the Project Communication Management.</i>
(Salameh, 2014; Shahram et al, 2014; APM, 2013; Anantatmula, 2012; Rania, 2011; Ajmal & Kekale, 2010; PMI, 2009; Koskinen & Pihlanto, 2008; Desouza & Evaristo, 2006; Martinsuo & Arto, 2003)	<i>Encouraging the Project Knowledge Management.</i>
(Wasseluk, 2014; PA&E Global, 2010; PM Solutions, 2010; Motawa et al, 2007; Sun et al., 2004)	<i>Improving the Project Change Management: (Training for PMs and Project Teams)</i>
(Hoffine, 2013; Planning Group, 2012; PMI, 2009; Hobbs and Aubry, 2007; APM, 2006; Doughty, 2005)	<i>Balancing the Project Resources Management.</i>
(Marttonen, 2014; Zayed, 2014; PMI, 2010; Almaghrabi, 2011; Wolthenholme, 2009; Elizabeth, 2008; APM, 2006)	<i>Promoting the Project Finance Management.</i>
(PA&E Global, 2010; Malhotra et al., 2009; APM, 2006; Levine et al., 2005; Callahan et al., 2004)	<i>Identifying the Project Risk Management.</i>

Table 3.8: Functions of PMOs

3.3.3 Summary of PMO and PM section

The functions of PMOs can be presented at different levels: for example, in large companies that have in place a number of projects, the existence of PMOs at this level might have more responsibilities, which may include unifying practices, participating in resources, activating the roles of communication and cooperation to implement best PM practices. Another example can be found in small companies that only deal with one project, at this stage the PMO's functions are to control the project from inception to completion. This will increase the importance of using different maturity levels of PMOs to suit organisation's needs. However, it is worth concluding that by providing the PMI (2009) thoughts around this discussion, which suggested that the main responsibility of PMO is to support the PM functions to lead the whole project rather than to focus on its specific tasks. Figure 3.12 is provided to illustrate the important aspects of PMO that increase its importance, effectiveness, functionality, and performance.

This opens the map for this research to identify one of the important functions of the new PMO roles, namely KM becoming the main function that encourages the majority of construction firms to improve their business performance. This can be linked with the contribution of this research to deal with the new immigration controls and transferring the valuable knowledge before the professional project management staff will leave the company. In section 3.5, the importance between this relationship of PMO and KM will be provided in more detail.

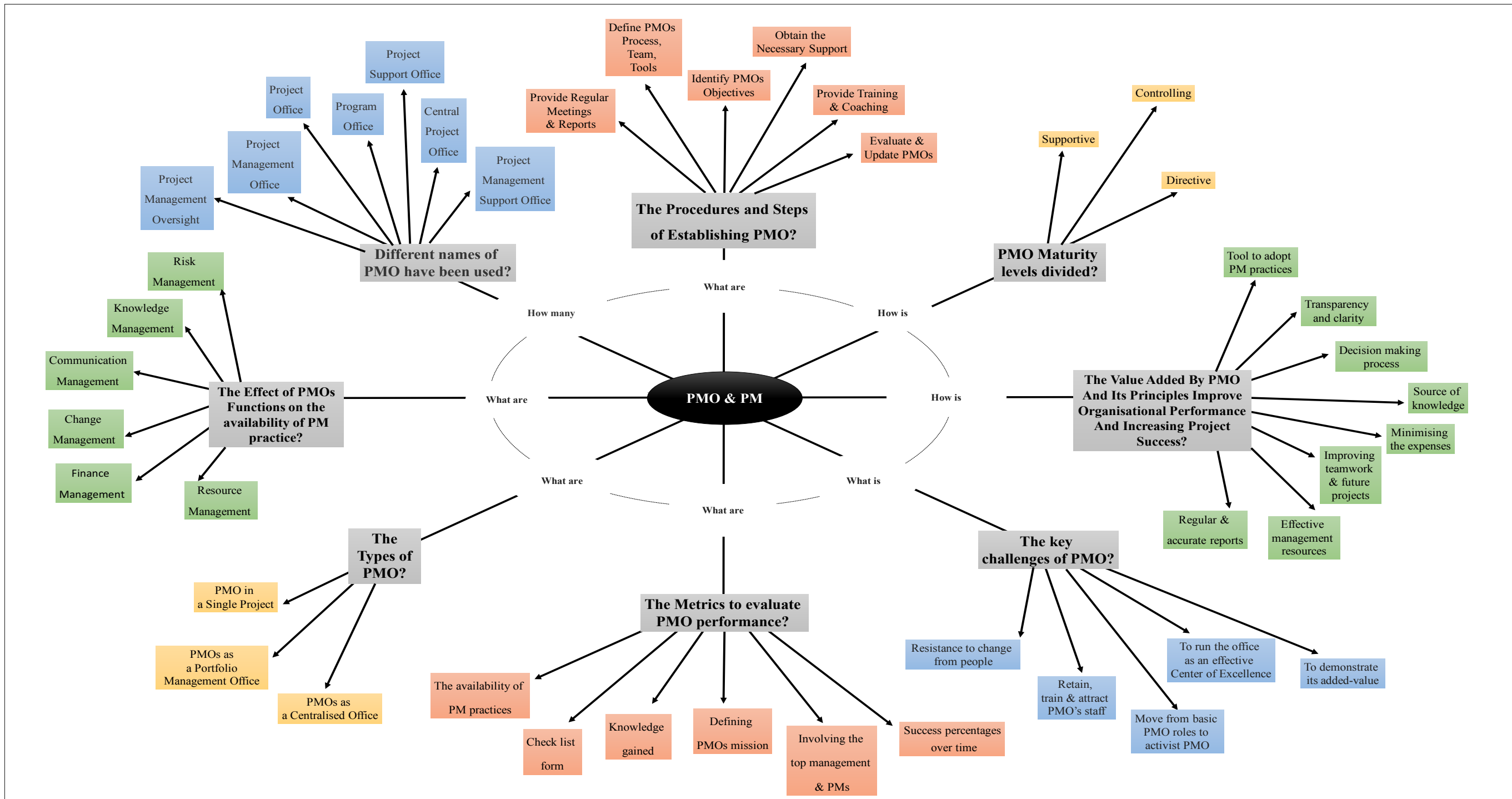


Figure 3.12: Synthesis - PMO and PM

3.5 The Effect of PMOs functions on the application of KM practice

As has already been discussed in chapter 2, the concept of KM is to share, reuse, capture, and identify the important knowledge held by employees (Tserng and Lin, 2004; Ahmad and An, 2008). Similarly, PMOs can act as centers, mentors, and can give guidance in a wide range of practices (Desouza and Evaristo, 2006; Hobbs, 2007; Koskinen and Pihlanto, 2008). The storage and collection of project knowledge, the methods used and models, and the lessons learned can be centralised by the PMO. The utilisation of some records that relate to project performance, such as variable analysis, risk lists, updates in initial plans, status reports and others pertaining to unsuccessful or successful experiments, should be stored in some formal standards or databases to make them accessible for the future projects (Martinsuo and Arto, 2003; Rania, 2011).

3.5.1 Summary of the previous studies of combining KM and PMO

The relationship between using the PMO as an effective tool and applying KM as an important function of PM practices has been discussed in academia for several years to improve organisational performance. Table 3.9 indicates that this important phenomenon should be studied and applied to various business needs:

Authors	Title of Journal
Muller and Gluckler and Aubry (2013)	<i>Project management knowledge flows in networks of Project Managers and PMOs</i>
Pemsel and Wiewiora (2013)	<i>PMO as a knowledge broker in project-based organisations</i>
Aubry and Muller and Gluckler (2011)	<i>Exploring PMOs through community of practice theory</i>
Chunha and Figuriredo and Matos (2010)	<i>Knowledge management on PMO's perspective</i>
Julian (2008)	<i>How PMOs leaders facilitate cross-project learning and continuous improvement</i>
Desouza and Evaristo (2006)	<i>PMOs: a case study of knowledge- based archetypes</i>
Walker and Christenson (2005)	<i>Knowledge wisdom and networks: a project management center of excellence example</i>

Table 3.9: Secondary sources of applying both PMO and KM

As table 3.9 illustrates some researchers such as Walker and Christenson (2005) have proposed that the PMO works as a centre of excellence to provide leadership, best practices, and knowledge. Yet others, including Pemsel and Wiewiora (2013), advocate the PMO as a knowledge broker, suggesting that the staff of the PMO will seek to develop knowledge sources, relationships, and networks among different department and projects. This point is reinforced by Chunha et al. (2010) who opine that knowledge can be an effective function that can be ultimately distributed via a PMO.

3.5.2 Common Aspects of PMO and KM

Knowledge Management and PMO can be very closely related by considering some important aspects, as discussed by Anantatmula (2012) and captured in table 3.10 below.

PMO	KM
Project repositories	Repository of tacit and explicit knowledge
Best Practices for PM	Best Practices
PM Standards and Methods	KM Standards and Methods
Consulting	experts
Mentoring	Communities of Learning
Review and analysis	Metrics for results of learning

Table 3.10: Common Aspects of PMO and KM (Anantatmula, 2012)

Anantatmula's (2012) research illustrates that both KM and PMO can support each other as well as work to achieve overall business needs. The PMO can create and formalise the KM model, processes, and concepts among various departments within the organisation. Since the existence of PMOs in project based organisations, the priority of considering KM as a function has become more important to the office. As the team members of some projects are leaving or disband from the organisation, this may give rise to issues such as the leaking of project knowledge, which could affect the reuse of important knowledge (Koskinen and Pihlanto,

2008; Ajmal and Kekale, 2010). However, Desouza and Evaristo (2006) and later Shahram *et al.* (2014) advocate that there is a significant gap in the existing literature that addresses KM wide practices from a PMO perspective.

3.5.3 Benefits of KM for the PMO development

Desouza *et al.* (2006) and Mysliviec (2013) argue that the presence of KM can offer some benefits for the operation of PMOs and divide them into two categories. Firstly, KM can offer quantitative benefits such as the time of resolution problem and rework can be reduced as the PMO teams facilitating the availability of organisational knowledge to employees. The PMO can be a source of guidance, information, and knowledge, the hiring of new staff members can create insights and begin to contribute to the success of a business. The continuous learning through the PMO from its previous projects will maximise the faster turnaround for new projects. Secondly, qualitative benefits can be seen by improving an employee's satisfaction as the PMO environment encourages people to share knowledge through the utilisation of some effective tools.

However, companies need to clarify what type of knowledge is important for the PMO. In many cases, PMOs should act as knowledge hubs. Modern PMOs must consider project KM as a key function (Villa, 2010). The optimisation perspective of the PMO is to identify the KM function, which enables the office to: facilitate and encourage collaboration among PMO leaders, PMs, and project teams; find ways to improve suitable approaches for project performance reports and effective system for project management information; and promote an individual's knowledge, experiences, and perspectives (Hill, 2008).

Another question needs to be considered as to what PMOs should do to encourage KM in the organisation. Primarily, the processes, roles, and technologies of KM should be familiar to PMO staff members. Specifically, this should include the promotion of the organisational knowledge strategy, the creation of initiatives, coordination of various types of knowledge, and the evaluation of business benefits based on the investments in KM. These can be held by the PMO leader or central staff members, portfolio managers, or business unit directors (Villa, 2010).

3.5.4 Benefits of PMO for the KM implementation

A comprehensive solution of KM can make it difficult to deliver the level of benefits to which PMOs are aiming. In this case, RTM (2014) suggests some guidance that PMOs need to deal with before adopting KM. Firstly, the organisational culture needs to consider the desire and trust of staff to share knowledge efficiently. Secondly, an effective understanding of the company's strategy must be clearly displayed by everyone; the PMO's office needs to ensure that the KM strategy fits with the overall company's strategy. Thirdly, the availability of technology and communications can be examined by the PMO to ascertain whether or not it meets the company's requirements and the extent to which employees are well trained to leverage knowledge.

However, Anantatmula (2012) suggests that the impact of PM, KM, and PMO should be divided into different levels to serve and apply different roles as proposed underneath, as shown in figure 3.13.

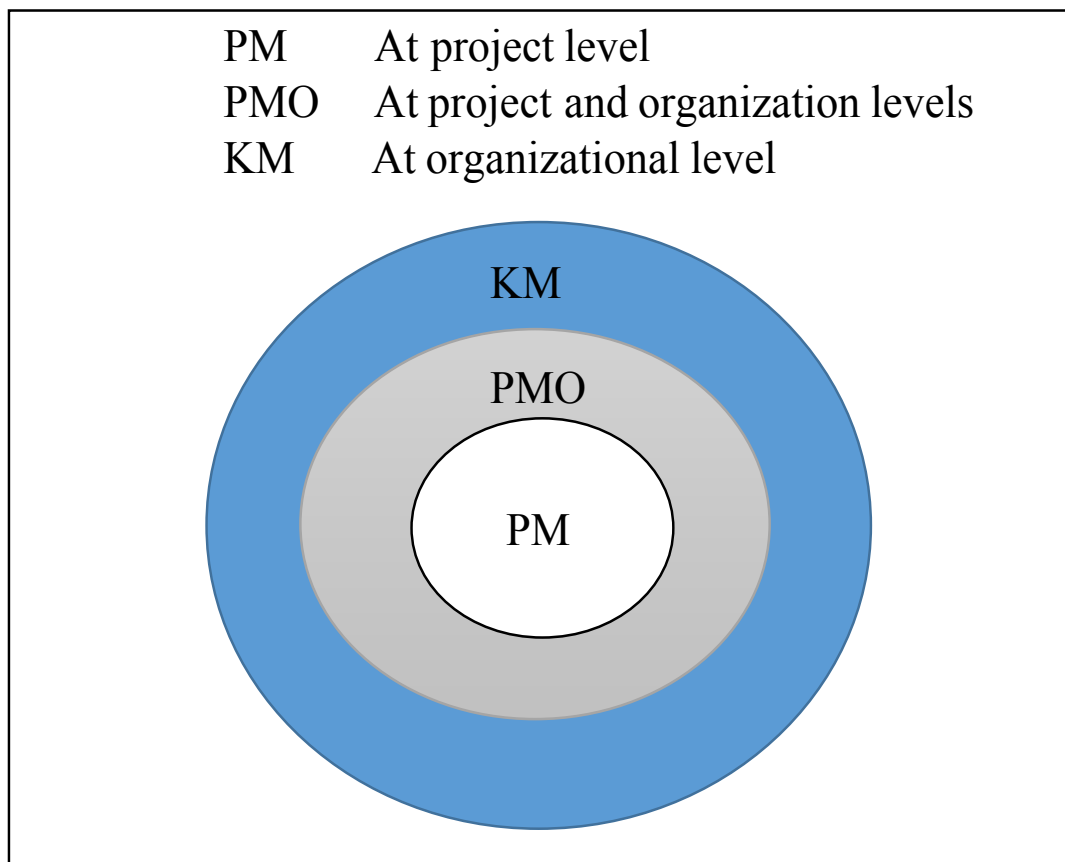


Figure 3.13: Impact of PM, KM, and PMO (Anantatmula, 2012)

The effective relationship between the PMO and PMs on the topic of knowledge sharing should produce equivalent results by examining all the project factors to develop the entire performance of the organisation. Muller et al. (2013) propose the model shown in figure 3.14 to explain how the PMO and KM can support each other.



Figure 3.14: The relationship between PMO and KM (Muller et al, 2013)

The availability of KM processes can be accessed through the way in which *"human knowledge is created and expanded through social interaction between tacit knowledge and explicit knowledge"* (Nonaka and Takeuchi, 2001:151). However, Wellman (2009) identified and proposed four processes for PMOs to guide the knowledge creation:

- Socialisation: the interaction of face-to-face processes will assist tacit knowledge to be shared among individuals.
- Externalisation: the application of collective reflection and dialogue processes should act to translate tacit knowledge into explicit knowledge.
- Combination: the utilisation of some forms of media such as IT communications, organisational networks, and database processes will merge various explicit objects into more complex systems of explicit knowledge.
- Internalisation: the presence of personal learning processes can act to transform explicit knowledge into tacit knowledge.

The role of the PMO in encouraging the spiral of knowledge creation needs to guide the implementation of these types of technologies and the best selection of suitable processes. This research maintains the need to find a suitable framework to ensure that the best functionalities are in the right place at the right time and all employees can buy-in towards best KM practices.

3.5.5 The effect of PMO functions on the KM processes

The useful concept of using KM in an organisation is to achieve, enable, represent, identify, and distribute the adoption of experiences and insights. However, organisations are currently looking to increase their investments in achieving the best practices of KM that are embodied in different processes or practices or embodied in individuals (Nonaka, 2000; Egbu, 2009; Hislop, 2009). These efforts mean that there are a lot of different directions to suit different organisation's needs. This has encouraged researchers in this area to find out what are the key perspectives in KM. For instance, Jed (2009) proposes the following perspectives in KM and organises them as shown in figure 3.15.

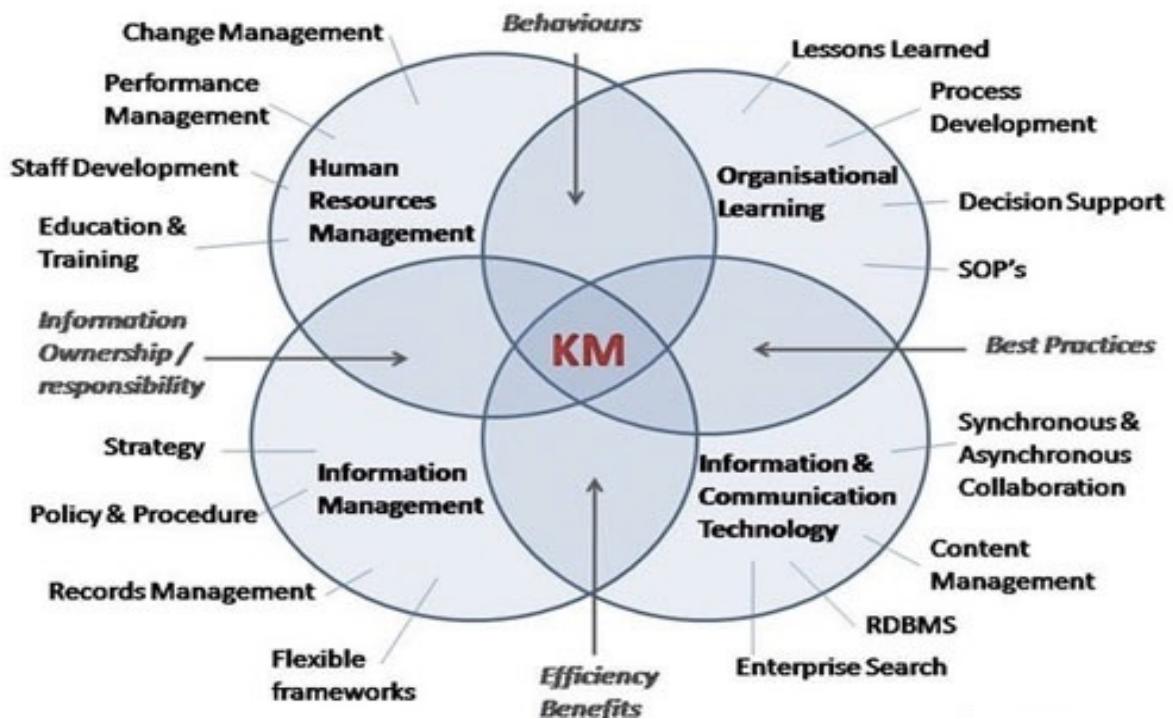


Figure 3.15: Useful concepts of KM perspectives (Jed, 2009)

Figure 3.15 includes four main perspectives and covers other perspectives under these main headings. For example, the importance of considering the organisational structure is linked to information management. This can represent a complex strategy, due to the nature of structure should be used before applying some processes of KM as information management. However, it would be better to separate the organization's culture from human resource management to facilitate the understanding of staff needs and the type of education or training they seek. The title of culture in the KM perspective can include other aspects to increase the performance of the organisation by increasing sharing and collaboration initiatives. The diagram identifies the

importance of using KM to achieve best practices, provide efficiency benefits, and to increase individual behaviors, however it lacks the presence of competitive advantage as one of the important perspective of KM (Zaim, 2007; Desouza, 2011). The competitive advantage can stop such valuable knowledge from walking out of the organisation. The vitally important knowledge can remain if the people in the organisation have decided to leave.

Nonaka and Vankrogh (2009) generally identify three aspects to evaluate the component of KM; as follows: How people in the organisation can perform and understand their own and other's tasks, and how they can communicate easily with specialists in the field to gain knowledge, and how employees in multiple locations can collaborate and learn as a group within the organisation. The following section discusses in detail these five perspectives that needs to be considered by the PMO teams to encourage the implementation of KM:

3.5.5.1 Organisational learning and knowledge adoption

Researchers and practitioners alike have increased their attention on organisational learning. This is used to address how organisations respond to the rapid changes of work environments (Meireles et al., 2010; Goldman, 2010). Models and frameworks are used to explore how the process of learning occurs at different levels of organisation. For instance, Nonaka and Vonkrogh (2009) suggest that the ability of organisations to learn faster than their competitors can be achieved through a sustainable competitive advantage. Most modern organisations are focused more on groups as a fundamental unit of learning (Argyris, 2006; Goldman, 2010).

However, the difficulty of using only databases or systems to manage knowledge seems to be unsuitable for addressing tacit knowledge. Vera and Crosson (2003) have proposed the organisational learning to be the process of creating knowledge. The presence of KM in an organisation can enable individuals to share their effective knowledge in different work groups and encourages groups to communicate with each other about what is known and to solve organisational problems by creating new suitable solutions.

Researchers (Hung et al., 2005; Chong, 2006; Ropes and Tholke, 2010) consider the relationship between employee's development and learning to the success of KM implementation. To encourage and support KM services and initiatives, modern organisations are creating professional departments or offices to support KM (Alsadhan, 2007). Chua and

Lam (2005) identify some indicators to achieve and facilitate learning within the organisation such as the availability of different workshops, seminars, training programs, coaching sessions, and conferences to acquire knowledge. Goldman (2010) considers the awareness of employees about the organisation goals and strategies important for effective organisational learning.

Dubberly (2010) has been working on organising a map for effective organisational learning and divides it into several levels to create connections between organisation, staff, and its customers. This requires the organisation to develop its thinking skills such as decision making and searching. The application of both connections and thinking skills is based on three important aspects. Firstly, the availability of technologies that can facilitate collaboration, sharing, and networking. Secondly, the organisational culture, which can provide resource learning and motivate independent learners. Thirdly, the development of performance management systems, which might include coaching, mentoring, and feedback. These aspects are illustrated in the concept mapping developed by Dubberly (2014) shown in figure 3.16.

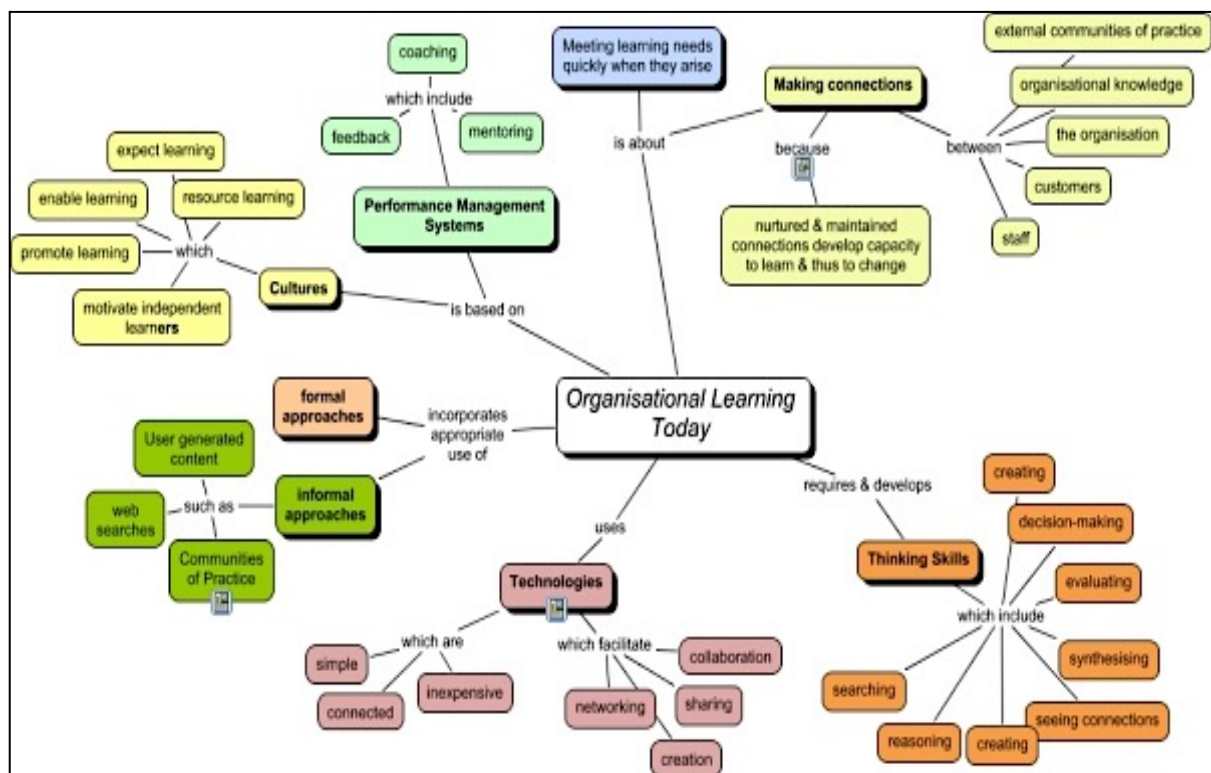


Figure 3.16: Organisational Learning Map (Dubberly, 2014)

3.5.5.2 Organisational structure and knowledge creation

Montana et al., (2009) together with Madhoushi and Sadati (2010) define organisational structures as the formal relationships between different functions, staff, and resources to achieve the objectives of the organisation. The communication of responsibility, authority, and accountability can be accessed through the adoption of effective frameworks for the organisation. Montana et al. (2009) divide the structure of organisations into three types namely; line and staff and committee type. The importance of using organisational structure is to facilitate and enable the flow of KM more effectively within the organisation. (Madhoushi and Sadati, 2010).

The existence of structure is used to change the controls of staff performance, decrease the uncertainty of decision making, and increase the coordination among various activities. Walczak (2005) and Madhoushi and Sadati (2010) suggest that sharing knowledge should be supported by a standardised reward system and that there is a need to have well designed processes. However, the presence of network structures to facilitate the knowledge creation and sharing barriers and to encourage the collaboration across internal organisation and the supply chain boundaries. The organisation's structure can facilitate the discovery, creation, and activation of new knowledge. Jafari et al., (2009) proposed the model shown in figure 3.17 to explain the structure of KM.

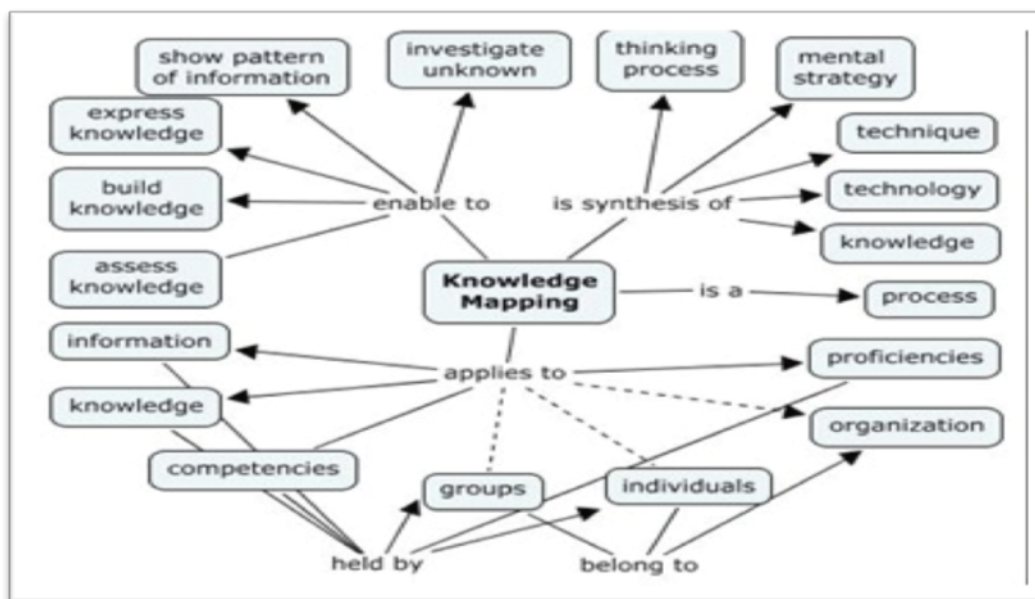


Figure 3.17: The structure of Knowledge mapping (Jafari, 2009)

3.5.5.3 Organisational culture and knowledge transfer

A great deal of literature has been generated about the effective role of organisational culture in successfully implementing KM (Oliver and Kanfadi, 2006; Alsadhan, 2007; Madhoushi and Sadati, 2010). The shared values, norms, and assumptions can be referred to organisational culture to increase KM input. However, Alshareef (2005) indicates that Arab States are attending to be more closing culture than European countries, which represent some problems through the dissemination of knowledge. In particular, Saudi Arabia exhibits a lack of progress in achieving properly organisational culture duo to some immigration laws and regulations (UNDP, 2003). This lack can explain the shortage of peoples' knowledge for not receiving suitable attention whether from scientists, researchers, and governmental bodies.

Wong and Aspinwall (2005) and Madhoushi and Sadati (2010) argued that the evaluation of knowledge development within the organisation can be based on the improvement of essential attributes of organisational culture such as trust, communications, and innovations. Yang and Wan (2004) assert that building a strong relationship between individuals builds the respect and trust that can assist the organisation to facilitate the process of knowledge transfer.

The transfer of knowledge requires individuals to communicate, exchange important ideas, and share knowledge with other groups. Goh (2002) suggests that a collaborative culture needs to exist before the application of knowledge transfer can take place. As the organisation structure can help the company to know and understand what types of knowledge are available, the organisation culture can be provided to explore and facilitate how knowledge can be transferred and shared among individuals and groups (Alhamoudi, 2012).

Yang and Wan (2004), Oliver and Kanfadi (2006) and Madhoushi and Sadati (2010) suggest that the following aspects are important for evaluating the knowledge transfer processes from the organisational culture perspective. Firstly, to evaluate the collaborative works is frequently used to capture and disseminate knowledge in the organisation. Secondly, it is important that employees understand the need for knowledge management to improve company's performance. Thirdly, senior management and PMs need to encourage knowledge management in their teams and across the organisation.

3.5.5.4 Human resources management and knowledge application

Researchers including Bhajaraju (2005), Wang and Noe (2010) and Desouza (2011) agree that people are the main component of the application of KM in the organisation. However, Kong and Cai (2008) indicate that there is a difficulty between employee’s knowledge such as; experiences, skills, competencies, and motivation with its application to increase the organisation development. Esteves and Caetano (2010) propose motivation to be a crucial factor in retaining employees. Employees always seek opportunities for advancing and growing in their careers. Organisations need to provide this and support their working environment to increase the rate of retention. The management of human resources should maximise the rewarding system to increase the contribution of staff to achieve the knowledge capital.

Kong and Cai (2008) and Esteves and Caetano (2010) suggest the following aspects to evaluate the knowledge application processes from the human resources management perspective. Firstly, the human resource management can be a knowledge facilitator to get all the information needed to the right people at the right time. Secondly, the implication of knowledge management practices can contribute to human resource development. However, Wicaksana (2015) proposes the use of a pyramid, as shown in figure 3.18, to illustrate how the HR managing the application of knowledge. To successfully encourage people to lead business, HR capabilities and objectives must be considered.



Figure 3.18: HR Application of Professional Knowledge (Wicaksana, 2015)

3.5.5.5 Competitive advantage and knowledge capturing

Due to the instability of current economic growth, organisations have begun to choose a better way of managing knowledge assets (Nasimi et al., 2013). Effective KM needs to have in place a proper organisational strategy. Adab and Khani (2007) identify that in order for KM to support the competitive advantage, it must first analyse and consider their company's culture, structure, and data. The investment in KM should be contributed to the growth of the organisation.

However, today's competitive pressures in the construction market can convince organisations to revise their available knowledge and to evaluate its roles in creating values. If the availability of information does not provide any changes or innovations for the management of projects, it seems to be useless information (Nasimi et al., 2013). The coordination of project activities, responding to market positions, and the capturing of knowledge can maximise the achievement of competitive advantage.

Adab and Khani (2007) and Nasimi et al. (2013) suggest the following aspects to evaluate the knowledge protection processes from the competitive advantage perspective. Firstly, it is important to evaluate if the organisation has difficult and expensive knowledge management systems that are difficult for rivals to duplicate. Secondly, it needs to be investigated whether the organisation uses knowledge management to increase market position. However, Yusof (2014) identifies the relationship between KM and CA in the following way, as shown in figure 3.19. Yusof uses the different processes of KM to work as dependent variables to achieve the independent variable of competitive advantage such as market position and innovativeness.

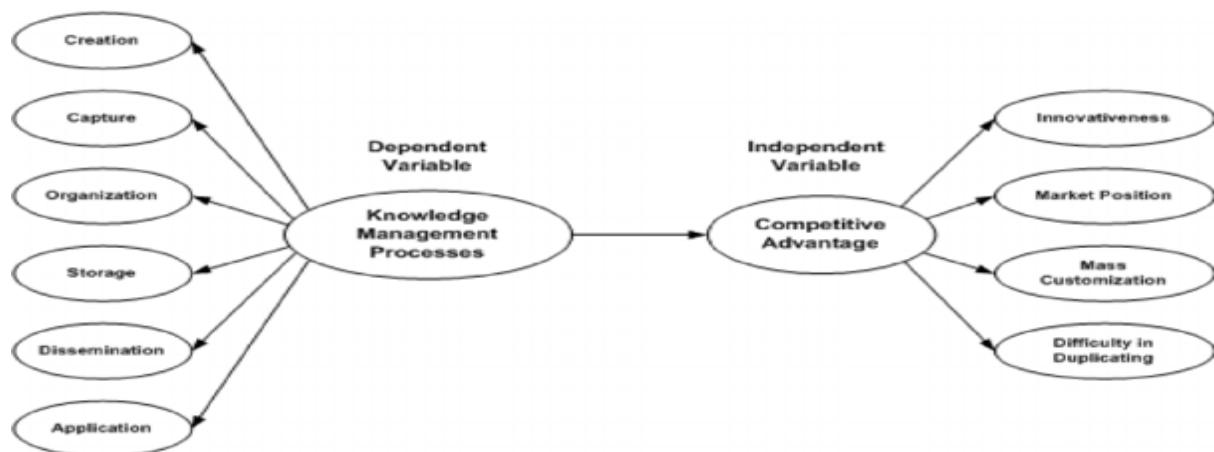


Figure 3.19: KM Vs. Competitive Advantage (Yusof et al., 2014)

3.5.6 The effect of PMO functions on the KM components

3.5.6.1 People

It is generally considered that Project Managers (PMs) have a lot of daily responsibilities. If PMs are not working properly it will affect the whole company and will impact the majority of people who are working under their management. If the project fails to achieve its goals, PMs are the most obvious target for blame from senior management or even stakeholders. PMs nowadays are facing many challenges from members of the project as giving them the leadership and guidance they seek in a daily basis, dealing with project issues as responding to risks and matters, reviewing factors, and to delegate work for each team member (Petty, 2009; Ellucian, 2013).

In particular Ford (2004) and CIO (2010) suggest one of big challenges facing PMs is how to deal with project resources. A particular strength of this is that if PMs are supported by the level of resources that they need, a lot of time can be saved for focusing on the implementation of projects. Otherwise, Rkelly (2011) argues that a serious problem that challenges the majority of PMs is the issue of distributing the right type of work to the right people. To increase work productivity, as a PM it is important to give tasks to the most suitable people. However, this research maintains that there are three significant challenges, as considered by Nielsen (2009) and PM Mastering (2014):

1. The selection and distribution of tasks between employees: PMOs can help managers select the right people through providing training programs, through which the PMs can see how individuals are qualified for doing specific tasks and/or by reviewing the PMO databases of previous projects that workers were part of. Furthermore, discussing the practices and potential improvements to current PMOs with all selected members of the various project teams can also be a solution (CIO, 2010; PM Mastering, 2014).
2. Dealing with project elements like resources, budgets, deadline date: The flexibility of PMOs for dealing with so many procedures whether inside or outside the project give the PMs the right opportunity to focus more on the project. Nielsen (2009:9) identifies that *“The outcome will be a good clean process for all to assure the right resources are doing the right things at the right time”*. The presence of PMOs can provide companies with the highest levels of transparency that were not clear enough for PMs, due to the large number of daily tasks entrusted to them.

3. Decision-making process and communication with various parties: Companies nowadays do not encounter great difficulties in decision-making because the regular PMOs are trying to keep senior management and/or stakeholders up to date with all the progress happening in all phases of the project. According to Cora (2014:4) “*A PMO provides a platform for good decision making by linking strategic plans together with corporate results. This will allow organizations to achieve more success within their projects*”. What this means is that a PMO not only works to allow decisions to be determined but also to allow the right decision to be identified.

Andrew (2014) identifies five ways in which PMs can help PMOs. Firstly, PMs must know PMO obligations in order to prevent project research being repeated and any overlapping tasks. Secondly, they must support the responsibilities of the PMO and assist in the development of existing activities. Thirdly, PMs must inform PMO teams on the issues and difficulties facing the project early in order to obtain full support. Fourthly, they must present the reports and documents in front of the office team for reviewing and evaluation as required. Fifthly, PMs can inform the office about the sources required by the project and the sources that are not needed before starting tasks.

Based on the results, it can be concluded that the research into how to combine PMs into PMOs has been very successful for helping PMOs to become established and recognised in their value, thus gaining the attention of a lot of construction companies around the world. In addition, it can be very effective when the organisation provides a centre of excellence in the form of a PMO; through this centre, firms can gain standards, methodologies, and tools to support the PMs with delivering a project and improving communications between different parts of the company. These mutual benefits between the PMs and PMOs can be used to evaluate PMs competency and to provide training programmes. The PMs are responsible for monitoring the performance of the office and how it achieves the desired goals.

The participation of PMs and project teams enables the fastest implementation of the PMO concept. Some researchers (Taylor, 2011; Alsahli, 2014) argue that PMs should be the right person to deal with or run the PMOs. However, it can be argued that not every PM is a suitable person to manage the office. Besides that, there are many skills and abilities required to apply this concept. It is generally agreed that the complexity of construction projects have become significantly greater than in the past and each project needs a large amount of organisation and

follow-up to achieve the desired success rate. An organisation called MMP (2014:15) make a valuable point when they argue that *“There are numerous different areas of the construction process that need to be taken into account. Each of these components large and small has the potential to derail a project and cause it to lose money or even come to a complete stop”*.

PMs can play many important roles such as planning, controlling resources, and completing the project within budgeted costs and the schedule (Yusof, 2011). According to PM Solution (2010) the State of the PMO can evaluate the competency of PMs and manage them to achieve the organisation objectives. The PMO can be worked as a center of excellence to be responsible for coaching and mentoring processes. However, to increase the adoption of PMOs, the PMs should be able and ready to understand its roles and functions. The PM can communicate with PMO managers and ensures and keeps the construction under control and achieves high levels of professionalism in the performance of various businesses.

PMs have gained importance in recent years for the process of improving PMOs, but research has shown that there remain some gaps in the essential skills that the PMs should be able to use, including a variety of interpersonal, technical, and managerial skills (PMI, 2012). Additionally, efficient PMO success depends on the success of the PMs and how they comply with organizational principles. As stated by PMI (2012) there is a strong relationship between PMs and the PMOs.

The PMO operates on a larger scale to manage different projects while PMs only focus on the specified project goals. The existence of PMO as a centralised office can manage the various standards, methodologies, and matrices towards different projects. The PMs in this case have more time and effort to manage other practices such as the scope, quality, and cost of particular projects, as illustrated in table 3.11.

PMs	PMO
Focuses on the specific project goals	Manages major program scope change
Controls the assigned project resources to best meet project goals	Optimises the use of shared organisational resources across all projects
Manages the constraints (Scope, schedule, cost, quality, etc.)	Manages the methodologies, standards, overall risk/ opportunities, matrices, and interdependencies among projects at the enterprise level

Table 3.11: How the PMs and PMOs assist each other (PMI, 2012)

PMOs work to unify all the various acts, actions, and procedures of the whole company under one system that can help PMs to be connected with other projects. The PMs will be focused more on one particular project but will be able to communicate with the PMO department as well as other PMs in different projects within the same company. However, there are so many requirements and skills that PMs need before participating in the PMO, as discussed below.

Ginny (2011) and Jason (2013) suggest that there are PM best practices that all PMs must know and clearly use. David (2013) emphasises the importance of using both interpersonal and managerial skills in order to increase the success of PMs. Further, Dick (2012) propose as a project manager, it is important to find and determine the right method for dealing with each team member because they have different interpersonal skills and cultures. From the various reports that support PMOs team, PMs can identify weaknesses in order to increase the efficiency of workers. PMOs nowadays offer a large number of coaching and training programs to change work routines resulting in more vibrancy in the work environment. Although, Petty (2009) suggests that understanding what is required and the true role of a leader is the first step for a good project manager. Lastly, as PMs are the likely candidate for implementing PMOs it is important that this department and its team is under his control.

3.5.6.2 Process

The PMO can find a great platform to leverage the organisational knowledge through the use of KM in order to meet its ultimate goal. Evidence to support this argument can be found in a study that was conducted by Cunha et al. (2011). This study attempted to find the KM aspects of the PMO's perspective and concluded with the following four themes besides PMO: Knowledge Broker, Communities of Practice (CoPs), Project Performance, and Lessons Learned. The following discussion is based on the previous study:

1. Community of Practice: This can be defined as a group of people working together to share their passion and expertise to achieve business needs (Wenger, 2008). PMOs should act to offer a platform of knowledge in which to transfer, create, and reuse knowledge, and to improve wisdom in employees (Walker et al, 2005). However, if the decision is only available to individuals and the organisation seems to be decentralised, the PMO leader must select the right PMO members who are not working in implementing projects to recommend suitable tools and processes (Desouza et al, 2006).
2. Knowledge brokers: This is known as the establishment of connections among communities to allow them to translate, coordinate, and align various perspectives (Pawlowski and Robey, 2004). The role of PMOs here is to promote and facilitate PMs and stakeholder relationships. It works to confirm competence and improvement by acting as trainers, negotiators, and coaches (Desouza et al, 2006; Pemsel et al, 2013). The creation of an awareness towards existing tacit and explicit knowledge should be stimulated by PMO members through the application of several processes and practices (Muller et al, 2013).
3. Lessons Learned: This can be seen as one of the hardest things for PMO to adopt. Williams (2008) identifies obstacles such as time concerns, incentive constraints, and the availability of resources that can perform poorly, which has a negative impact on the decision-making processes and learning. Companies, in order to avoid repeating unsuccessful experiments, need to create memory and databases for the organisation (Desouza et al., 2006). PMO leaders should be engaged with projects teams in explaining the reasons why certain types of project are successful or unsuccessful,

rather than only making the process of learning more effective (Julian et al, 2008).

4. **Project Performance:** the PMO has many roles in managing PM best practices and learning either by considering successes or failures. It works by applying purposeful effort towards improving knowledge to satisfy the overall performance of the company (Desouza et al, 2006). PMOs needing to mobilise attention should attain a degree of legitimacy within the organisation.

3.5.6.3 Technology

According to ESI (2014), there are five competencies and skill areas in which the PMO can encourage KM in the organisation:

1. **Data:** In the execution of large projects, data can be produced everywhere and every day. Through the application of different activities such as the management of resources, risk analysis, and changes in schedules or control, some data outputs need to be considered by KM processes. If the PMO can easily own the data, the office can start to take responsibility of its accuracy. However, the PMO in this case should not only be focused on managing the data. It should be used to establish the most suitable data, which can be related to the management of particular projects. Some researchers (Taylor, 2011; Alsahli, 2014) propose the utilisation of MS Excel as one of the important abilities should PMO team have to extract data from different places.
2. **Interpreter:** The role of PMO requires to be knowledgeable about where and how the data is being produced. The PMO analyst need to deal properly with different audiences. For example, the stakeholder is likely to be interested in knowing the headlines rather than going into complicated figures. However, PMs needs to go deeply into details as this will have a direct effect on their projects. However, the importance of capturing the existing data is to make it available to predict with some degree of accuracy future project results and to apply certain courses of action in current projects. The PMO team can utilities their effective knowledge to reduce risks and conflicts throughout the organisation.

3. Facilitator: The interaction between the PMO team or analyst with different people is an important task. It is important that the right data reaches the right people. The availability of workshop sessions can facilitate the right data being collected. However, Desouza and Evaristo (2006) and Julian (2008) note that knowing what type of data is captured is more important than noting down inappropriate data.
4. Thinker: The process of thinking about what and how knowledge is being collected can improve KM throughout the organisation. Anantatmula (2012) and Hill (2008) have proposed that the PMO analyst is the suitable person within the PMO department to improve on processes if there is a need to provide an improved way of working. Effective trainers and mentors in various project aspects and efficient processes can ultimately result in better data, which can improve the overall business performance.

3.5.8 The role of PMO and KM in the management of construction projects

Alsahli (2014) proposes a model to illustrate the importance of integrating both PMO and KM for the management of construction projects and concludes with these four areas; as follows:

Firstly, it is important to support projects: This is the basic roles of adopting PMO to encourage such knowledge. The existence of the PMO can assist in the different phases of executing projects. Another aspect is to provide standards and methods to review and evaluate the project status. This can be useful for solving the project issues and overcoming various problems. Secondly, to provide methodology, metrics, and performance standards, companies are trying to benefit from adopting PMO to develop and facilitate various work procedures and ensure that these comply with the standards and methodologies of the company's strategy.

Thirdly, counselling and surveillance are important to keeping up with new approaches and practices. Organisation are utilising PMO to apply and follow best practices. The availability of monitoring and supporting the best PM practices can increase the business performance and decrease the overall costs. The PMO team should be familiar with supporting expertise and transferring the type of knowledge that needed. Finally, to support PMs and provide training, the PMO can act as a center of excellence to provide and coordinate training programs. This can be done to define the specification of PMs and to contribute to their selection. Figure 3.20 is provided to illustrate PMO and KM roles in the management towards constructions projects.

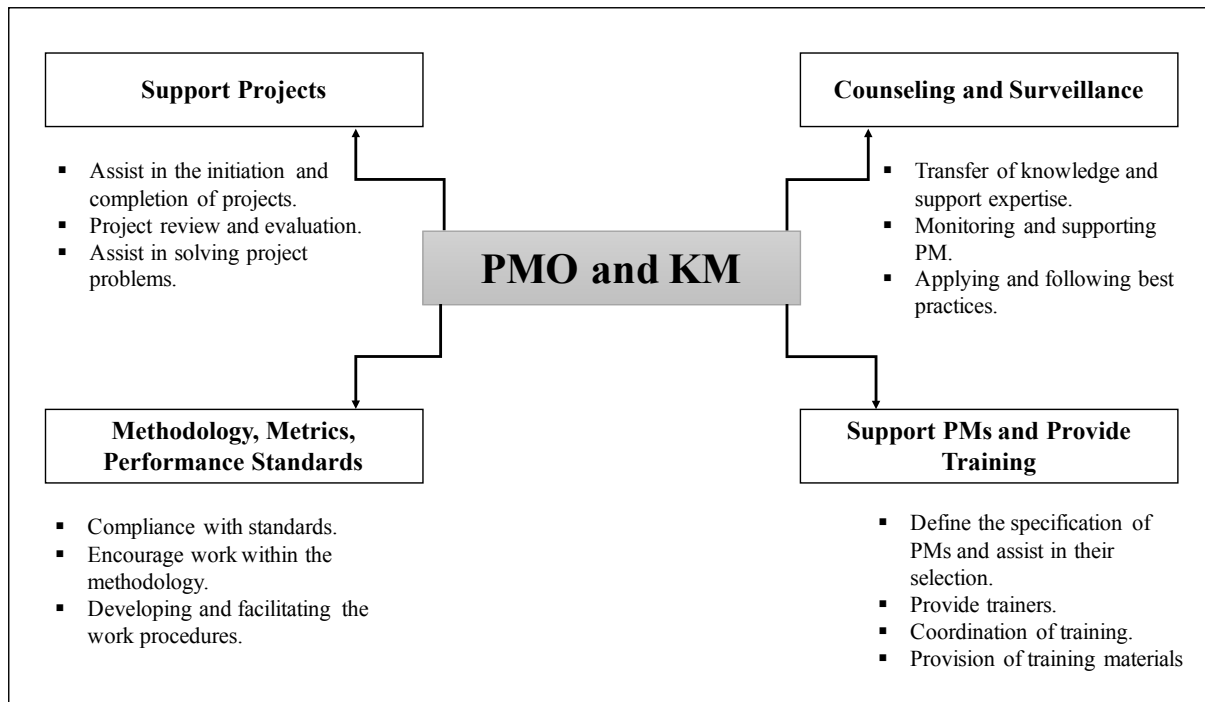


Figure 3.20: PMO and KM roles in the management of construction projects (Alsahli, 2014)

3.5.9 Summary of PMO and KM section

Knowledge Management and PMO can be very closely related by considering some important aspects. A comprehensive solution for KM via PMO can be difficult to deliver the level of benefits to which organisations are aiming. Therefore, the utilisation of different maturity levels of the PMO can overcome these issues and maximise the benefits of this relationship. The PMO needs to guide and mentor the storage and collection of project knowledge; the methods used and models, and the lessons learned, can be centralised by the PMO. Figure 3.21 summarises the PMO and KM section in more details:

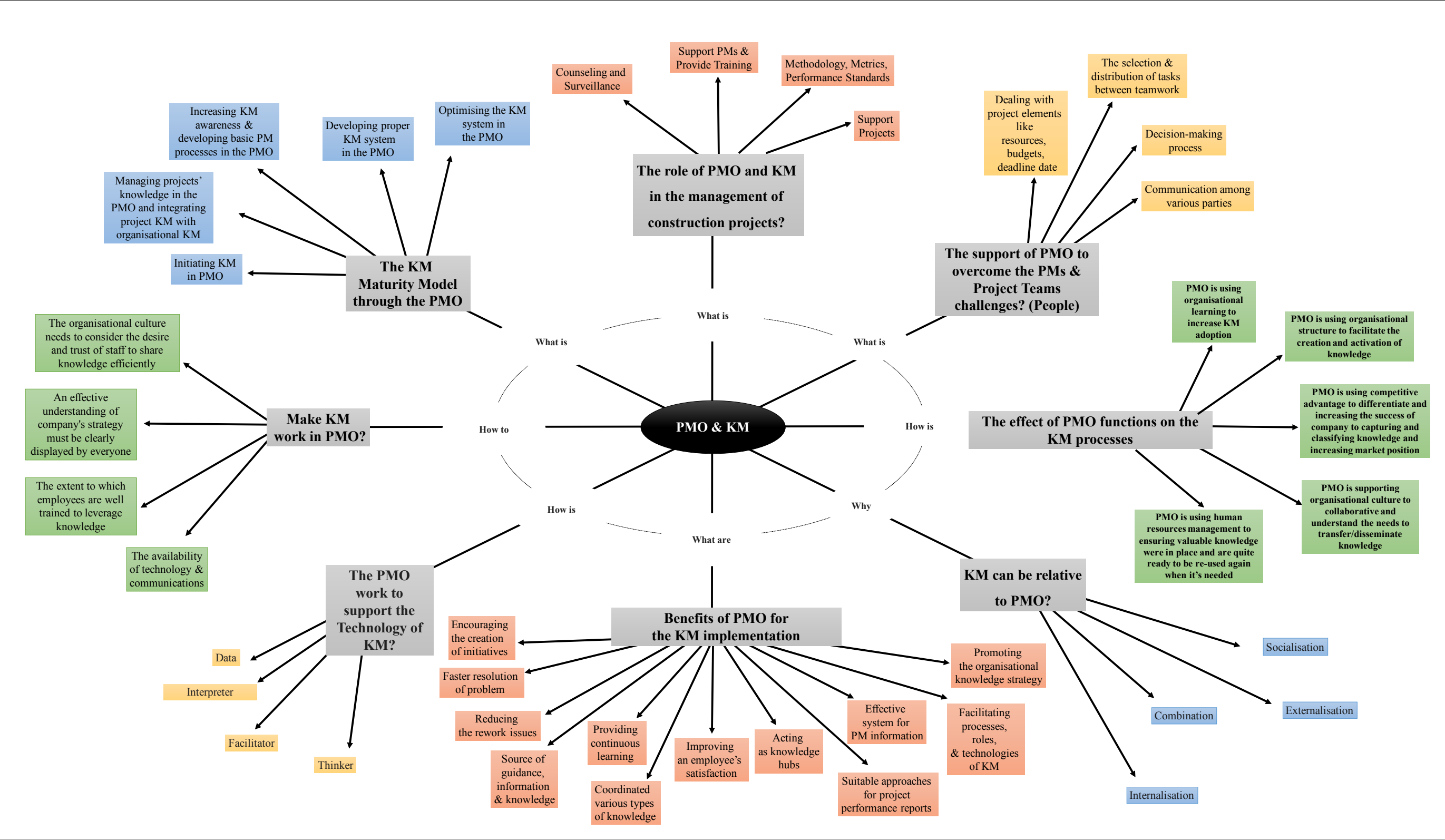


Figure 3.21: Synthesis – PMO and KM

3.6 Synopsis of the whole literature review

As a consequence of this chapter, several studies of PMOs and KM by different organisations and practitioners from around the world have been defined and discussed. It can be claimed that the responsibility and activity undertaken by PMOs as well as the level of influence they can have on various project aspects will illustrate the success of this approach or the failure. Having PMOs cannot increase the project's success by itself; the key aspect of a successful PMO should contribute to address various problems and challenges facing the construction firms. Therefore, it is essential that the PMO should be implemented to deliver significant development for the business performance. Once PMO roles are identified, then the level of skill and expertise of PMO staff needs to be computable enough to deliver PMOs services.

However, the opportunity to work in the PMO should allow individuals to increase their managerial skills and managing project knowledge, while also helping the company to increase its management capability and success rate. The senior management and PMs can have many roles to support the establishment of this office.

However, the nature of construction projects requires various parties to be involved in project tasks. The smooth flow of effective knowledge can be difficult and raises some issues, such as cost and time overruns, disputes, and extensive reworks. The previous literatures confirmed that the concept of KM has a direct impact on collaborative decision making, innovation, and individual and collective learning, which in turn acts to improve the organisational performance. The benefits of KM for construction firms are considered to be high. The effectiveness of KM can offer many benefits, such as taking advantage of cost savings, facilitating collaboration, increasing employee productivity and solving problems much faster based on previous knowledge.

A comprehensive solution of KM can make it difficult to deliver the level of benefits to which PMOs are aiming. As long as PMOs exist in the business it is extremely important to provide some metric procedures to evaluate the PMO its services and the KM practices that are brought in by PMOs to enable the project to succeed. However, based on the outcome of literature review chapter 2 and 3, the following synopsis can pull everything together, as illustrated in table (3.12):

	Reasons behind Project to Failure in the KSA Construction Market	The application of PMOs in improving business performance	Functions of using PMOs to the management of projects	PMO Maturity levels	The Types of PMO	The key challenges of PMO	Names of PMO	Procedures and steps of Establishing PMO	Metrics to Evaluate PMOs Performance	Types of Knowledge Management	The Knowledge Hierarchy	Knowledge Management Components	Knowledge Management Process	Knowledge Management Prospective	KM Impact on Organisational Performance	Classification of KM Tools	Barriers and Challenges of KM	The KM Maturity Model through the PMO	KM and its relative to PMO	The PMO work to support KM?	Knowledge Management on PMO's perspective	Make KM work in PMO	The support of PMO to overcome the PMs challenges	The role of PMO and KM in the management of construction projects	The benefits of PMO for the Knowledge Management
1	Best practices of PM do not work as desired.	An effective tool to adopt PM practices.	Supporting the Project Communication Management.	Controlling	PMO in a Single Project	Resistance to change from people	Project Management Office	Identify PMOs Objectives	The success percentages of company's projects that delivered over time.	Explicit Knowledge	Data	People	Knowledge Creation Process: (Acquisition)	KM and Organisational Learning	Collaborative decision making	Collaboration (individuals & groups)	Human Factors	Initiating KM in PMO	Socialisation	Data	Community of Practice	The organisational culture needs to consider the desire and trust of staff to share knowledge efficiently	Communication among various parties	Counseling and Surveillance	Encouraging the creation of initiatives
2	Lack of access to the database and not benefit from the successful experiences and the experiences of others.	More transparency and clarity to various projects policies, standards and procedures.	Designing the Project Knowledge Management.	Supportive	PMOs as a Portfolio Management Office	Retain, train & attract PMO's staff	Project Management Support Office	Obtain the Necessary Support	The availability of PM practices on site are implemented and working across various projects.	Tacit Knowledge	Information	Process	Knowledge Use Process: (Application)	KM and Organisational Structure	Retaining professional staff	Knowledge Mapping	Cultural Factors	Managing projects' knowledge in the PMO and integrating project KM with organisational KM	Externalisation	Interpreter	Knowledge brokers	An effective understanding of company's strategy must be clearly displayed by everyone	Decision-making process	Support PMs & Provide Training	Faster resolution of problem
3	Entry in the competition without knowing how they are compatible with the possibilities.	The clarity of decision making process.	Improving the Project Change Management: (Training for PMs and Project Teams)	Directive	PMOs as a Centralised Office	Move from basic PMO roles to activist PMO	Project Management Oversight	Provide Training & Coaching	Providing check list form and remains reporting lines.		Knowledge	Technology	Knowledge Transfer Process: (Conversion)	KM and Organisational Culture	Facilitates collaboration	Retrieve Information	Political Factors	Increasing KM awareness & developing basic PM processes in the PMO	Combination	Facilitator	Lessons Learned	The extent to which employees are well trained to leverage knowledge	The selection & distribution of tasks between teamwork	Methodology, Metrics, Performance Standards	Reducing the rework issues
4	Knowledge gained from previous projects is missing.	The source of knowledge (center of excellence)	Encouraging the Project Resources Management.			To run the office as an effective Center of Excellence	Project Office	Define PMOs Process, Team, Tools	The evaluation of staff attitudes and knowledge gained.				Knowledge Storage Process: (Protection)	KM and Human Resources	Solving problems much faster	Training and Coaching	Technical or Technology Factors	Developing proper KM system in the PMO	Internalisation	Thinker	Project Performance	The availability of technology & communications	Dealing with project elements like resources, budgets, deadline date	Support Projects	Source of guidance, information & knowledge
5	Poor coordination among various projects to link them as one whole project unit to deliver the entire organisation's needs.	Minimizing the expenses, costs, time, and reducing risk factors.	Promoting the Project Finance Management.			To demonstrate its added-value	Program Office	Provide Regular Meetings and Reports	Defining PMOs mission, objectives, and strategies.					KM and Competitive Advantage	Best practice gathering	Document Management	Organisational Factors	Optimising the KM system in the PMO							Providing continuous learning
6	Modest performance of PMs as to make decision individually and teamwork's are not directed correctly.	Increasing the performance of individuals, teamwork and the implementation of future projects.	Identifying the Project Risk Management.				Project Support Office	Evaluate & Update PMOs	Fully acknowledge the needs of involving the top management and/or stakeholders.						Activity improvement	Organisation Memory									Coordinated various types of knowledge
7	Communication system and Knowledge sharing among projects is missing.	Effective management of human resources, technical and financial aspects.					Central Project Office								Individual and collective learning										Improving an employee's satisfaction
8	Failure to provide senior management with the required project status reports.	Support and providing current project information (regular and accurate reports)													Increased employee productivity										Acting as knowledge hubs
9															Cost savings										Promoting the organisational knowledge strategy
10															Innovation										Facilitating processes, roles, & technologies of KM
11															Intellectual capital storage										Suitable approaches for project performance reports

Table 3.12: Synopsis Table of the whole literature review sections

Chapter Four:
Theory Development

4.1 Introduction

The implementation of KM in construction sector is generally based on the availability of techniques that are used to organise and encourage knowledge sharing and/or the support of technology programs and communication systems to disseminate and connect people's effective knowledge. Human Resource Management (HRM) is concerned with finding ways and forms to encourage the facilitation of project knowledge. By contrast, the systematic attempt is concerned with the utilization of communication and information technology to ensure the dissemination of knowledge is taking place. However, in regard to the complexity of managing construction projects and organisational and cultural issues such as the high turnover of staff, it is often hard to rely on information technology alone. Similarly, it is difficult to depend solely on HRM perspectives to encourage and motivate people to leverage their valuable knowledge and not utilising the faster and cheaper means of collating information with technologies. Therefore, Egbu (2004), Tan et al (2010) and Autumnal (2014) have argued that an integrated methodology of combining KM techniques with technological approaches is the more viable option, which can be offered and served by the PMO to encourage and facilitate KM implementation. This research suggests the PMO solution as a methodology that is capable of:

- Offering the quickest response to KM related issues in order to deal with the knowledge created in real time to prevent the loss of valuable knowledge.
- Encouraging the initiatives by PMs and project teams to collaborate in sharing their knowledge, expertise, and skills with others.
- Facilitating the transformation of tacit knowledge into explicit knowledge and providing some forms, standards, and policies to benefit from both tacit and explicit knowledge.

4.2 Theoretical Background

The preliminary theoretical framework for PM and KM implementation via a PMO has been identified as in table (4.1). This framework is developed: 1) to identify the KM practices and the Knowledge Management Maturity Model (KMMM) to addresses and integrate KM within PMO; 2) to investigate the steps and procedures for establishing and evaluating PMOs and PM maturity models to assist the development of PMO; 3) to evaluate the effectiveness of PMO to encourage and adopt best practices of both PM and KM; and 4) to evaluate the current difficulties and challenges that affect the completion of KSA's construction projects and utilize the principles and values created via PMOs to address them. This framework should be used as a first attempt towards building the conceptual framework as this study is aiming for, which will be discussed largely in this chapter to identify the shortcomings of current practices in KM, to investigate the relation between PM and KM within PMO, to provide the different types of project knowledge, to suggest the methods that used for transforming Tacit to Explicit Knowledge, and to propose the maturity levels of PMO.

This theoretical framework mainly divided into three main sections: First, theoretical factors for evaluating PMO's roles as; reasons behind project's failing and being abandoned in KSA, principles and values added by PMO, procedures and steps of establishing PMO, the key challenges of PMO, metrics to evaluate PMOs performance, and maturity levels of PMO. Second, theoretical factors for encouraging KM best practice via PMO; KM impact on organisational performance, PMO roles to encourage best practice of KM, the key barriers and challenges of KM, make KM work in PMO, developed KM maturity model at various levels of PMO, important process to KM implementation, the effect of PMO functions on KM processes, the effect of PMO functions on KM components, and different types of project knowledge. Third, theoretical factors for enforcing PM best practice via PMO; the effect of PMO functions on PM practices, developed PM maturity model at various levels of PMO, the key barriers and challenges of PM, PMO roles to encourage best practice of PM, and PM impact on organisational performance. As a result, the PMO should be able to act as an effective methodology for implementing best practices of both KM and PM as illustrated in table 4.1:

Project Management (PM)					Project Management Office (PMO)						Knowledge Management (KM)												
The effect of PMO functions on PM practices		Developed PM maturity model at various levels of PMO	The key barriers and challenges of PM	PMO roles to encourage best practice of PM	PM impact on organisational performance	Reasons behind Project's failing and being abandoned in KSA	Principles and Values added by PMO	Procedures and steps of Establishing PMO	The key challenges of PMO	Metrics to Evaluate PMOs Performance	Maturity Levels of PMO	KM impact on organisational performance	PMO roles to encourage best practice of KM	The key barriers and challenges of KM	Make KM work in PMO	Developed KM maturity model at various levels of PMO	Important Process to KM implementation	The effect of PMO functions on KM processes	The effect of PMO functions on KM components	Different types of project knowledge			
Best PM practice	Supporting the Project Communication Management:	Standardize	Re-inventing the wheel by using every time different processes, tools, and templates	PMOs for best practice and process	Better decision taking	Best practices of PM do not work as desired	An effective tool to adopt PM practices	Identify PMOs Objectives	Resistance to change from people	The success percentages of company's projects that delivered over time	Developing/Initial No formal PM or KM processes exist across the organisation (No PMO)	Collaborative decision making	Encouraging the creation of initiatives	Human Factors	Communities of practice	Initial/Aware	Knowledge Creation and Activation Process:	<ul style="list-style-type: none"> Organization needs to disseminate knowledge across the organisation. Organization needs to generate from existing knowledge some types of new knowledge. 	<ul style="list-style-type: none"> Sharing knowledge should be supported by a standardised reward system. The need to have well designed processes to facilitate the exchange of knowledge throughout the organisation. The organisation's structure can facilitate the discovery, creation, and transfer of new knowledge. 	People:	<ul style="list-style-type: none"> Specialisation Combination Internalisation 	Process and procedures knowledge	
	Encouraging the Project Knowledge Management:					<ul style="list-style-type: none"> Allows and advises people to share knowledge and learning with each other. Provide some tools and techniques to collect knowledge and avoid their loss. PMOs should lead PMs to implement knowledge management to increase people's abilities for conducting matters more effectively. 	<ul style="list-style-type: none"> Entry in the competition without knowing how they are compatible with the possibilities. The clarity of decision making process 					Obtain the Necessary Support	Retain, train & attract PMO's staff								<ul style="list-style-type: none"> The availability of PM practices on site are implemented and working across various projects 	Facilitates collaboration	Reducing the rework issues
	Improving the Project Change Management: (Training for PMs and Project Teams)	Measure	Organisation's performance is mainly dependent upon the competency and skills of individuals and the learning and KM not used across the firm's projects	Common PM language, culture, and mindset	Improved the Client's satisfaction	PMO (As an effective methodology for PM)	Knowledge gained from previous projects is missing	The source of knowledge (center of excellence)	Provide Training & Coaching	Move from basic PMO roles to activate PMO	Providing check list form and remains reporting lines	Supportive PMO Defined/implement Group or Unit or in a single project Level (PMO Group)	Retaining professional staff	Faster resolution of problem	Political Factors	Recruitment of people	Managed	Knowledge Dissemination and Transferring Process:	<ul style="list-style-type: none"> Organization needs to have a specific process for organising and filtering knowledge. Organization needs to transfer explicit knowledge to individuals. Organization needs to collect tacit knowledge from individuals into the organisation. 	<ul style="list-style-type: none"> To evaluate the collaborative and team working is frequently used to capture and disseminate knowledge in the organisation. To evaluate that employees understanding to the need of knowledge management to improve company's performance. To evaluate that senior management and PMs are encouraging knowledge management in their teams and across the organisation 	Process:	<ul style="list-style-type: none"> Community of Practice Knowledge brokers Lessons Learned Project Performance 	Costing and financial knowledge
	Balancing the Project Resources Management:						<ul style="list-style-type: none"> PMOs should be ready to provide some training programs and coaching sessions for PMs and/or project teams PMO can ensure PMs are well prepared to deal with all a project's aspects and are best equipped to implement and change old policies. Effective PMOs should be worked as a center of excellence 						<ul style="list-style-type: none"> Poor coordination among various projects to link them as one whole project unit to deliver the entire organisation's needs. 	<ul style="list-style-type: none"> The sharing of valuable knowledge and gathering lessons learned are occurring by different teams in their own ways 								<ul style="list-style-type: none"> Modest performance of PMs as to make decision individually and teamwork's are not directed correctly Increasing the performance of individuals, teamwork and the implementation of future projects 	<ul style="list-style-type: none"> Minimizing the expenses, costs, time, and reducing risk factors Provide Regular Meetings and Reports
	Promoting the Project Finance Management:	Control	Unclearly defined roles and responsibilities	Creating and maintaining project knowledge, archives, and toolsets	Increased the project teams motivation	PMO (As an effective methodology for PM)	Communication system and Knowledge sharing among projects is missing.	Effective management of human resources, technical and financial aspects	Define PMOs Process, Team, Tools	To run the office as an effective Center of Excellence	The evaluation of staff attitudes and knowledge gained	Controlling PMO Managed/monitor Departmental Level (PMO Department)	Individual and collective learning	Improving an employee's satisfaction	Technical or Technology Factors	Reassignment of people	Managed	Knowledge Application and Reusing Process:	<ul style="list-style-type: none"> The existence of KM should improve efficiency by matching problems and challenges to the source of knowledge. The development of new services, policies, and strategies should be based on the knowledge gained. 	<ul style="list-style-type: none"> To evaluate does the human resource management can be a knowledge facilitator to get all the information needed to the right people at the right time. To evaluate does the implication of knowledge management practices can contribute to human resource development. 	Technology:	<ul style="list-style-type: none"> Data Interpreter Facilitator Thinker 	Suppliers and subcontractors' knowledge
	Identifying the Project Risk Management:						<ul style="list-style-type: none"> PMO is used to ensure that each type of project can meet the estimated costs. PMO using regular reporting lines to explain what is the status of each construction project to allow senior management to support them directly PMO analysing various project's processes and procedures can determine the best course of action. Preparing well planning system by PMO's team is necessary to have effective budget system and promoting strategies. The accounting by PMO department to put good system in place for unifying wide policies and standards for the entire organisation can ensure efficient internal controls and accuracy. 						<ul style="list-style-type: none"> Modest performance of PMs as to make decision individually and teamwork's are not directed correctly Increasing the performance of individuals, teamwork and the implementation of future projects 	<ul style="list-style-type: none"> Facilitating processes, roles, & technologies of KM Suitable approaches for project performance reports 								<ul style="list-style-type: none"> Organization needs to have a specific process for organising and filtering knowledge. Organization needs to transfer explicit knowledge to individuals. Organization needs to collect tacit knowledge from individuals into the organisation. 	<ul style="list-style-type: none"> To evaluate does the human resource management can be a knowledge facilitator to get all the information needed to the right people at the right time. To evaluate does the implication of knowledge management practices can contribute to human resource development.
	Theoretical Factors for Enforcing PM Best Practice via PMO					Theoretical Factors for Evaluating PMO's Roles						Theoretical Factors for Encouraging KM Best Practice via PMO											

Table 4.1: Theoretical Framework for KM and PM Implementation via a PMO

4.2.1 The shortcomings of current practices in KM

As identified in the literature review in chapters two and three, the shortcomings of current practice in the implementation of KM in the construction sector and the roles, functions, and techniques of PMO to encourage and facilitate KM processes are as follows: Firstly, tacit knowledge is the hardest type of knowledge to share as it resides in the minds of individuals. However, the existence of PMOs in the construction sector can provide a set of initiatives, techniques, and technologies to facilitate the collection of tacit knowledge, encouraging individuals to share their valuable knowledge and skills. Secondly, explicit knowledge tends to be poorly organised and there are not suitable standards, policies, and procedures to capture, maintain, and disseminate project knowledge across entire organisations. However, the roles of today's PMO can mentor and control the collection of useful project information and knowledge and then ensure that this valuable knowledge is in place at the right time when it's needed.

Thirdly, currently there is no established group of people or method for implementing KM processes; it is left to the engagement and initiatives of employees to share their knowledge. However, the availability of different maturity levels of PMOs are in place to offer for project environment and their head office some necessarily perspectives to addresses organisation's issues such as: organisational structure, cultures, learning, competitive advantage, and HRM to facilitate and encourage useful knowledge. Fourthly, there is a lack of training programs, coaching, incentives, and rewards system to motivate individuals and groups to come up with new innovative ideas and to share their knowledge. However, the role of the PMO as a center of excellence is able to evaluate the performance of project team and PMs and then suggest some type of training, coaching or feedback by visiting project's sites to investigate work progress and community of practice; unique incentives and rewards systems can increase awareness in understanding the needs of KM.

Fifthly, knowledge life cycle is missing and the organisational structure is not playing a sufficient role in structuring the different KM processes. However, stronger reliance on PMOs to provide formal networks and increase the collaboration between teams, PMs, and projects will increase the success level of the whole organisation. Sixthly, there are limitations to how post project evaluation reports are conducted, and/or insufficient time is permitted to conduct

a successful project review of the major problems, practices, risks, and lessons learnt. However, the role of the PMO working group, according to existing scholarship, confirms its importance to conducting and evaluating this report. The PMO is responsible for ensuring that valuable knowledge, project status, and skills would be smoothly retained and then absorbed into another organisation's project. Seventhly, there is a high staff turnover in construction firms that might weaken their competitive advantage. Partial loss of valuable knowledge and lessons learned is at the highest risk when the turnover of staff is high, either because the cost of maintaining PM professional staff is too high or in regard to the current governments' policies to reserve a certain percentage of jobs for local citizens. However, the PMO now exists to find formal and structured forms to facilitate knowledge to be acquired and transferred in order to achieve the organisation's objectives.

4.2.2 The relation between PM and KM within PMO

Both Project Management (PM) and Knowledge Management (KM) are crucial in developing business performance. The application of PM is used to employ appropriate knowledge, techniques, skills, and processes to meet the organisation's requirement (PMI, 2008; Kerzner, 2012; APM, 2012; Alsahli, 2013). By contrast, the application of KM is used to improve project activities and secure the project success by exploring at the right time, the proper knowledge (Egbu et al; 2001, Carrillo et al, 2004; Ahmad and An, 2008; Hislop, 2009).

During the project lifecycle (Initiating, Planning, Executing, Controlling, and Closing) a number of activities occur, which comprise of various procedures, methods, and policies. Therefore, for delivering successful projects, the utilisation of project team member's knowledge is crucial. However, in mega and complex projects, the integration of different project stages with their related activities has been a problematic challenge. As a result, the current practices of KM is challenging with a number of issues as:

- Re-inventing the wheel by the lack of reusing effective knowledge (Desouza et al, 2006; Owen et al, 2009).
- Poor collaboration between departments within the head office and projects due to the lack of systematic KM (Davidson and Jillian, 2009).

- Loss of organisational learning because of weaknesses in the way that valuable knowledge is collected and archived (Baxter et al, 2010).

However, according to some (PMI, 2008; PRINCE2, 2008; Kerzner, 2009), the PMO offers a valuable solution for establishing and applying PM methodologies that synthesize best practices. The PMO also has the ability to encourage PMs and project teams to share knowledge across the organisation and to organise the efficient flow of knowledge through communities of practice (Aubry et al, 2011; Muller et al, 2013; Pamsel and Wiewiora, 2013). The PMO is responsible for adopting training, coaching, and role building initiatives to increase the awareness of knowledge. Desouza and Evaristo (2006) carried out a study to investigate the main characteristics of PMOs and concluded with that the PMO exists to centralize different areas of information in order to create a knowledge base, which enables an organisation to achieve competitive advantage.

Other researchers (Rose, 2011; Unger et al, 2012) have also corroborated this PMO objective of being able to centralize knowledge by collecting lessons learned and then converting this accumulated knowledge into new procedures and processes and maintaining best practices. Thus, these important functions and roles of PMOs confirm its direct impact on the practices of KM and PM. This can contribute to structuring the sharing of lessons learned and project knowledge, allowing the diffusion of valuable ideas and innovations throughout the organisation. Anantatmula (2012) suggests that the impact of PM, KM, and PMO should be divided into different levels to serve and apply different roles as proposed underneath, as shown in figure 4.1:

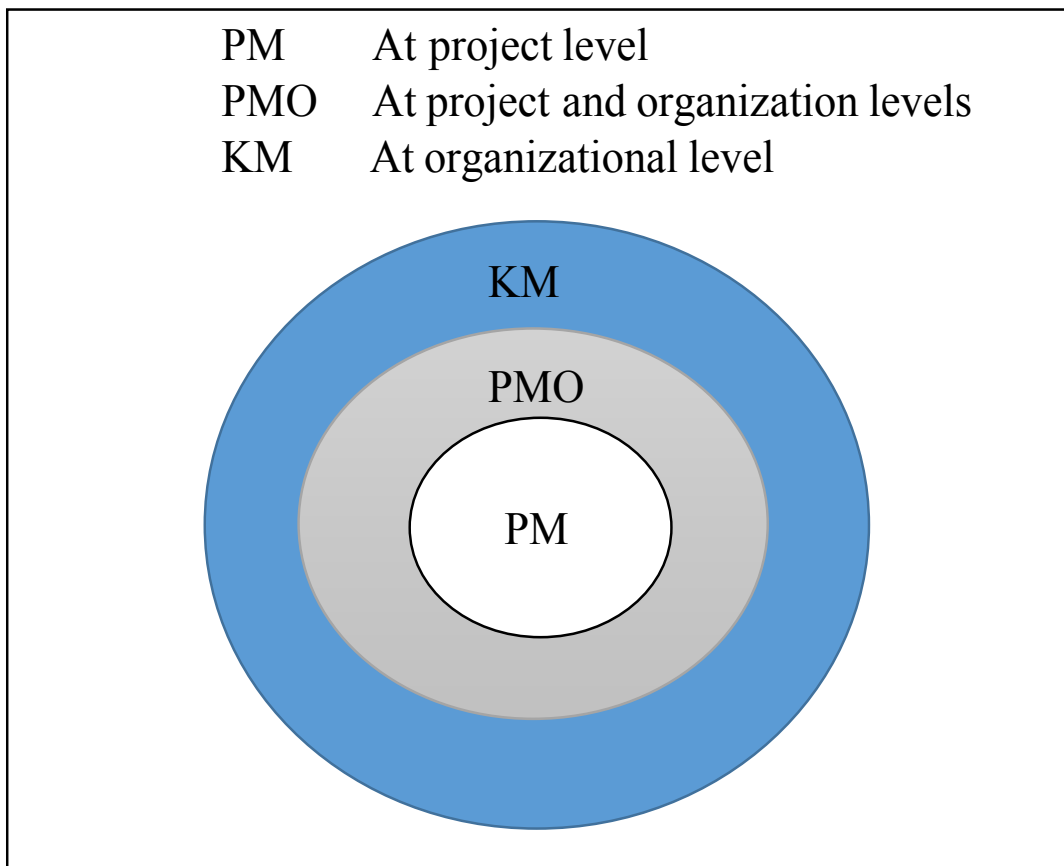


Figure 4.1: Impact of PM, KM, and PMO (Anantatmula, 2012)

In the existing literature there is little discussion of the role of PM and KM in the PMO. This can be seen as a significant gap in current scholarship. Therefore, it is important that KM practices are integrated into the PMO as an effective tool that will encourage and facilitate the various processes of KM. This will result in improving the efficiency of PM and this in turn is likely to increase project success rates.

4.2.3 PMBoK and Knowledge Management

The various methodologies of project management are addressed the management of project knowledge through providing a number of processes that can be used during the life-cycle of project (PMI, 2013). (PMBoK), in its 5th version, proposed ten different knowledge areas to be addressed and developed. From the PMBoK point of view, knowledge occurs and is created at different phases in a project's lifecycle. Reich and Wee (2006) conducted a study on PMBoK to investigate the practices and processes that can be classified as knowledge objects. Table

(4.2) shows how many times that explicit and tacit knowledge were recognised within PMBoK. For instance, explicit knowledge was seen 47 times as a knowledge object, whereas only once did PMBoK record tacit knowledge. According to this study, tacit knowledge seems to be the missing part, and this is yet to be addressed in the forthcoming versions of PMBoK.

Type	Count	Explanation
Total processes	44	The 4th edition of PMBOK comprises of 44 processes which contains 70 unique inputs and outputs.(Recently in the 5th edition 4 more processes have been included)
Knowledge objects	48	48 Out of 70 input/outputs deal with knowledge management
Explicit/Tacit knowledge	47/1	Majority of knowledge objects are explicit There is only one object, Enterprise Environmental Factor, contain tacit knowledge
Processes deal with Tacit KM	19	19 out of 44 processes are related to tacit KM and they are mainly referring to “expert judgment”

Table 4.2: Knowledge management objects of PMBOK (Reich and Wee, 2006)

This research assumes that PMOs need to find a means of collecting and transforming this tacit knowledge into explicit knowledge as this can be crucial for the success of projects (Koskinen and Pihlanto, 2008; Goffin et al, 2010; Shahram et al, 2014). In order to manage this transformation, PMOs will need to consider the important factors of both PM and organisational readiness to establish effective KM practices (Ajmal and Koskinen, 2008; Shahram et al, 2014). The improvement of KM to achieve best practice is dependent upon the following factors: organisational structure, culture, learning, Human Resource Management (HRM), and the competitive advantage (Desouza et al, 2006).

4.2.4 Different Types of Project Knowledge

Tan et al (2010) identified eight types of project knowledge widely used in the construction sector; as follows:

1. Process and procedures knowledge: this type of knowledge relates to the execution of construction projects in different stages. For instance, this can include categories such as designing knowledge, planning knowledge, tendering knowledge, knowledge of methods and techniques used, and the knowledge of maintenance or operation processes.
2. Client knowledge: This knowledge is important for the success of business as it covers the clients' requirements and specifications. This knowledge might remain tacit until there is an interaction between people to deliver the project.
3. Costing and financial knowledge: This knowledge deals with a number of aspects such as: knowledge of project location, and knowledge of construction cost, methods, and resources. However, the knowledge of financial aspects can increase the ability of the organisation to achieve low expenses and maximise benefits.
4. Statutory requirements and legal knowledge: Over time, regulatory requirements change. Therefore, companies need to keep up to date with knowledge of contracts, health, safety, and current codes of practice.
5. Lessons learned and reusable knowledge: Construction firms need to have reusable knowledge in place. Managing and executing similar projects or repeating business with the same type of clients can be facilitated through the use of previous knowledge.
6. Suppliers and subcontractors' knowledge: Better knowledge about contractors, consultants, subcontractors, and suppliers can facilitate the selection of them in future projects.
7. Project Management best practice knowledge: This knowledge is important in developing company efficiency, enabling companies to consider factors that might affect the completion of projects for instance: risk management, change management, innovation, and problem solving.
8. Knowledge of who knows what: This knowledge is difficult to apply as it requires guiding, leading, and connecting people with the right source of knowledge at the right time. The consideration of this knowledge needs to address the different experiences and skills people have as well as how to store this effective type of knowledge.

4.2.5 Methods of transforming Tacit to Explicit Knowledge

Srikantaiah et al (2010) suggest that in order for an organisation to transform tacit knowledge to explicit knowledge certain procedures need to be put in place, such as formal meetings, establishing a community of practice, and developing the retention of strategies. However, organisations must first identify which formal management department can mentor and apply these methods. Researchers such as Koulouriotis & Emiris (2004) and Deaouza (2006) have proposed the following factors to improve various practices such as individual behavior, organisational culture, and the existing systems in place. There is a good case for the PMO to be responsible for developing and serving these practices. Nonaka (2000) proposed the process shown in figure 3.15 to convert tacit knowledge into explicit knowledge by identifying their differences and roles in the organisation. For example, tacit knowledge seems to be intertwined with the personality of people and developed within their experiences, motivation, and intuition, and this may be best transferred through coaching sessions. By contrast, explicit knowledge is easily shareable and stored into organisation’s databases and documented, as illustrated in figure 4.2:

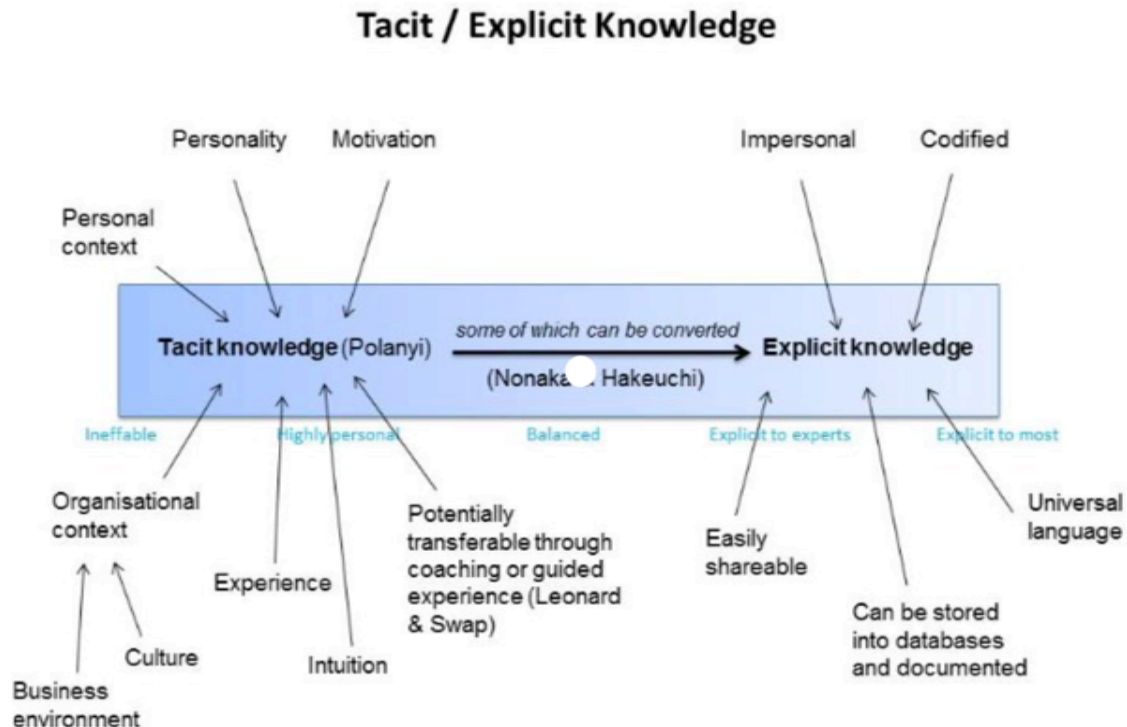


Figure 4.2: Type of Knowledge (Nonaka, 2000)

However, the process of transforming tacit knowledge into explicit knowledge should understand the characteristics behind each one in order to establish effective practices (Reich & Wee, 2006; Goffin et al, 2010). Delving deeply into the practice of transforming these types of knowledge, Koenig *et al*, (2010) have conducted a research study to investigate the various stages and formats of explicit and tacit knowledge, which can be presented as in table 4.2.5:

Tacit Knowledge exists in	Explicit Knowledge resides in	Methods of transforming Tacit knowledge to explicit
Face to face communication	Publication and books	Formal & informal meetings, networking
Telephone conversations	Internal records	Developing community of practices
Virtual communication	Sound/ video recording	Interviews and videotaping
Presentation & video conferences	Map & graphical material	Subject matter expert directories and/or yellow page
Mentoring and Coaching	Data warehouses	Knowledge/ information repositories
Study tours	E-mails	Mentoring programs
Training	Internet	Knowledge maps
Client knowledge	Self-study materials	Requiring strategies
Best Practices	Newsletters	Retention strategies

Table 4.3: Knowledge types in project context (Srikantaiah et al, 2010)

4.3 Proposed Conceptual Model

4.3.1 The Maturity Levels of PMO

According to PMI (2012 :20), the PMO is “*An organization structure that standardizes the project-related governance processes and facilitates the sharing of resources, methodologies, tools, and techniques*”. The APM (2008: 18) define the PMO as “*A group or department within a business, agency or enterprise that defines and maintains standards for project management within the organisation*”. Both of these definitions illustrate the purpose of the PMO to offer an effective methodology of PM to maintain and standardise the most common practices, processes, and techniques to achieve the organisational objectives. A good deal of scholarship has been written to define, propose, and assess it’s roles and functions, which is previously discussed in the literature review chapter three.

However, there is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. The implementation of PMO as PM methodologies has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before going into the establishment processes as (APM, 2008; PMI, 2012; Andrew, 2013). Each type has different roles and functions and can be suitable for particular organisational structure; as illustrated in the table (4.4):

Tylor (2011), Al-Nahj (2012), Andrew (2013), Daptiv (2013) and Nehme (2014)	APM (2012)	PMI (2008)
Directive PMO	Portfolio PMO	Enterprise PMO
Controlling PMO	Program PMO	Departmental PMO
Supportive PMO	Project PMO	Special-Purpose PMO

Table 4.4: Suggested Names of PMOs

The previous chart showed that the majority of researchers, including Tylor (2011), Al-Nahj (2012), Andrew (2013), Daptiv (2013) and Nehme (2014) suggest the PMO's core function can be divided into three maturity levels or operational functions, including: supportive, controlling, and directive. Each function has its own strategy and role in the delivery of the organisation's output as follows:

1) Supportive PMOs:

This level of PMO mainly works to assist the PMs and various project teams by having in place some type of supportive procedures, such as guidelines, templates, knowledge, and PM best practices. This can be achieved by bridging the gap between different projects and bringing them together as one project community. The nature of the PMO in this type can work as a repository of lessons learned, keeping track of best practice, and providing training for PMs and staff. This is an important model that should be used throughout the whole Organisation to establish these benefits:

- Increasing the project success levels by supporting widely the existing projects.
- Allowing the PMs and project teams to have in place some types of suitable PM information.
- Encouraging and empowering PMs and project teams to come up with ideas for solving various project problems.

2) Controlling PMOs:

This level of PMO is appropriate when the organisation needs to have discipline and standard formats across their existing project procedures, processes, activities, and methodologies. The utilisation of this model should be available to the organisation for ensuring all standards and methodologies are used across projects. PMO here acts as the company auditor to ensure all tools, standards, and processes are applied across organisational units and projects. The utilisation of this model should be available to the organisation for achieving these goals:

- Ensuring all standards and methodologies are used across projects.
- Ensuring the new types of projects are executed under its estimated budget.
- Spreading the regulatory compliance among different parties and projects.

3) Directive PMOs:

This level of PMO empowers the office to have more directive roles. For instance, the PMs will be assigned by the PMO leader and their project progress will be reported to PMO in order to make some types of decisions. However, construction companies usually begin with the supportive model, then over time, they move to control and directive models regarding their levels of business need. The PMO at this level is responsible for directing various departments and projects within the company. This should be used to gain the following factors:

- Ensuring PM practices are applied across projects.
- Reducing the overall costs and time by discussing the risks in early stages.

Therefore, Rowley (2013) propose the following chart (4.3) to illustrate the degree of control in PMO types:

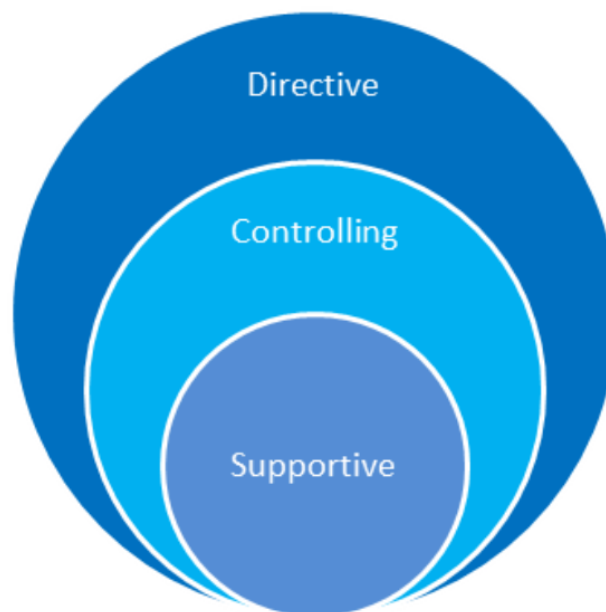


Figure 4.3: The degree of control of PMOs (Rowley, 2013)

The chart (4.3) can show the overlapping duties between these three phenomena. In the other words, as the supportive PMO is acting to identify templates and provide best practice, the controlling PMO is ensuring these templates and the different practices of PM are properly applied, while the directive PMO applies these important templates and best PM practices to the organisation's projects for improving business performance and ensuring successful completion.

However, the PMI (2012) proposes its types of PMO to work in the project oriented organisations. The types of PMO can be different in the Construction Sector as there are a wide range of activities; each company needs to identify PMO types by evaluating the organisation’s size and number of projects. Scott (2016) provides the following framework (4.4) to illustrate how the PMO can be organised according to its different maturity levels:

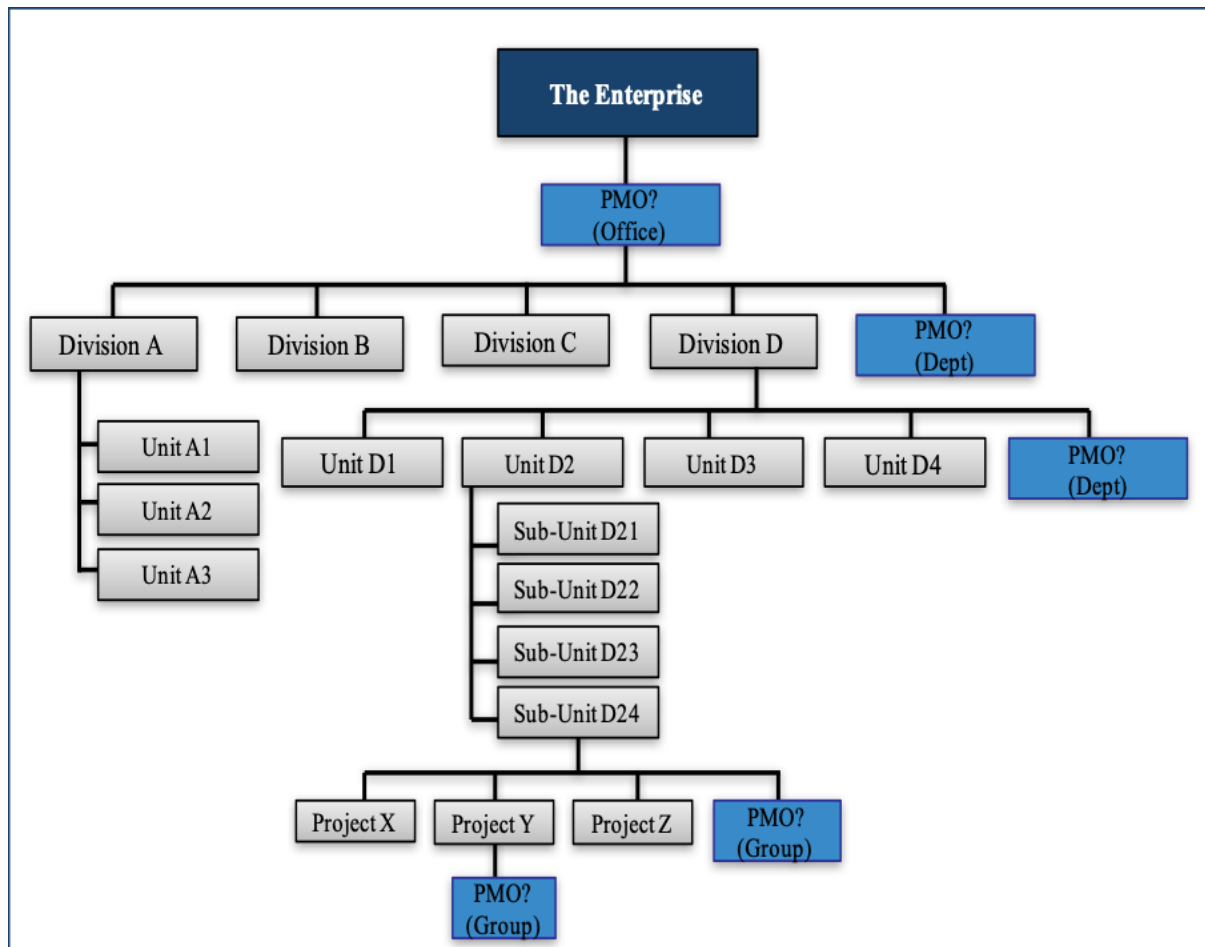


Figure 4.4: the organisation of PMO in different maturity levels (Scott, 2016)

Almaghrabi (2011), Godbole (2014) and Scott (2016) describe the types of PMO that can be used in construction, as follows:

1. PMO in a Single Project:

This is intended to be a limited version, which means that this type is only provided to manage one specific project and its job is almost done after the project is completed.

2. PMOs as a departmental level:

Here, the responsibility is to support some PM practices and act as one small department, but its job does not involve managing projects.

3. PMOs as a Centralised Office:

As the organisation executes a number of projects, this PMO will be located centrally across all the organisational units and projects. This type has other sub-PMOs who report to the main PMO; this can be seen if the organisation is implementing more than one project in different regions.

As the Association of Project Management 'APM' (2008) divided the PMO into three types, Taylor (2012) define those terminology as in the figure (4.5). The portfolio management is designed to view the status of all of the organisation's projects and the program is designed to manage more than one project according to the priorities of the organisation. As well as the project is a temporary management that focus on specific project and is closed after the completion. These types the APM proposed are used widely in cross-functional projects, manufacturing, IT projects, which is not more suitable in construction industry as the PMI proposed specific types of PMO that can be seen from the organisational point of view rather than generally proposed.



Figure 4.5: Different types of PMOs (Taylor, 2012)

4.3.2 Evaluating the roles and functions of PMOs to enforce best PM practice

The PMO impacts upon different practices of PM, as discussed previously in the literature review. Following on from this, this section discusses how PMO roles are used to encourage best PM practice. Khan (2016) defines the following roles of the PMO:

- PM methodologies for best practice and process: PMOs standardise the PM processes across all departments and projects. Via the existence of PMOs, organisations can use repeatable project delivery processes and apply them to future projects. By applying unified methods, tools, and guidance, the PMO can achieve consistent projects gains all over the organisation.
- Common PM Language, culture, and mindset: PMOs assist organisations to disseminate more of the common mindset and culture of projects by improving employees' awareness about the utilisation of different techniques and technologies.
- Creating and maintaining project knowledge, archives, and toolsets: PMOs play a key role after the completion of projects by acting to archive best practices and problems into a document repository. The acquired knowledge is very useful in future references and experiments.
- Strategic planning and governance: By predefining the structural criteria and business goals PMOs can advise top management in selecting candidate projects, which can be aligned with the firm's needs.

4.3.3 Developed PM practices at various levels of PMO

Project Management (PM) is necessary to meet project objectives by applying effective knowledge, tools, techniques, and technologies (PMI, 2008). Similarly, the Project Management Office (PMO) is significant for applying many roles in developing and maintaining best practice of PM (Spalek, 2012). Therefore, the Project Management Maturity Model (PMMM) exists to develop and address the functioning of PMOs (Kerzner, 2005; Hsieh et al, 2009). To successfully establish and evaluate the PMO's roles in an organisation, a number of suggested PMMMs have been proposed. For instance, the Organisational Project Management Maturity Model (OPM3), proposed by PMI (2008), has been used widely by a

number of organisations (Shahram, 2014). OPM3 addresses the development of PMO in four maturity levels, namely: to standardise, measure, control, and continuously improve. Another recognised model is the Portfolio Program Project Management Maturity Model (P3M3) by PRINCE2 (2008), which is used in a similar manner to OPM3 but has one more maturity level. P3M3 addresses the customisation of PMO in five maturity levels namely: awareness, repeatable, defined, managed, and optimised. Both PMMMs, whether PMBoK or PRINCE2, are considered a process-based-approach to systematically addresses the PMO roles to be developed from an initial maturity level to a Center of Excellence and an optimised level of PMO by following certain processes (Anderson et al, 2007). Table (4.5) illustrates the comparison between these PMMMs:

Maturity Model	Level 1	Level 2	Level 3	Level 4	Level 5
OPM3 (PMBoK)	Standardise	Measure	Control	Continuously improve	---
P3M3 (PRINCE2)	Awareness	Repeatable	Defined	Managed	Optimised

Table 4.5: The comparison of PMMM for the development of PMO

To put things together, there is no big difference by comparing previous models. But by considering that the PMBoK methodology is recommended two different categories of PMO types, one from an organisational point of view, which divided PMO at three types namely: 1) PMO in a single project or special purpose version of PMO, 2) Departmental PMO, 3) Enterprise or Centralised PMO. Another category by the PMBoK is called operational level of PMO, which divided into three levels: 1) supportive PMO, 2) controlling PMO, 3) directive PMO. Those can be useful and linked directly to select the appropriate PM maturity model as it has been adopted by a number of organisations (Bentley, 2009).

4.3.4 Evaluating the roles and functions of PMOs to encourage best KM practice

To perform the various KM processes, construction firms need to adopt and facilitate efficient management tools. Tan et al (2010) categories KM tools into two groups namely: IT - based tools and non - IT based tools. Further Algassani (2002) argues that not all KM tools are necessarily based on IT tools; such tools as documents and experience can be seen as KM tools. This research therefore to avoid confusion is proposing the term of “KM Techniques” to be served via PMO. The following section outlines the most relevant and important functions that the PMO can offer to encourage effective KM techniques as discussed by Tylor (2010):

- Communities of practice: the PMO working Group (PWG) can share a set of issues, concerns, problems, solutions, and developments with learning communities.
- Training and coaching: the PWG can evaluate staffs’ knowledge and then prepare and organise suitable training programs and coaching sessions to enhance their knowledge and skills.
- Recruitment of people: the PWG is responsible for bringing new knowledge to the company. The process of hiring new people can improve the organisation maturity level.
- Reassignment of people: the PWG usually reassigns the employees after project completed to another project to transform and acquire their valuable knowledge, skills, and expertise.
- Mentoring and controlling: one of the important duties of the PWG is to mentor and assist the performance of PMs and project teams. Usually the PMO will attach new or junior staff to an experienced employee so that they can gain the knowledge needed.
- Face-to-face interaction: the role of PWG is to transfer tacit knowledge into the company needs by meeting people face to face.

However, there are some soft issues in KM that PMO needs to consider in order to maximise its functionality as identified by Carrillo et al (2010):

- People issues: such as employees’ willingness and motivation to share effective knowledge, self-confidence, and trust.
- Organisational issues: the availability of incentives and rewards system is key to build up supporting knowledge. The level of job security and staff sensitivity can affect KM processes if it’s not made clear for all.

- Cultural issues: to share knowledge across organisation in the construction industry is often complicated as it includes people from different countries and cultures.

4.3.5 Developed KM processes and components at various maturity levels of the PMO

The improvement and effectiveness of various KM activities and systems are dependent upon the existing Knowledge Management Maturity Model “KMMM” (Feng, 2006; Hsieh et al, 2009). The KMMM can progressively assist the organisation to develop a proper KM system, which is similar to the role of the PMMM. There are a number of existing studies that set out to develop a comprehensive KMMM, such as Feng (2006) and Kanakanhlli and Pee (2009). Firstly, Feng (2006) proposes that three criteria should be considered to adopt and follow appropriate KMMM; as follows:

- 1) To attain the objectives in each maturity level
- 2) To identify different KM processes and the most important practices
- 3) To provide the appropriate key enablers and/or KM components

Further, Feng (2006) proposed five levels of maturity to address the KM development as well as identifying four major processes to create, store, share, and apply KM as in table (4.6). In this model, the first two levels are mainly focused on the required preparation works such as defining the needs to adopt KM practices and increasing the awareness by people and organisation to invest in KM. The remaining levels of maturity are focused on finding ways to improve and maintain KM practices.

KK Maturity	KM Processes			
	Creation	Storage	Sharing	Application
First level KMM	<ul style="list-style-type: none"> At this stage required preparation works are undertaken and KM processes and practices should be defined and planned 			
Initial activities and Enablers	<ul style="list-style-type: none"> SWOT analysis, Feasibility study and requirements analysis KM concepts definition, Challenges against KM, KM evaluation for organization 			
Second level of KMM	<ul style="list-style-type: none"> Valuing knowledge creation Respecting to the originality of K. 	<ul style="list-style-type: none"> Developing K. documentation Developing repository systems 	<ul style="list-style-type: none"> Facilitating informal communication 	<ul style="list-style-type: none"> Developing process to reuse existing knowledge
Enablers, tools and systems	<ul style="list-style-type: none"> Learning tool Plot assistant design Simulation Software Brain and thinking support systems 	<ul style="list-style-type: none"> Electronic notice board Document edit S/W Database 	<ul style="list-style-type: none"> Electronic notice board Video Conference meeting Email and Chat room 	<ul style="list-style-type: none"> Interface design S/W
Common initiatives, tools and systems	<ul style="list-style-type: none"> Defining the concept of KM in practice Developing Internet, Intranet and any types of networks in organization Developing community of practices 			
Third level of KMM	<ul style="list-style-type: none"> Developing K. creation strategies Establishing formal K. creation 	<ul style="list-style-type: none"> Developing processes for refining K. K. conformity check Storing K. in suitable place 	<ul style="list-style-type: none"> Establishing and developing formal channels for sharing K. Education and Training Enhancing the security of K. sharing 	<ul style="list-style-type: none"> Developing systems to support K. application Dividing the work areas to related functions
Enablers, tools and systems	<ul style="list-style-type: none"> Data mining Documentation Search Knowledge detection tools Idea implement assistant tools Case-based reasoning systems Pattern simulation 	<ul style="list-style-type: none"> Data Repository Data storage File management systems Case-based reasoning systems FAQ Work process systems Expert systems 	<ul style="list-style-type: none"> Search engine Knowledge list Knowledge map Content-based original search Online learning systems Expert yellow page Expert training systems Seminar and workshops 	<ul style="list-style-type: none"> Expert systems Work process systems Online prompt analysis Decision support systems
Common initiatives, tools and systems	<ul style="list-style-type: none"> Establishing a unit to take the responsibility and accountability of KM Systematically Supporting KM Establishing and developing standard for KM Developing KM sub processes 			
Fourth level of KMM	<ul style="list-style-type: none"> Developing the K. creating sub-processes 	<ul style="list-style-type: none"> Developing the K. storage sub-processes 	<ul style="list-style-type: none"> Developing the K. sharing sub-processes 	<ul style="list-style-type: none"> Developing K. app. sub-processes
Enablers, tools and systems	<ul style="list-style-type: none"> Measuring the K. creating success 	<ul style="list-style-type: none"> Measuring the K. storage success 	<ul style="list-style-type: none"> Measuring the K. sharing success 	<ul style="list-style-type: none"> Measuring the K. application success
Common initiatives, tools and systems	<ul style="list-style-type: none"> Measuring the success of KM through indexes and Critical success factor (CSF) Measuring the success of KM sub-processes Putting control in place for all KM processes and activities Developing an Audit unit for measuring the KM 			
Fifth level of KMM	<ul style="list-style-type: none"> Continuously improving the KM processes and procedures Developing the KM control and audit systems and unit Integrating the KM processes and procedures 			
Enablers, tools and systems	<ul style="list-style-type: none"> Developing a research unit in the KM department Developing a Decision making unit in the KM department 			

Table 4.6: Knowledge Management Maturity Model (Feng, 2006)

The previous KMMM has been tested and refined by different organisations, including governmental organisations and commercial banks. From this research project's point of view, Feng (2006) has not been applied yet to the PMO or in any of the project-based organisations. One weakness of this model is that it fails to address the key players of KM as it focuses more

on the KM processes and gives more comprehensive details about its practices. To ensure that this model is valid, further and wider research is needed. Furthermore, it can be compared to other studies. The importance of KM components can be seen by Kanakanhlli and Pee's (2009) KMMM. This model is divided its maturity levels into five namely: Initial, Aware, Defined, Managed, and Optimised as shown in the table (4.7):

Maturity Level		General Description	Key Process Areas		
			People	Process	Technology
1	Initial	Little or no intention to formally manage organizational knowledge	Organization and its people are not aware of the need to formally manage its knowledge resources	No formal processes to capture, share and reuse organizational knowledge	No specific KM technology or infrastructure in place
2	Aware	Organization is aware of and has the intention to manage its organizational knowledge, but it might not know how to do so	Management is aware of the need for formal KM	Knowledge indispensable for performing routine task is documented	Pilot KM projects are initiated (not necessarily by management)
3	Defined	Organization has put in place a basic infrastructure to support KM	<ul style="list-style-type: none"> - Management is aware of its role in encouraging KM - Basic training on KM are provided (e.g., awareness courses) - Basic KM strategy is put in place - Individual KM roles are defined - Incentive systems are in place 	<ul style="list-style-type: none"> - Processes for content and information management is formalized - Metrics are used to measure the increase in productivity due to KM 	<ul style="list-style-type: none"> - Basic KM Infrastructure in place (e.g., single point of access) - Some enterprise-level KM projects are put in place
4	Managed	KM initiatives are well established in the organization	<ul style="list-style-type: none"> - Common strategy and standardized approaches towards KM - KM is incorporated into the overall organizational strategy - More advanced KM training - Organizational standards 	Quantitative measurement of KM processes (i.e., use of metrics)	<ul style="list-style-type: none"> - Enterprise-wide KM systems are fully in place - Usage of KM systems is at a reasonable level - Seamless integration of technology with content architecture
5	Optimizing	<ul style="list-style-type: none"> - KM is deeply integrated into the organization and is continually improved upon - It is an automatic component in any organizational processes 	Culture of sharing is institutionalized	<ul style="list-style-type: none"> - KM processes are constantly reviewed and improved upon - Existing KM processes can be easily adapted to meet new business requirements - KM procedures are an integral part of the organization 	Existing KM infrastructure is continually improved upon

Table 4.7: General Knowledge Management Maturity Model (Kanakanhlli and Pee, 2009)

The KMMM presented by Kanakanhlli and Pee (2009) categorised the key players of KM into three important components: People, Processes, and Technology, in order to address the current issues facing KM implementation. Building upon current scholarship in the field, this research sets out to explore some of the factors that have not been explored sufficiently in the literature, such as the importance of people's interactions and the availability of the technology factor that not extensively covered. Kanakanhlli and Pee (2009) suggested that their model could be adopted in any general organisations. To the best of this researcher's knowledge, the Feng's KMMM is important in identifying and outlining KM processes and practices, whereas Kanakanhlli and Pee's KMMM gives more consideration to the important players in KM. This research assumes that these two models are quite similar in frame-working KM activities and can be integrated as a complementary KMMM to maximise their importance and effectiveness. Therefore, the incorporation of KMMM is not yet examined in project based organisations and/or in the PMO, which seems to be the missing part that needed to be addressed and discussed.

4.3.6 Proposed Conceptual Framework

To evaluate the level of change that the implementation of PMOs can have on the organisation and project environment, there is a need to propose a conceptual framework. According to Kristonis (2005), Ellinger et al (2009) and Haider et al (2016), Lewin's force field analysis model can help to reframe shared perceptions and improve performance. Lewin's Model is based on the driving forces to gain positive forces and comparing this with restraining forces about the obstacles that affecting the levels of changes. This can be useful to present the state or to propose the desired state. This research builds a conceptual framework based on identifying and evaluating the current difficulties and challenges that affect the management and completion of construction projects, as investigated in relation to project failing and delays in the KSA construction sectors. This will be played against the principles and values that can be created in the PMO. The third aspect of this model are used to present the level of changes that are required to take place, which is divided into four factors namely; 1) steps and procedures for the establishment and evaluation of PMOs, 2) the effect of PMO functions to enforce best practice of PM, 3) Important types and components of KM and their implementation via PMOs, 4) Different maturity levels of PMOs.

One of the hypotheses made is that PMO values and principles can be used to improve business performance and to address the current difficulties and challenges that affect the completion of construction projects. To evaluate this proposition, the conceptual model in Figure 2 was considered. The model used different maturity levels namely: supportive PMOs, controlling PMOs, and directive PMOs to review certain effects of PMOs on both the organisation and its various projects. This can represent the second hypothesis of the proposed research model; PMO functions and PMO maturity levels can be connected to increased project success rates and to implementing best practices of KM. However, it will be important to evaluate the level of changes that PMOs will have in adopting best practices of both KM and PM and in confirming its added value in the organisational performance and project environment before and after the implementation of PMO.

4.4 Summary

This research aims to propose an effective framework to develop the KM processes from the PMO perspective. This conceptual framework should consider the four processes of KM that need to be managed through the different phases of the project: initiation, planning, execution, and closing phase. PMOs roles have been divided into four maturity levels. This can be useful as this research aims to identify such levels and to propose a framework to maximise the importance of different levels. The proposed conceptual model is designed to be linked directly with the research objectives provided in chapter 1. Figure 4.7 highlights that the adoption of KM processes needs to be addressed in different maturity levels of PMO. As a result, this research should be developed framework to implement PM and KM practices at various maturity levels of PMOs.

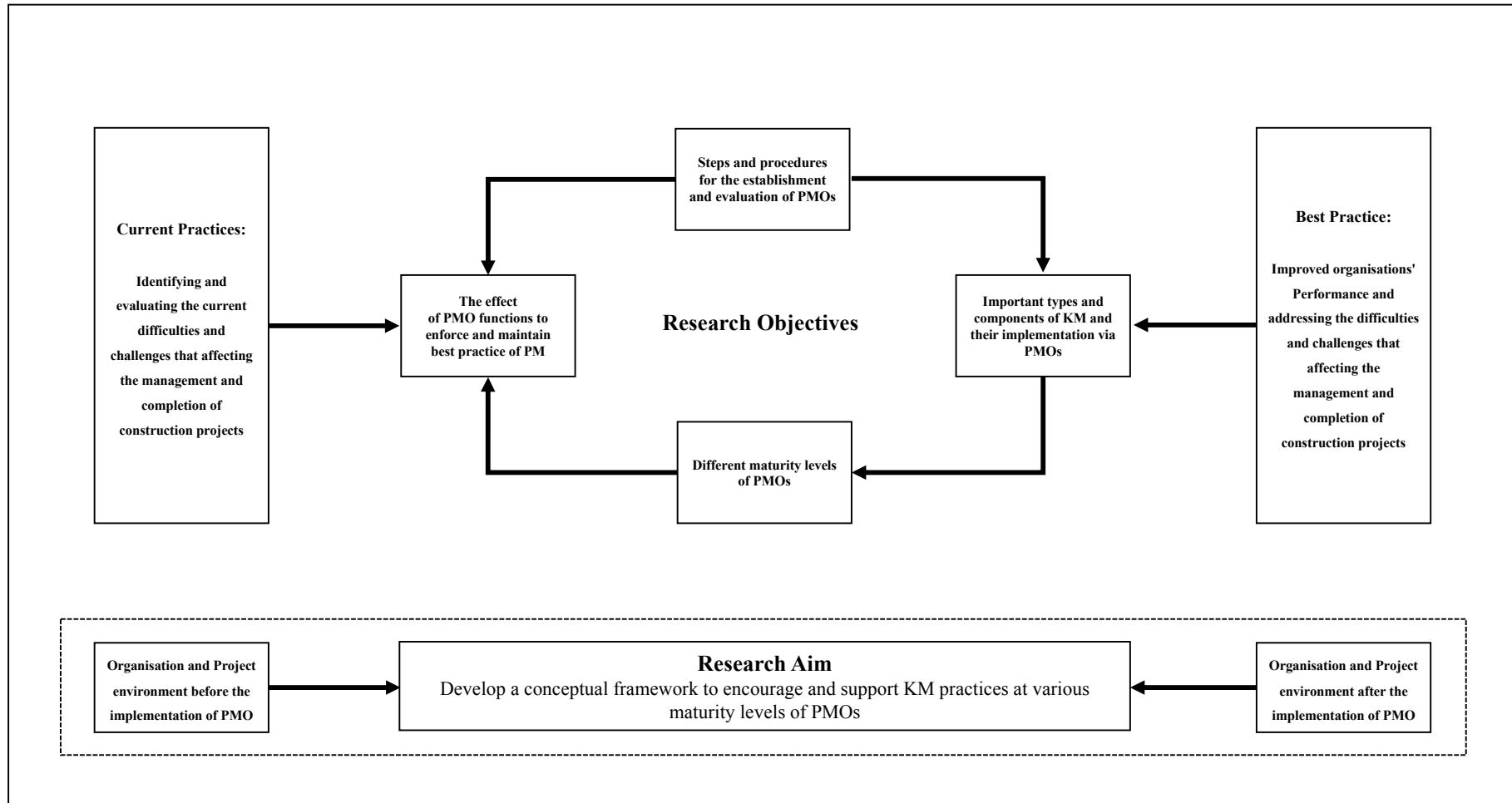


Figure 4.7: Review and link research objectives with the main aim adapted based on (Lewin, 2005)

Chapter Five:

Research Design and Methodology

5.1 Introduction

The main purpose of this chapter is to provide the research design and various methods used in achieving the objectives of the research. It also discusses the philosophies underlying the types of methods used to justify the rationale of choosing them. The discussion is linked within the previous research shown in chapter one and two and is guided by the literature review in chapter two.

This chapter is divided into two main sections. The first one focuses on the theoretical side, discussing the research philosophy, approaches, and strategy. The second section focuses on the practical side, discussing the research choices, data collection and analysis methods, and then concludes with the research design. The following chart can illustrate the divisions of this chapter as it divided into two main headings namely, theoretical side and practical side; as illustrated in figure 5.1:

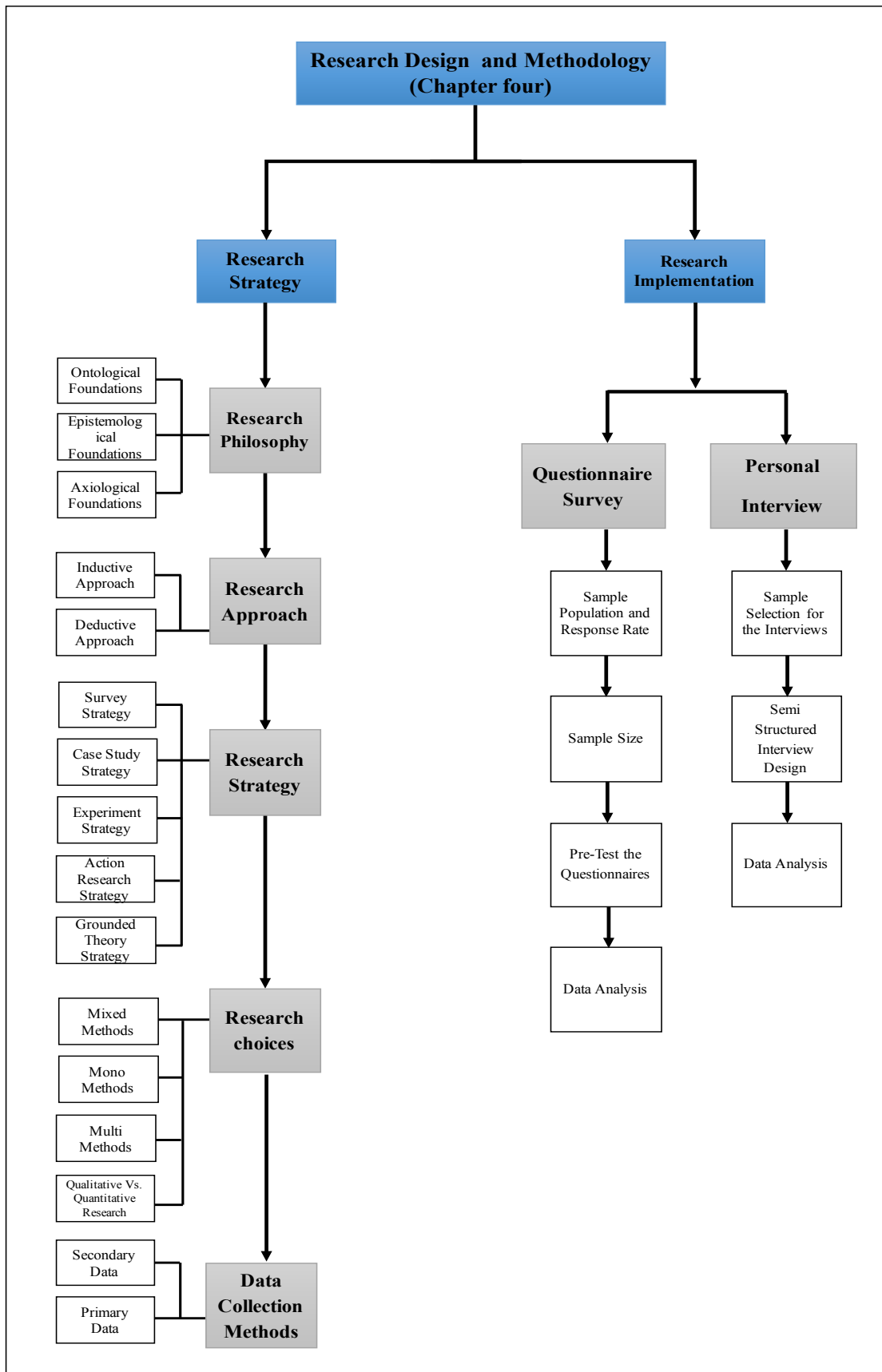


Figure 5.1: The structure of Methodology chapter

5.2 Research Strategy

5.2.1 Research Philosophy

Goodson et al. (2004) and Tight (2006) argue that the process of selecting and understanding the various research philosophies is the first step in carrying out and planning research. The majority of researchers including Bergman (2008), Blaxter et al (2006) and Hughes (2006) primarily focus on epistemology, ontology, and axiology as the fundamental building blocks of research philosophy. Thus, research philosophy can be defined as the belief held by researchers to choose the right way of gathering, analysing, and using different data to address the research phenomenon. Saunders et al. (2009) and Hinkelmann and Witschel (2014) suggest that the Research Onion diagram should be considered before the process of designing and collecting data. Researchers following Saunders' diagram, shown in figure 5.2, can choose suitable philosophies, approaches, strategies, choices, time horizons, and techniques. Due to the Research Onion having different layers, it is worth discussing them and justify how it can be connected with this research:

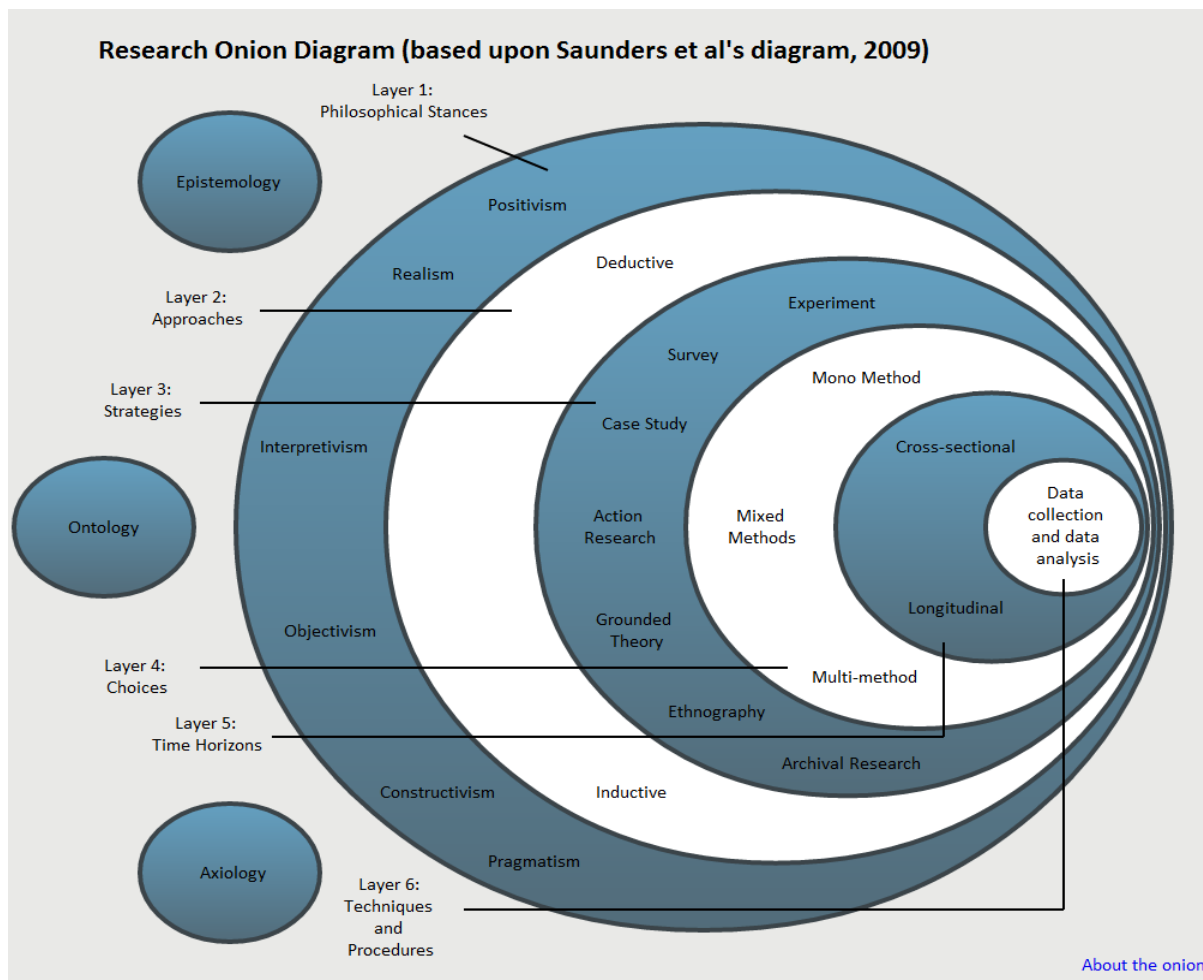


Figure 5.2: Research Onion (Saunders et al., 2009)

5.2.1.1 Ontological Foundations

Ontological philosophy focuses mainly on the nature and level of reality (Phillimore, 2004; Milman, 2010). This type of philosophy is concerned with the difference between the researcher's perception of reality and how this phenomenology might affect people's behavior. The assumption is based on the existence of truth and how we see it as well as the characteristics of reality. Phillimore (2004) suggests there are three types of philosophical positions that can be connected directly with ontology: pragmatism, constructivism, and objectivism.

Objectivism and constructivism come from very different angles. Objectivism argues that the meanings of social phenomena can exist differently to social actors; they can be used for scientific or lab work (Brace, 2008; Milman, 2010). Realism has the same beliefs and processes as objectivism with regard to the need for researchers to avoid creating biased results, whilst also benefiting from each other. Realism is different in that the certainty of believing what reality is should not continue because the majority of theories can be revised by continuous research and be open to the utilisation of new research methods. More reliable results can always be obtained through different research methods (Bergman, 2008). Brace (2008) defined constructivism as constructing one's own understanding of people through their experience of things and then reflecting on those experiences. Constructivism recognise social actors as effective in that they construct social phenomena or reality as a process of the mind. There is no independent status and it provides multiple realities. However, pragmatism considers both constructivism and objectivism to be appropriate approaches. The role of social actors on the level of influence can help to view the topic more deeply and create a practical research approach (Maiy, 2011).

This study assumes the constructivism ontology about the existence of truth. As such, this philosophy constructs different truth from different people with different backgrounds, interests, and experiences. This can provide evidence by considering these different perspectives through the analysis of data such as quotes and themes. The continuing state of revision is a key factor of constructivism, which is suitable to deal with the differences that might arise between the theoretical framework and methodology. It seems to be an inductive approach as this research needs to understand people's opinions while building the theory.

5.2.1.2 Epistemological Foundations

Epistemological philosophy is concerned with what is acceptable knowledge that can be used to address the research question. The definition of acceptable knowledge in the research field and the utilisation of rigorous testing can assist in determining the level of understanding about information that can be true and should be treated as a fact (Norris, 2005; Riemer et al., 2012). This type of philosophy is also concerned with searching for only facts, and only using information that can be presented with a high level of certainty, which increases the desire of scientific researchers to follow this philosophy. Norris (2005) said that some philosophical positions in this area are Interpretivism and Positivism.

Positivism is mainly intended to generate research questions or hypotheses that can be tested and measured against currently accepted knowledge. Other researchers can then replicate the studies to gain the same results (VanderStop, 2009). Critical realism is one example based on the concept that the researcher understands the phenomena but there is no attempt to make changes (Bergman, 2008).

Interpretivism relates to the participation of people in social life. Researchers following this approach will need to understand people's ideas, thinking, and ways of viewing the existing culture. There is a need to apply different methods due to the study of objects that are different from the study of human (Jupp, 2006; Milman, 2010).

In terms of epistemological foundations, this research will follow the philosophy of Interpretivism. This study is working to gather facts to gain the knowledge by understanding the different opinions from the subject's point of view. This understanding includes the subjective nature of the existence of people's knowledge and how it can be interpreted into social actions for achieving the company's objectives. This research is following this philosophy in case the social world requires the use of various methods to deal with the study of people rather than the study of objects. The contribution of knowledge will emerge from the meaningful thinking of people about the phenomena being studied in this research. Interpretivism philosophy should allow this study to understand, explore, and explain the reality of providing PMO to encourage KM.

5.2.1.3 Axiological Foundations

Axiological philosophy is quite different from the previous philosophies. It focuses on the opinions and values of researchers in understanding and recognising their roles, while the process of analysing and collecting the research can be used to balance influence (Riemer et al., 2012). There are two extremes as proposed by Bergman (2008): value-free or value neutral, and value-laden or value-biased.

Value-free or value neutral argues that the existence of phenomena can be independent of actors; the actor is not important. This approach can be linked to the philosophy of objectivism and positivism. However, in a value-laden or value-biased, the researcher is important in attaching value to the knowledge and there is no independent status (Milman, 2010).

The value-laden nature of axiological foundations is selected in this study. The amount of values of others that can be put into this research attaches value to the knowledge. This position assumes that there are multiple realities, which is appropriate for this research to see the value placed on the knowledge.

5.2.2 Research Approach

Gill and Johnson (2010) and Milman (2010) suggest these two types of approach: deductive to generate theory then research and inductive to generate research then theory. The choice is very important for the researcher, who must choose one or even apply them both. This is known as the abductive approach. Matthews and Ross (2010) suggest that an assessment of research aims, limitations, and personal opinions will confirm which method is best. The difference between these approaches can be seen in table 5.1.

Deduction	Induction
Scientific principles	Gaining an understanding of the meanings humans attach to events
Moving from theory to data	A close understanding of the research context
The collection of quantitative data	The collection of qualitative data
The application of controls to ensure clarity of definition	A more flexible structure to permit changes of research emphasis as the research progresses
A highly structured approach	A realisation that the researcher is part of the research process
The researcher is independent of what is being researched	Less concern with the need to generalise
Necessary to select samples of sufficient size in order to generalise conclusions	

Table 5.1: Deductive and Inductive Approaches (Saunders et al., 2009)

Saunders et al., (2009) argue that deduction is testing theory while induction is building theory. The contribution and realisation of the researcher in the induction approach is highly important as part of the research process. Riemer et al., (2012) Gill and Johnson (2010) propose that the involvement of developing a prior theory is based on accurate empirical testing. The purpose is to confirm the validity of data and explain the relationship between variables. The type of information must be collected and how the findings relate to the theory should be decided by the researcher.

5.2.2.1 Inductive Approach

The inductive approach is mainly focused on attempting to create a new theory. It works in the opposite way to the deductive approach, because it does not necessarily take into account the existing theories (Bergman, 2008). However, this approach can be suitable if there is not much research about the chosen topic. Further, Norris (2005) identifies the inductive approach relating data analysis to involve collecting data and developing theory. A close understanding of the research context should provide a clear understanding of the nature of the problem.

The attempt of this research is to evaluate the relevance of the theoretical framework within the specific empirical context. The research will use the inductive approach for building theory. The researcher is collecting data and the development of the theory can be based on the analysis of data. This allows the researcher to gain an understanding of the nature of the problem through a close understanding of the context of the research. The model can be modified as a result of emerging data.

5.2.2.2 Deductive Approach

The deductive approach proposes a type of statement or question, and the research then tries to answer it. This approach can allow the researcher to see if the findings will be suitable to confirm the research question or if they can be rejected, and the process will start again. However, Sanders et al. (2009) stress that the deductive and inductive approaches can be combined together so that the testing of theory can be done deductively, and the evaluation of theoretical terms and assumption can be accessed inductively. Similarly, the development of theory can be inductive while the process of testing the theory can be deductive. The experiment strategy can be an example of the deductive approach, which is used widely in the image of chemist and other related sectors. Such as the approach of deductive can be used to test the hypotheses based on the experiment research. Figure 5.3 illustrates where the research stands in terms of each proposition.

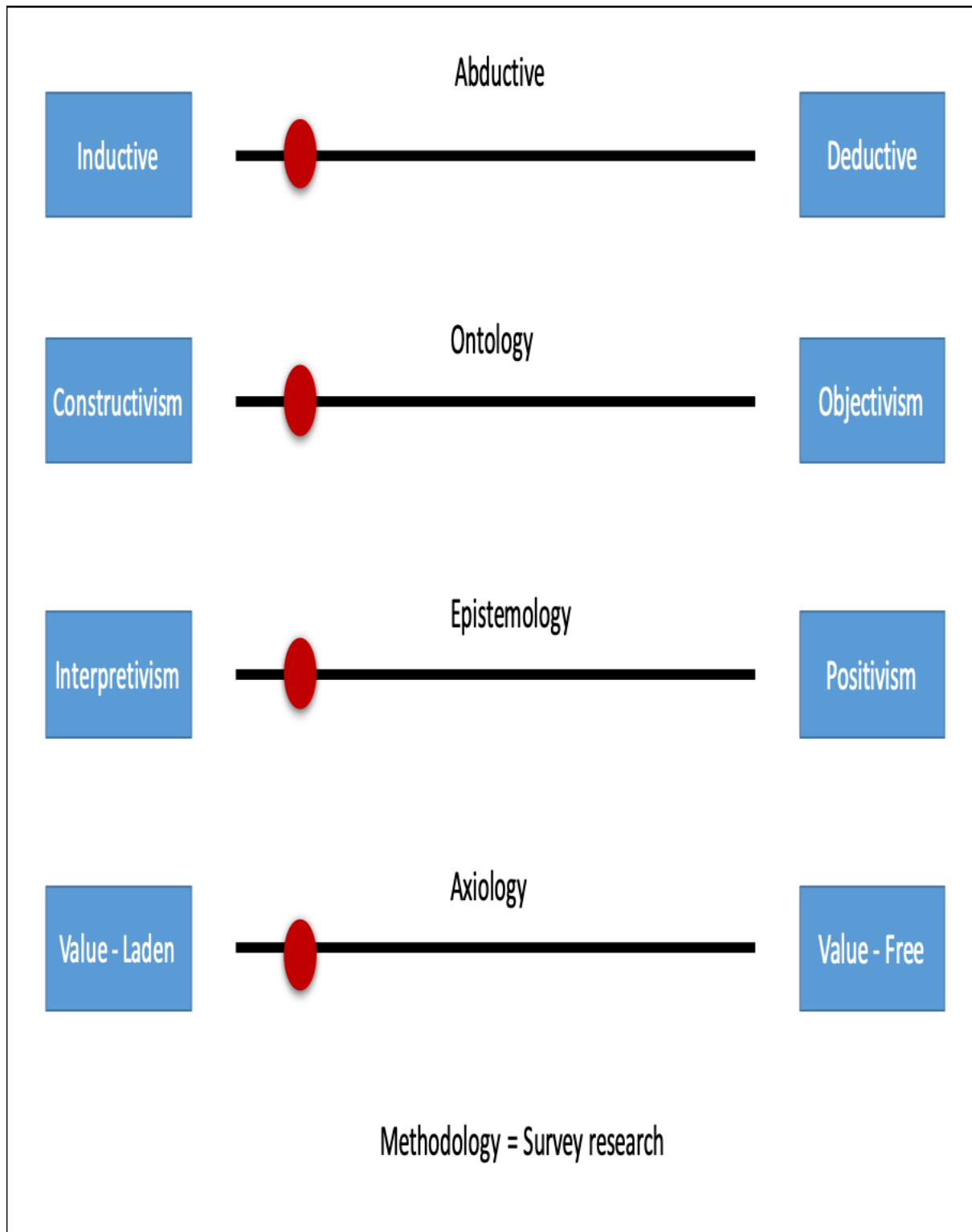


Figure 5.3: Research Philosophical Stance and approach

5.2.3 Research Strategy

Saunders et al. (2009) and Matthews (2010) define research strategy as the general plan of how the researcher will go about meeting the objectives and answering the questions of the research. The process of collecting and analysing data should follow one or more research styles, such as the survey or case study method. This utilisation could involve limitations and benefits that require the researcher to know which strategy to be adopted.

5.2.3.1 Survey Strategy

Crang (2007) and Saunders et al. (2009) defined the survey as a flexible approach of the research that is used for investigating a wide range of topics. The survey strategy is based on the collection of large amounts of data by the questions what, when, who, and how. However, there are some advantages of using a survey approach as discussed by Mathers et al. (2009). The advantage is to have external and internal validity that are both based on the sample to represent the particular population of the study to be generalised to the whole population.

Surveys can be accessed by participants to cover geographically spread samples, such as postal questionnaires and telephone interviews. Surveys can be flexible and as such are easily combined with other methods, for instance the in-depth interview. However, the limitations of this approach are noted by the lack of explaining why respondents act, think, behave, and are satisfied or dissatisfied. Qualitative research gained from in-depth interviews can answer ‘why’ questions in more detail. The objectives of the study are to look at the impact of PMO and KM to overcome the reasons behind project to falter and abandoned in the KSA. The collection of large amounts of data should be considered to satisfy the findings of the study. This research assumes the survey as a strategy to conduct the study.

5.2.3.2 Case Study Strategy

The case study method aims to provide an extensive study on one or more organisations to address the research phenomenon in a practical way. There are a number of different approaches to collecting data; for instance, observing aspects over time, or attending some interviews (Gerring, 2007). The flexibility that can be offered by the case study to allow the researcher to investigate deeply into a real-life event is valuing this strategy as one of the most used methods. Usually the case study is more suitable to investigate the boundaries between

phenomenon and context, which not clearly evident by using different sources of evidence and the real-life context of contemporary phenomenon. The identification of certain research problem can explain the appropriate methods used as observation, archival information, and surveys.

5.2.3.3 Experiment Strategy

Experimental design can be suitable for some types of research where there is a phenomenon in one group that can be compared to another successful group, which enables the researcher to replicate data (Riemer et al., 2012). However, in the selected area of study, there is currently no other effective PMO to be followed. As such, the experiment strategy is used widely in the image of chemist and other related sectors. Recently, as discussed by Mathers et al. (2009) experiments can be used effectively in physical and behavioral research to gain deeper extent. Nevertheless, business scientists are using this strategy to analyse the relationship between cause and effect such as the approach of deductive can be used to test the hypotheses based on the experiment research.

5.2.3.4 Action Research Strategy

In line with Smoekh (2006) action research is based on providing a list of actions to implement solutions. Considering the time-consuming regulations of KSA organisations, it can be difficult to obtain the suitable level of support. Many other names of action research have been developed as collaborative inquiry, action learning, and participatory research. Mathers et al. (2009) defined action research as learning by doing, this can happen by identifying a certain problem and trying to come up with solutions to resolve it.

5.2.3.5 Grounded Theory Strategy

According to Wertz (2011), grounded theory predicts and explains the behavior of people to build a new theory. It can be hard to predict some aspects because the majority of PMOs have been established in the last few years and there are thus no theories to build research around them. However, participation in and observation about some research strategies, such as ethnography, will be required to allow the researcher to form part of the community, and this method needs to be followed in the long term (Crang, 2007). Archival research will also be difficult because only current data is available, so it may be difficult to test the accuracy of that information.

5.2.4 Research choices

Bergman (2008) and Saunders et al. (2009) suggest these three choices namely; mono-methods, mixed methods, and multi methods. Each one of these methods are different from the other and it works to satisfy a specific purpose. The following discussion is used to highlight their importance and differences to the research.

5.2.4.1 Mixed Methods

Mixed-methods, which is the opposite to mono-methods; the researcher adopts both methods to collect and analyse data. Halcomb (2009) argues that utilising both methods assists the researcher to fill the gaps and overcome the limitations of each individual method as well as it mixes different worldviews or paradigms. Mixed methods research also have been defined by Creswell (2015) as an approach for gathering both methods quantitative (closed ended questions) and qualitative (open ended questions) then integrating these methods and drawing interpretations to understand the problem of the research.

Further, Saunders et al. (2009) suggested that using mixed methods has many advantages because the researcher can be more confident in addressing the majority of significant issues and applying different methods to validate the findings. Mixed methods are currently used by a large number of businesses and management research to satisfy both factors - data collection and analysis (Smoeckh, 2006). As reported by Media and Moss (2014), using mixed methods can provide the following advantages:

- Broader perspective: clarify the nuances that are difficult to uncover by one method.
- Personal bias: some respondents prefer one research methodology over the other; by using mixed methods at this stage a large number can be accessed.
- More data: for the research to be more comprehensive, it is better to include an example of both qualitative and quantitative information.
- Different answers: each method has certain goals; for instance, the quantitative approach only looks for one answer. It is worth finding different answers to support the final results.

However, Teddlie & Tashakkori (2010) espouse the existence of eight contemporary characteristics of the mixed methods including:

1. Methodological eclecticism
2. Paradigm pluralism
3. Emphasis on diversity
4. Continua rather than dichotomies
5. Iterative research
6. Research questions lead to methods
7. Signature research designs
8. A third methodological community

5.2.4.2 Mono Methods

Norris (2005) and later Riemer et al., (2012) propose mono-methods to involve in the collection of data by using either qualitative or quantitative methods, rather than applying both. This responsibility will require the researcher to identify if the study worthwhile one method to achieve the set of objectives.

5.2.4.3 Multi Methods

Matthews and Ross (2010) differentiate the multi-methods to the mixed methods, by identifying its similarity in that it benefits from both qualitative and quantitative methods, but the analysis uses only one perspective. It uses the various tools of data collection within one philosophical paradigm. The findings in this case can explain, which is more suitable to be used in the research. However, researchers (David and Sutton, 2004; Neuman, 2004 and Bryman and Bell, 2007) emphasize that the combination of both quantitative and qualitative research can allow the researcher to be more confident in their findings by checking the qualitative result against quantitative methods or vice versa. Using both methods will assist the researcher to fill the gaps, to see the broader perspective, to gather more data, to find different answers, and to overcome the limitations of each individual method. It also mixes different worldviews or paradigms. As this research assumes the mixed methods as a choice of this research; the following section is provided to illustrate both quantitative and qualitative approaches and their relation to the research.

5.2.4.4 Qualitative and Quantitative Research

The classification of undertaking research can follow either a qualitative or quantitative category. The qualitative approach is based on the perceptions of examining and reflecting the understanding of human activities. However, the selection of the quantitative approach allows us to measure the phenomena and to collect and analyse numerical data (Bryman and Bell, 2007; Saunders et al., 2009). The different between these two approaches can be seen by McDaniel and Gates (2002) as illustrated in table 5.2

	Qualitative Research	Quantitative Research
Type of questions	Probing	Limited Probing
Sample size	Small	Large
Amount of information from each respondent	Substantial	Varies
Requirements for administration	Interviewer with special skills	Interviewer with fewer special skills
Type of analysis	Subjective and interpretive	Statistical and summation
Hardware	Tape recorders, projection devices, video recorders, pictures; and discussion guides.	Questionnaires, computers and printouts
Degree of reliability	Low	High
Researcher training	Psychology, sociology, social psychology, consumer behaviour, marketing and marketing research	Statistics, decision models, decision support systems, and computer programming
Type of research	Exploratory	Descriptive or causal

Table 5.2: Qualitative and Quantitative Research (McDaniel and Gates, 2002)

Table 5.2 indicates that qualitative data is more time-consuming and is less able to be generalised. A subjective individual's interpretation of events is important, such as using participant observation as in-depth interviews. Qualitative research data takes the form of words, while quantitative research data consists of numbers and statistics. In qualitative research, the researcher is the data-gathering instrument; in quantitative research, the researcher uses tools such as questionnaires to collect numerical data. Quantitative research is recommended during the earlier phases of research projects, while qualitative research is recommended during the latter phases. The aim of qualitative research is a complete and detailed description; the aim of quantitative research is to classify features, count them, and construct statistical models in an attempt to explain what is observed (Wilderdom, 2012). Researchers including (David and Sutton, 2004; Neuman, 2004; Bryman and Bell, 2007) emphasises the combination of both quantitative and qualitative research can allow the researcher to be more confident in their findings by checking the qualitative result against quantitative methods or vice versa. Further, the usage of various methods for the process of studying the same phenomenon should provide a greater reliability and validity more than using single methodological approach.

As a result of the previous discussion, it is necessary for this study to adopt both approaches, quantitative and qualitative. The research's conceptual framework requires the utilisation of quantitative methods to illustrate the extent of the defined principles, which are applied as well as allowing the achievement of its dimensions through a consistent measurement. Quantitative methods are used to describe and measure the context of KSA's construction sector. By investigating the reasons behind project to falter in the KSA, including relationships and patterns across the KSA's construction organisations. Qualitative methods are used as a means of gaining a deeper understanding of the meaning attached to KM and PMO by understanding relevant concepts, functions, and impact on organisational performance. Qualitative methods aim to capture perspectives, definitions, and common aspects of both KM and PMO. The questionnaire method will deal with what questions such as; investigating the practices of PM and KM in the KSA? And issues involved about the usage of PMO and KM to evaluate its adoption and effectiveness? While the interviewees should provide in-depth details and answer about the how questions for example; how does KM practices can fit and flow through the presence of PMO? as well as how do the KSA construction firms address the needs and success factors of applying KM?

5.2.5 Data Collection and Analysis Methods

Saunders et al. (2009), Alhamoudi (2010), and Gill and Johnson (2010) emphasize the two distinct types of collecting data, which are usually used by the researchers, namely primary and secondary data. However, the primary data will be discussed and evaluated in the following sections for their applicability to this research:

5.2.5.1 Secondary Data

There is already data in some forms, which can be found in one of the following common sources but not limited to: books, articles, company material, and Internet sources. Secondary data can be classified into three main categories. Firstly, is documentary secondary data, which based on written documents for example journals, books, reports, or as unwritten documents such as pictures, drawing, video recordings, and films. Secondly, is survey-based of secondary data, which is already collected by other researchers. Thirdly, multiple- source secondary data that based on the combination of the previous types (Yin, 2009). The secondary data is known as a historical and do not require access to subject or respondent due to it is already assembled.

5.2.5.2 Primary Data

It can be collected to fulfil the goals of the research and it is yet to be collected. Researchers are gathering primary data on their own to achieve a specific purpose in mind. Brac (2008) asserted that there are several possible methods of data collection are available for the survey strategy, for instance; interviews, questionnaires, and participant observation. However, Saunders et al., (2009) illustrated that there is no single best way for collecting data as it depends on the research nature and the findings that the researcher seeks to.

5.2.6 Research Ethics

Ethics can be defined as the norms, standards, and protection of conducting a research study. Ethical considerations are important in determining the behaviors of participants. The differences between the acceptable and unacceptable approach can be assessed through the process of ethical consideration before conducting the research (Gill and Johnson, 2010). This

research is adopted the following approach to ensure the informed consent from anyone involved in the study is in place; as follows:

- 1- In the first phase of the study (Questionnaires): The research participant will be given a minimum of 48 hours to consider their involvement in the research study after receiving the Participant Invitation Letter and Participant Information Sheet. Participants will then be sent the formal questionnaire via email with a web-link to the electronic survey. The survey will at the point of opening present with participant with a further information sheet and the consent questions. The participant should be given a minimum of two weeks to fill up the survey only once, but they can edit it at any time until the end of the time has been given.
- 2- In the second phase of the study (Interviews): The participant of the research will be given a minimum of five working days to consider their involvement in the research study after receiving the Participant Invitation Letter. Once they have agreed, they will be invited to sign the consent form, and proposed a date and time to conduct the interview to be agreed.

However, this study will follow the following aspects to address any data protection issues, which will be provided in detail as in appendix A-E-F-G (see page 493).

- 1- All the research participants in the study will be given a research code, known only to the researcher to ensure that their identity remains anonymous and confidential.
- 2- All Names and contact details of research participants should be stored on a password protected anticipated computer, accessed only by the researcher.
- 3- All the data collected such as questionnaires, interview recordings, transcripts, will be anonymous and coded, hard paper copies of data, including consent forms will be stored in a locked filing cabinet within a locked room, accessed only by the researcher.
- 4- Data will be stored and archived for a minimum of 3 years after the degree is awarded to allow verification of data from external sources if necessary.
- 5- All data will be securely delated/ shredded as confidential waste.

5.3 Research Implementation

5.3.1 Phase one: Questionnaire Survey

McDaniel and Gates (2002), Collies and Hussey (2003) and Saunders et al. (2009) define the questionnaire survey as a set of questions that are designed in order to generate the necessary evidence for the research to deal with the research objectives. This method is proposed to gather data, when other types of methods might cause some issues such as: the questions type seems to be sensitive or confidential to the respondents or they might need more time to consider their answers. The questionnaire method is usually cheap as it is easy to access a large amount of data from different people.

There are two types of question: firstly, in closed-ended questions there is a set of possible answers that are offered to respondents for ticking the suitable answers based on their views. The respondents are limited to one of the pre-coded answers given in advance. Secondly, open-ended questions do not constrain possible types of responses and allow the respondents to write their own views. However, lots of people's answers will produce different answers, which can be difficult to analyse and might require more time (Mathers et al., 2009). The analysing process in using closed questions can be straightforward, which is considered in this research.

5.3.1.1 Sample Population and Response Rate

According to the National Anti-Corruption Commission (NACC, 2016), there are around 500 large contracting or construction companies in the KSA. Since this is an official statistic from the KSA government, the population size will be 500. Saunders et al. (2016:281) suggest that the margin of error = 5% and the confidence level to be used is 97%. The estimated response rate is assumed to be between 20% - 30% and the average response rate as represented by 25% = 340 (the sample size) * 0.25, which is equal to 85, should be returned. This research will work to maximise the response rate by considering the following aspects by Fink (2013):

- Give your questionnaire a short and meaningful title.
- Begin by introducing yourself and the purpose of your research.
- Keep it as short and succinct as possible.
- Offer incentives for responding, if appropriate.
- Make it look attractive, e.g. use colour and images.

5.3.1.2 Sample Size and questionnaire design

As the population seems to be large and there are concerns about the time and money to be spent, NHS (2009) and Fink (2013) suggested the random sample. This can reduce the participants' number without biasing the results in any way. The random sample can support the hypotheses of this research, in that people hold knowledge and knowledge is created at every phase of a project. If captured, this knowledge can flow seamlessly through the organisation, and can be promoted through PMO. The random sample will be distributed equally to two groups (Head Office group and Project Site group) and every individual in the population might be selected.

The electronic mail surveys are used as a method of collecting the survey data. Tuten et al. (2009) and Yin (2009) describe the benefits of using electronic mail surveys as gaining high response rates; they reach more people in multiple time zones and can be used to tight deadlines. The information about the survey will be sent electronically to participants via email addresses and the questionnaires will be sent through BoS survey software. Individual participants can read, answer, and replay or send the completed survey through the BoS program. This research allows the participants who do not want to answer online to print out the survey and answer it like a paper questionnaire paper, before mailing it back to the researcher.

5.3.1.3 Pre-Test the Questionnaires

The questionnaires will be sent to a number of 10 qualified people to pre-test and pilot it before conducting the actual study. However, Saunders at al., (2009) and Gill and Johnson (2010) suggest Pretesting the questionnaire can help to improve and determine the strengths and weaknesses by concerning question format, wording and order. It is also used to measure the quality of question and understand whether question gathers intended information or not. Therefore, some criteria are proposed in testing the questionnaires as provided in appendix D.

5.3.1.4 Data Analysis

The analysis of the collected data will be analysed statistically and then make a comparison between the two groups. The survey questionnaires will be distributed equally to two groups namely; project-based group and office-based group. The respondent's positions in the organisations will be selected as: PMO Leader, PMO Administration, Project Managers and Head of Departments, Operators (Engineers and Staff). Statistics programs such as SPSS are considered to facilitate the analysis method. However, statistical analysis used in this research illustrates the data in a numerical value, which is computed from the sample to describe the mean and makes inferences about the population. The questionnaire method will deal with questions such as investigating the reasons of project to falter and abandoned in the KSA and issues involving the usage of PMO to improve business performances. This can be seen in more detail later in the analysis of questionnaires chapter six.

However, the adoption of questionnaires alone will cause some issues to arise, such as: when the response rate is low, the completion of questionnaires cannot be controlled, the accuracy for checking the answers is low when sent to inappropriate people, and the question styles are not always easy to read (Gillham, 2000; Neuman, 2004). However, to overcome these issues, the in-depth interview is used as a second phase in this study to be complemented using the quantitative method in order to check for some issues that not covered.

5.3.2 Phase two: Personal Interview

The interview is described as a qualitative approach, which is employed to collect a detailed and rich set of data (Saunders et. al., 2009). Punch (2009) explained the interview method as an action to involve a personal contact between the interviewer and the interviewee. The majority of researchers (Collis and Hussey, 2003; Punch, 2009; Yin, 2009) propose that this type of method should be linked to the questionnaire surveys. This is because the role of the interviews can confirm and emphasize the findings of the questionnaires. This method is useful to find out aspects that questionnaires cannot convey. Interviews can give much more in-depth data. The interview is described as a qualitative approach, which is employed to collect a detailed and rich set of data (Saunders et. al., 2009; Punch, 2009).

The purpose is to not to look for answers such as yes or no, or even maybe, but instead to encourage the interviewees to produce rich descriptions. However, the role of the interviewer is to guide and enhance the participation of respondent in answering different questions and to clarify the meaning of the interview. This method is usually more expensive than other methods and can be complex when the respondent is talking about personal interests. Mathers at al., (2009) suggested that personal interview is preferable for:

- when the subject matter is very sensitive, but not personal
- if the questions to be coded are very complex
- if the interview is likely to be lengthy

5.3.2.1 Semi Structured Interview Design

The interviewees should receive initial contact by letter, which should explain the aim of the research, the purpose of the interview, and privacy protection. The interviews will be recorded and fully transcribed to avoid any losses of the information being given. The face-to-face interviews are selected to conduct in-depth interviews. Semi-structured face-to-face interviews are to be considered. Teiglingen (2014) defines this as a set of predetermined questions, but it seems to be flexible in terms of modifying the order, changing the wording of questions, and explaining inappropriate questions or the interview's perception. Sixteen personal interviews will be conducted and distributed to four main levels that representing different maturity levels of PMO as discussed in chapter four. Using the whole population for every research study would be superlative. To include every subject of the population is not possible due to the population size and time constraints. However, convenience sampling is used in this research study to represent and reflect on the whole population. Battaglia (2008) and Cresswell and Clark (2011) define convenience sampling as a type of non-random or non-probability sampling technique. The criteria used for the selection of interviewees will be discussed in more details later in the analysis of the interview chapter seven.

5.3.2.2 Data Analysis

The analysis process resulting from the interviews will take the qualitative approach of thematic analysis. Braun and Clarke (2006) propose thematic analysis as a method to identify, analyse, and report themes through the data. The data collected will be analysed by considering

Braun and Clarke (2006) and Creswell's (2007) three-stage procedure: to prepare the collected data for analysis by transcription, using themes to reduce the data through the coding process, and then representing the data. The different themes can be accessed through data familiarisation by a rigorous process, the coding of data, and the revision and development of themes. The NVivo software is selected to facilitate and organise the interviews analysis to increase efficiency and save time. The interviewees should provide in-depth details and answers about the 'how' questions, for example: how does KM practice fit and flow through the presence of PMO? How do the KSA's construction firms address the needs and success factors of applying KM? The following aspects will be covered and tested via the interviews:

- The KM Maturity Levels through the PMO
- KM and its relative to PMO
- The PMO work to support KM
- Knowledge Management on PMO's perspective
- Make KM work in PMO
- The support of PMO to overcome the PMs challenges
- The role of PMO and KM in the management of construction projects
- The benefits of PMO for the Knowledge Management

The data collection and analysis methods of first and second phases can be summarised in figure 5.4:

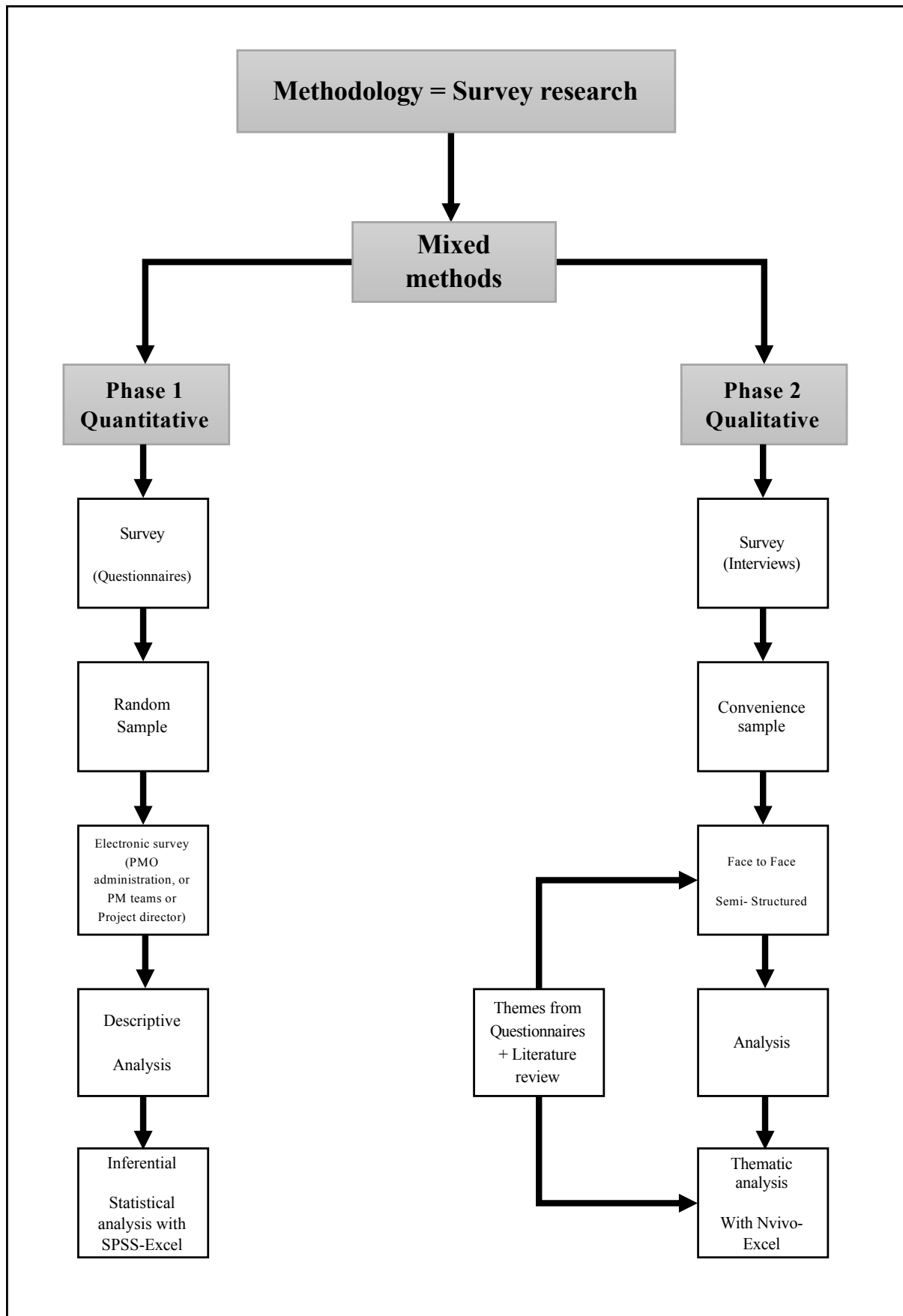


Figure 5.4: Data collection and analysis methods

5.4 Research Design

The main purpose of this section is to provide the research design. The research design will begin by illustrating the triangulation processes and then move to highlight the strategies associated with the approach of mixed methods. A mixed methods approach can be classified into different strategies that suit different types of research. The identification of such criteria should be in place to select the appropriate strategy. Lastly, the data collection and analysis procedures for mixed methods will be briefly discussed.

5.4.1 Triangulation

Olsen (2004) defined triangulation as the mixing of methods or even data, which is often used to support and assist in the validation that might arise by relying on one method. However, it is generally known that triangulation can help to minimise the bias that might be encountered in a particular study. In addition to the potential bias of sampling, there is the potential issue of the researcher being unable to cover the entire population sample. Kennedy (2009) proposed triangulation to combine different methods to increase the strength of relying on findings and to ensure reliable outcomes. Further, Kennedy (2009) confirms that triangulation can achieve full explanation and map out the richness of findings by attempting to study the problem from more than one perspective. Mertens and Biber (2012) argue that the validation of data not the only can can be performed by triangulation, but it contributes to deliver deeper understanding for both methods as well as acting to enhance innovation while framing the conceptual framework. Based upon the overlapping between methods, triangulation can be appropriate for balancing each method out and providing a richer outcome.

This research employs triangulation to combine the three data sources explored, namely: the literature review, questionnaires, and Interviews. Each source of data is used in this study to provide a philosophical starting basis. Figure 5.5 illustrates how these three sources were triangulated and their sequences:

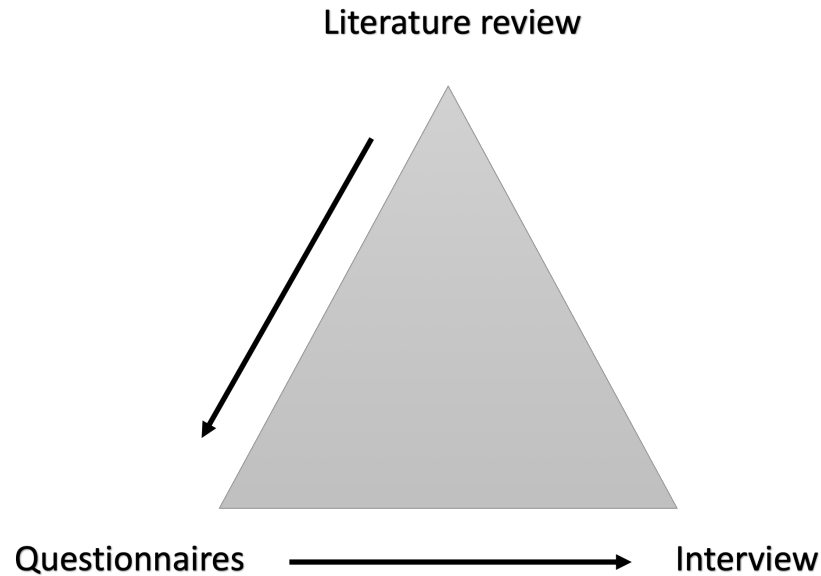


Figure 5.5: Triangulation stages

The secondary data have been identified through the literature review. The type of questions and important features for designing the questionnaires were formulated from the findings of literature review. Otherwise, the collection and analysis of the first phase (Questionnaires) were used to inform and formulate the types of questions employed for the second phase (Interviews).

5.4.2 Types of mixed methods strategies

The strategies associated with the approach of mixed methods have been discussed extensively by Creswell (2015), who categorises them in terms of sequential, concurrent, and transformative procedures. Further, Creswell (2015) divides the sequential procedure into two main strategies. Firstly, the Sequential Explanatory Strategy is characterised by the collection and analysis of quantitative method followed by the collection and analysis of qualitative method. This approach seems to be the most straightforward. Although as this approach fall into clear and separate phases. This might be easy to implement, describe, and report. Secondly, the Sequential Exploratory Strategy, which seems to be similar to the previous one but with the priority mostly given to the first stage. The qualitative method goes first and is followed by the quantitative method. However, the Sequential approach has some disadvantages as it can be time consuming to conduct two separated phases which take longer than other major mixed methods approaches.

Otherwise, Concurrent procedures require researchers to collect and analyse both methods at the same time. This is in order to make a comprehensive measurement for the research problem whereas the transformative procedures, which contain both methods but the processes of collecting data might involve the previous procedures whether the approach of Sequential or Concurrent.

5.4.3 Criteria for choosing a mixed method strategy

Due to the nature of mixed methods approach being classified into different strategies to suit different types of research, the identification of such criteria should be in place to select the appropriate strategy. Tashakkori and Teddlie (2003) define four decisions that need to be addressed before choosing a strategy. Firstly, it is important to define the sequence of both methods. Secondly, it is necessary to clarify the priority to be given for one method or weight should be given for both methods to confirm the utilisation of equal priority. Thirdly, it is important to explain how the appropriate integration will take place at which stage. Fourthly, it is necessary to identify if there is an overall theoretical perspective used in the study.

Further to this, Creswell (2015) discusses three main criteria that need to be addressed, namely; Priority, Integration, and Implementation. The level of interaction between the two strands in this research is interactive. The integration will occur after the data analysis of each phase. In this case, the qualitative analysis should provide a better understanding of the research problem and potential solutions. The design of the qualitative study is based on what is learned from the quantitative results. The research will collect both quantitative and qualitative data in separate phases, following the Sequential procedure. The quantitative method will come first and will be followed up with the qualitative, which is known as a Sequential Explanatory Strategy.

5.4.4 Sequential Explanatory Strategy

The sequential explanatory as a strategy has been selected as an appropriate type of mixed method strategies. This is a useful strategy to expand on the outcome of one method with another. This study involved two phases that began by conducting a quantitative method to test

and confirm the concepts, theories, and factors found in the literature review, which are presented in the theoretical framework. The second phase follows up with a qualitative method that provides a more detailed exploration with a number of interviews.

The purpose of these two phases represented by the sequential mixed methods strategy is to obtain statistical, quantitative results from a random sample and then follow this up with individual interviews to explore the results in more depth (Creswell, 2015). Specifically, in the first phase, quantitative research questions will investigate the KSA's context to evaluate the current practices and to address the needs of the PMO and its relationship with KM within construction firms. In the second phase, qualitative interviews will be used to probe significant KM processes, types, and components by exploring aspects of the PMO to support and encourage KM at different maturity levels.

As a result, this research follows the four main procedures suggested by Creswell (2015), as highlighted in figure 5.6. First, to conduct and analyse the quantitative data. Second, to determine what factors need to be further explored in qualitative method. Third, to collect and analyse the qualitative data to assist in explaining and supporting the quantitative findings. Fourth, to draw inferences between both methods to properly addressing the research objectives. The rationale of combining these quantitative and qualitative methods are to better understand the research problem by triangulating both broad numeric trends by conducting quantitative approach and then follow up with the details of conducting qualitative data. The research questions of this approach might be, how the analysis of first phase (quantitative results) can be explained by the analysis of second phase (qualitative results)? Figure 5.6 illustrates the procedures that the research will adopt in implementing this strategy, as follows:

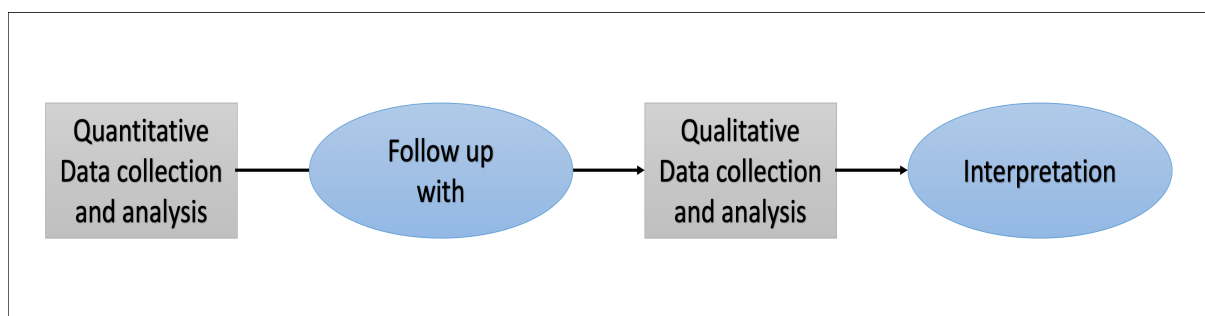


Figure 5.6: Mixed methods procedures adapted based on (Creswell, 2015)

5.4.5 Data collection and analysis procedures for mixed methods

The data collection procedures used to identify the strategies of sampling and the approaches that this research uses to validate the data will be discussed largely in chapter six and seven. To briefly summarise here, random sampling is used in the quantitative data collection and there is an equal probability for each individual to be selected in this sample. In the collection of qualitative data, convince sampling is applied based upon the selection of experienced people regarding the central phenomenon.

The data analysis will be discussed in detail in the analysis chapters. At this stage, the research in analysing quantitative data will be divided into descriptive and inferential analysis approaches. Qualitative data will be used at the beginning descriptive analysis to represent thematical maps and then followed by analysing the differentiations that occurred between different maturity levels of PMO.

5.5 Concluding Chapter Five

The reasons behind this research to select the mixed method approach is to address the following aspects. Firstly, the initial results of the first phase (Questionnaires) needs to be further explained as the utilisation of this method alone is insufficient to investigate deeply in answering all research questions. Secondly, applying the second phase (Personal Interviews) is needed to enhance and investigate aspects that cannot be covered in the first phase, as the implementation of KM will be discussed regarding the different maturity levels of PMO, which requires a specialist knowledge of these procedures. However, relying only on the qualitative method is limited because it can be hard to generalize a small sample of individuals to a large population. Therefore, the presence of one method cannot cover all of the factors identified in the literature review, whereas the combination of both methods will provide a good rational for the research.

This study assumes the constructivism ontology about the existence of truth. As such, this philosophy suggests that different truths will be observed by different people with different backgrounds, interests, and experiences. This can provide evidence by considering these

different perspectives through the analysis of data such as quotes and themes. The continuing state of revision is a key factor of constructivism, which is suitable to deal with the differences that might arise between the theoretical framework and methodology. It seems to be an inductive approach as this research needs to understand people's opinions while building the theory.

In terms of epistemological foundations, this research will follow the philosophy of Interpretivism. This study is working to gather facts to gain the knowledge by understanding the different opinions from the subject's point of view. This understanding includes the subjective nature of the existence of people's knowledge and how it can be interpreted into social actions for achieving the company's objectives. This research is following this philosophy in case the social world requires the use of various methods to deal with the study of people rather than the study of objects. The contribution of knowledge will emerge from the meaningful thinking of people about the phenomena being studied in this research. Interpretivism philosophy should allow this study to understand, explore, and explain the reality of providing PMO to encourage KM.

The value-laden nature of axiological foundations is selected in this study. The amount of value of others that can be put into this research attaches value to the knowledge. This position assumes that there are multiple realities, which is appropriate for this research to see the value placed on knowledge. The attempt of this research is to evaluate the relevance of the theoretical framework within the specific empirical context. The research will use the inductive approach for building its theory. The researcher will collect data and develop a theory based on the analysis of data. This allows the researcher to gain an understanding of the nature of the problem through a close understanding of the context of the research. The model can be modified as a result of emerging data.

Surveys can be accessed by participants to cover geographically spread samples, such as postal questionnaires and telephone interviews. Surveys can be flexible and as such are easily combined with other methods, for instance the in-depth interview. However, the limitations of this approach are noted by the lack of explaining why respondents act, think, behave, and are satisfied or dissatisfied. Qualitative research gained from in-depth interviews can answer 'why' questions in more detail. The objectives of the study are to look at the impact of PMO and KM

in terms of their potential to overcome the reasons behind projects faltering and being abandoned in the KSA. The collection of large amounts of data should be considered to satisfy the findings of the study.

As a result of the previous discussion in this chapter, it is necessary for this study to adopt both approaches, quantitative and qualitative. The research's conceptual framework requires the utilisation of quantitative methods to illustrate the extent of the defined principles, which are applied as well as allowing the achievement of its dimensions through a consistent measurement. Quantitative methods are used to describe and measure the context of KSA's construction sector by investigating the reasons behind projects faltering in the KSA, including relationships and patterns across the KSA's construction organisations. Qualitative methods are used as a means of gaining a deeper understanding of the meaning attached to KM and PMO by understanding relevant concepts, functions, and impact on organisational performance. Qualitative methods aim to capture perspectives, definitions, and common aspects of both KM and PMO. The questionnaire method will deal with what questions that investigate the practices of PM and KM in the KSA and issues involving the usage of the PMO and KM. By contrast, the interviewees should provide in-depth details and answers about how KM practices can fit and flow through the presence of PMO as well as how KSA construction firms can address the needs and success factors of applying KM.

However, this research uses triangulation to combine the three data sources, namely: the literature review, the Questionnaire, and the Interviews. Each source of data is used in this study to provide a philosophical starting basis. The secondary data have been identified throughout the literature review. The type of questions and important features for designing the questionnaires were formulated from the findings of literature review. Otherwise, the collection and analysis of the first phase (Questionnaires) were used to inform and formulate the types of questions for the second phase (Interviews). As a result, the rationale of combining both of these quantitative and qualitative methods could be to better understand the research problem by triangulating both broad numeric trends and by conducting a quantitative approach and follow up with the details of qualitative data. Figure 5.7 is provided to summarise the structure and stages of the research design, as follows:

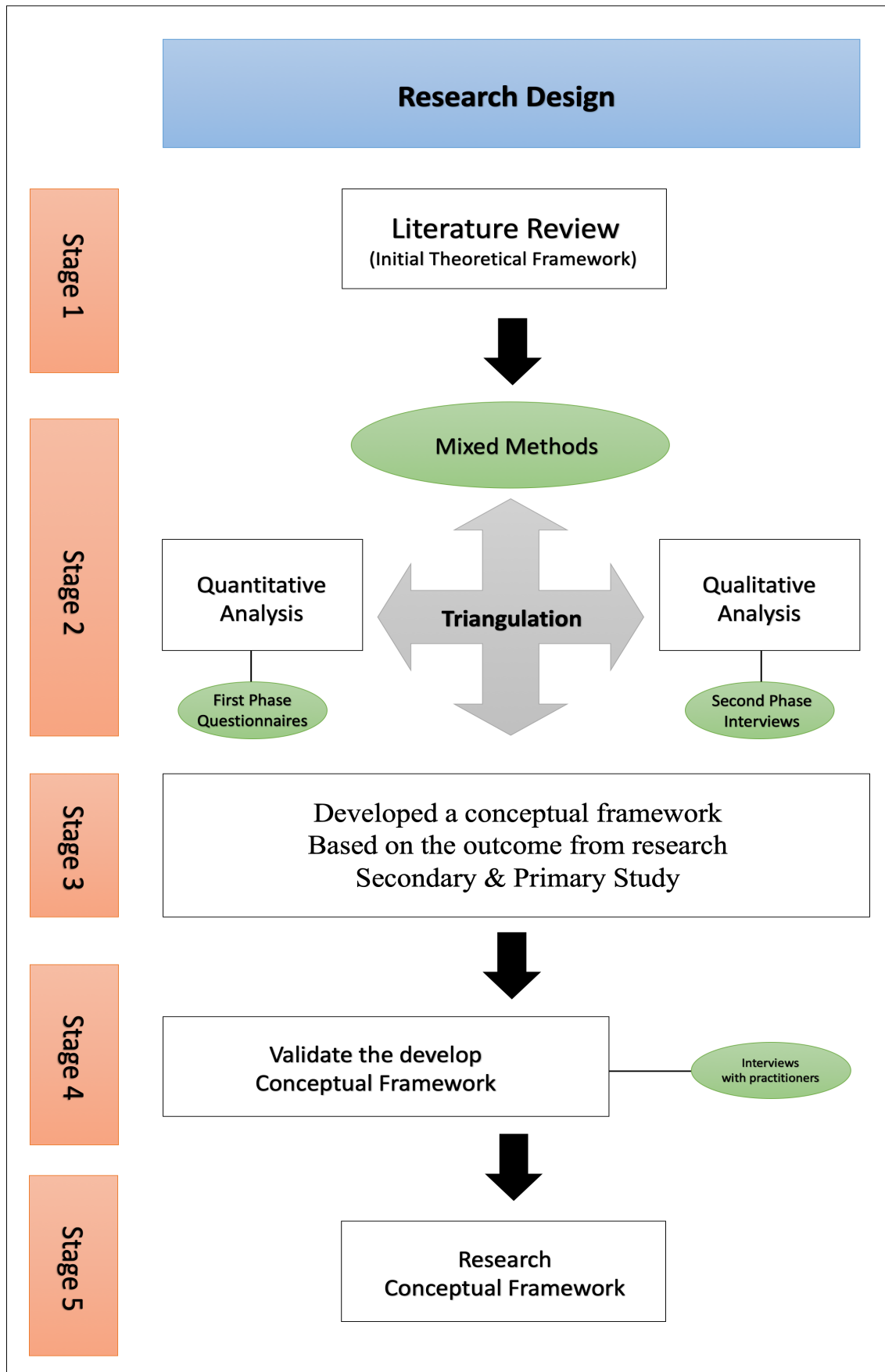


Figure 5.7: The structure and stages of the research design

Chapter Six:

Analysis of Quantitative Data (Questionnaires)

6.1 Introduction (Mapping the State of the Art)

This chapter outlines the analysis of collected data obtained from different organisations in the KSA to describe and explore what is happening in the KSA's construction sector. It will also outline the contribution of this data to the research aim and objectives of the project. The findings from the literature review, as presented in the theoretical framework introduced in chapter four, were investigated by using a wider questionnaire survey for which a more representative sample was drawn from the population. Specifically, this chapter will consider the following aspects:

- Biographical questions to support analysis
- Evaluating the difficulties and challenges of the KSA's construction sector
- Evaluating the use and success factors of PMOs in improving business performance
- Evaluating the current functions of PMOs
- Evaluating the establishment processes of PMOs
- Evaluating the existence of the PMO
- The evaluation of KM processes
- The evaluation of KM components and perspectives necessary for its implementation

6.1.1 Data Analysis Framework and Statistical Testing

According to Fellows and Liu (2008), statistics can be classified into two different ways; descriptively or inferentially. This chapter will be divided into two main sections. Firstly, it will offer a descriptive analysis to provide simple descriptive tests to generate a range of tables and charts. The second section will offer an inferential analysis, highlighting the potential relationships between variables and groups. Figure (6.1) explains the data analysis processes, as suggested by Pallant (2016), which can be applied to structure both sections; as follows:

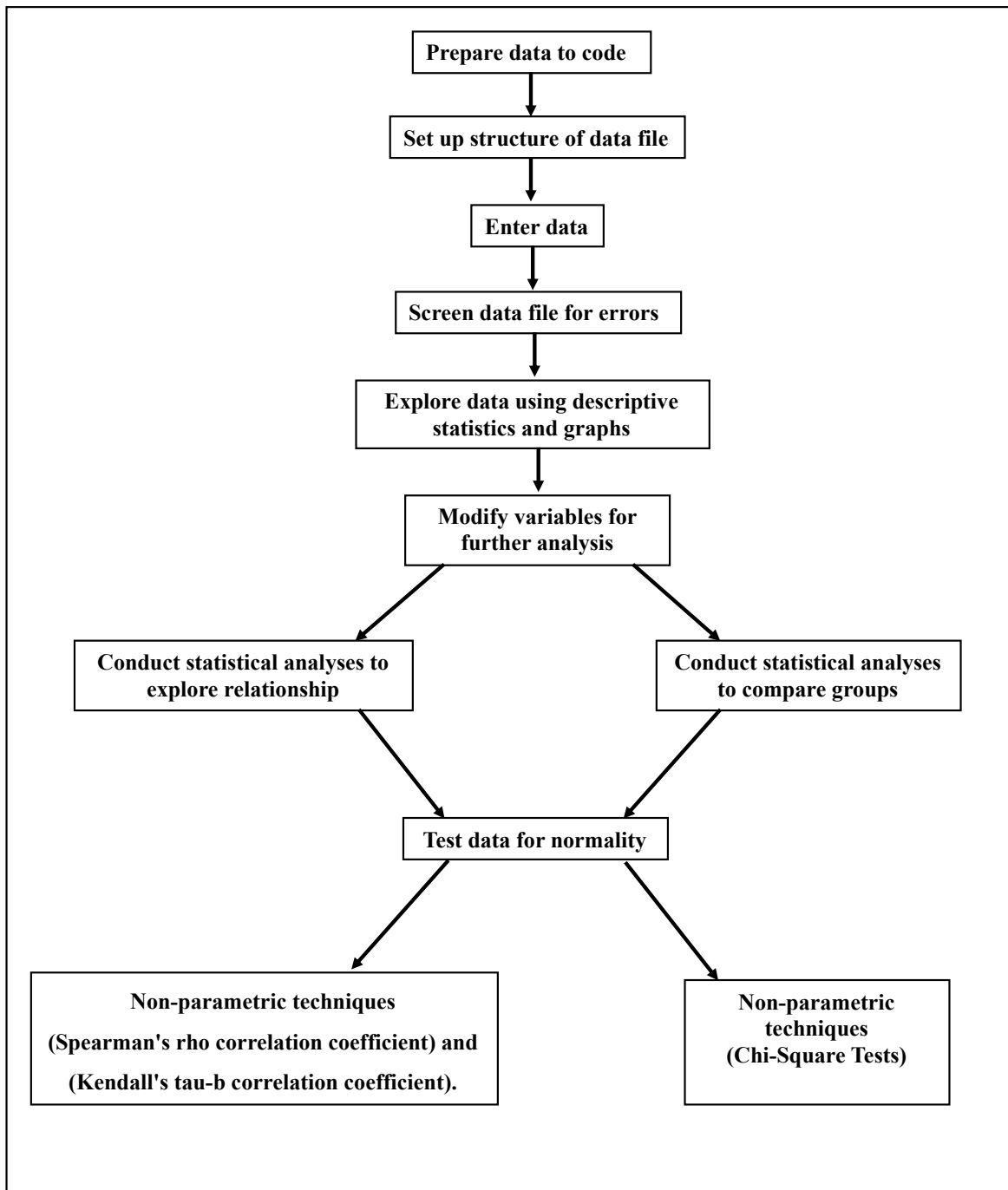


Figure 6.1: Flow chart of data analysis process adapted from Pallant (2016)

The descriptive analysis of the questionnaires has been divided into three sections: The first section comprises of 21 biographical questions to support the subsequent analysis. The second section evaluates what is happening currently in the KSA's construction sector, exploring problems but also success factors in the function, establishment, and usage of PMOs. It will explore the willingness to use PMOs and individual views on PMOs and KM. The third section is related to the evaluation of KM processes, components, and the necessary perspectives for

its adoption. Inferential analysis is used to draw a conclusion representing the wider population, by exploring the relationships among variables and between groups. A number of 14 hypotheses have been established to evaluate whether observed similarities or differences between the selected groups is dependent on each other or might not and happen by chance. To appraise the data's suitability, different types of tests were used to determine normality such as, the Skewness test as a measure of the asymmetry for the distribution, the Shapiro-Wilk test, and the Kolmogorov-Smirnoff test, and the plot in the corresponding Q-Q-plots. Based on their outcomes, the non-parametric test was selected, and three different tests were used, namely; Chi-Square Tests, Spearman's rho correlation coefficient, and Kendall's tau-b correlation coefficient (see later discussion in section 6.3.2).

6.1.2 Respondent Characteristics

As proposed in chapter four, the data was collected randomly from medium to large organisations from multiple locations in the KSA. The survey questionnaires have been distributed equally to two groups, namely; project-based groups and office-based groups. A number of 340 of questionnaires were distributed to employees from different positions under these two groups. The respondent's positions in the organisations were various and included the following positions: PMO Leader, PMO Administration, Project Managers and Head of Departments, Operators (Engineers and Staff). A response rate of 25.5% was achieved, with 86 surveys returned which could be counted as a usable completed questionnaire. This response rate is acceptable and is in line with the normal response rate for postal questionnaires in the construction industry of between 20-30 percent, as outlined by Akintoye (2000). The table 6.1 illustrates the returned questionnaire and response rate from both groups:

Group	Distributed	Returned Questionnaires				Response rate	
		Un usable	%	Usable	%	Response Per group	Response Rate
Project based	170	2	3.4%	44	96.6%	51.2%	26%
Office based	170	0	0%	42	100%	48.8%	25%
Total	340	2	3.4%	86	96.6%	100%	25.5%

Table 6.1: Research selected groups and their percentages

The BoS survey program, Microsoft Excel, and SPSS IBM software were used to distribute and analyse the data. The statistical analysis was used to describe the percentages, frequencies, mean, variance, standard deviation, and the lower and upper quartile. The coding framework provided by Farrell (2011: 84) was used to facilitate the analysis. Therefore, each question of the questionnaire was coded. The data collection period was completed within 12 weeks, beginning from May 2017 to the end of July. The line chart below is used to illustrate the progress of returned questions. It is obvious the work level has been increased regularly until the completion date; as illustrated in figure 6.2:

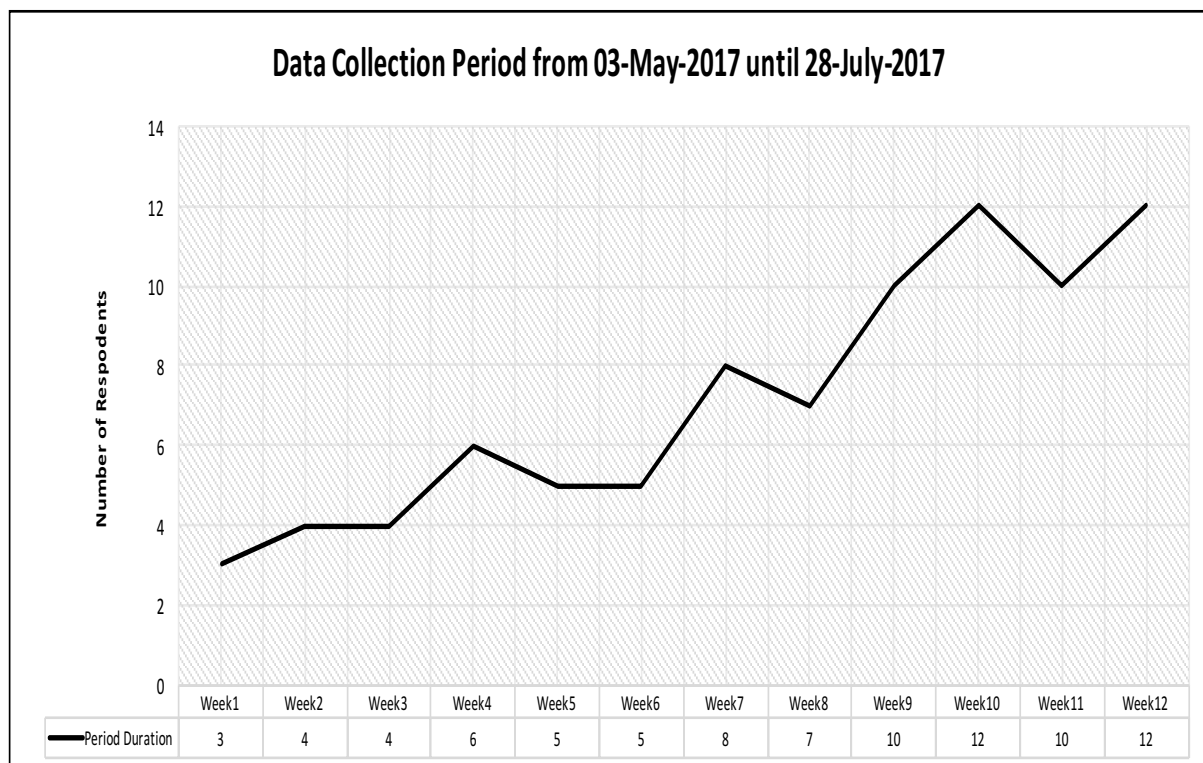


Figure 6.2: Data collection period

6.2 Survey Results

The initial findings from the descriptive analysis are presented in this section, which will outline the key findings of each question. An inferential statistical analysis of the findings is provided in section 6.3. At the end of each section, an overview is provided to summarise the main results. The questionnaire was sent to ten qualified people to pre-test before conducting the actual study, as illustrated in the methodology (see chapter 5). The descriptive analysis of the questionnaires has been divided into three sections: The first section comprises of 21

biographical questions to support the subsequent analysis. The second section evaluates what is happening currently in the KSA’s construction market, exploring problems but also success factors in the function, establishment, and usage of PMOs. It will explore the willingness to use PMOs and individual views on PMOs and KM. The third section is related to the evaluation of KM processes, components, and the necessary perspectives for its adoption. The questionnaires format was placed at appendix B (see page 496).

6.2.1 Biographical questions to support analysis (Questions 1-21)

Question 1: Gender of Participant

It is apparent from this table that very few females participated in this survey. Men comprised 95.3% of the respondents, with only 4.7% being women. According to Alroilay (2017), the proportion of women in the private sector does not exceed 15% in the KSA. This table (6.2) is quite revealing in several ways. Firstly, unlike the other results in this survey, there was a significant disparity in the proportion of men and women working in the construction sector in KSA. Secondly, as expected, males are more likely to be working in construction sector as the KSA’s culture has not traditionally encouraged female participation in this sector. Yet, there are many social and governmental policies supporting women to find jobs in various sectors.

Gender of Participant				
Factors	Frequency	Percent	Valid Percent	Cumulative Percent
Male	82	95.3	95.3	95.3
Female	4	4.7	4.7	100.0
Total	86	100.0	100.0	

Table 6.2: Gender of Participant

Question 2: Age of Participant

From the data in table 6.3, it is apparent that the average age of survey respondent is between 31-40 years, with percentages of 47.7. Group of ages between 31-40 and 41-50 years represent the highest percent of nearly 48% and 22% respectively. This can be compared later with question seven that explores how many years of experience respondents have working in the sector.

Age of Participant				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Under 30 years	13	15.1	15.1	15.1
31-40 years	41	47.7	47.7	62.8
41-50 years	19	22.1	22.1	84.9
51-60 years	12	14.0	14.0	98.8
Over 60 years	1	1.2	1.2	100.0
Total	86	100.0	100.0	

Table 6.3: Age of Participant

Question 3: Nationality of Participant

As mentioned earlier in the literature review, the biggest challenge currently facing the KSA's construction firms is the introduction of immigration controls in 2012, which state that only a maximum of 50% of employees can originate from outside the KSA (Diry, 2012; Alsahli, 2013). Given that most Project Management staff are either European or American citizens, this, together with the temporary and transient nature of construction projects, is causing a significant challenge to most medium to large construction firms operating in the KSA. As a result, the KSA's construction firms are now facing a skills and knowledge drain as Project

Management staff leave both the organisation and country (Deemah, 2014; Halwah, 2013; Majmah, 2013). Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival. Figure (6.3) presents the breakdown of participants according to their nationality. What is interesting in this data is that almost 69% of participants were foreign workers, which suggests that substantial changes will have to be made to meet the new immigration policy; 19% would need to go to local employees. The Arab Citizens (Egyptian-Lebanon..etc.) category was at the highest level with almost 51% whereas the second highest category was the South Asian Citizens (Indian-Pakistani..etc.). European Citizens and East Asian Citizens (Chinese-Japanese..etc.) were the lowest groups.

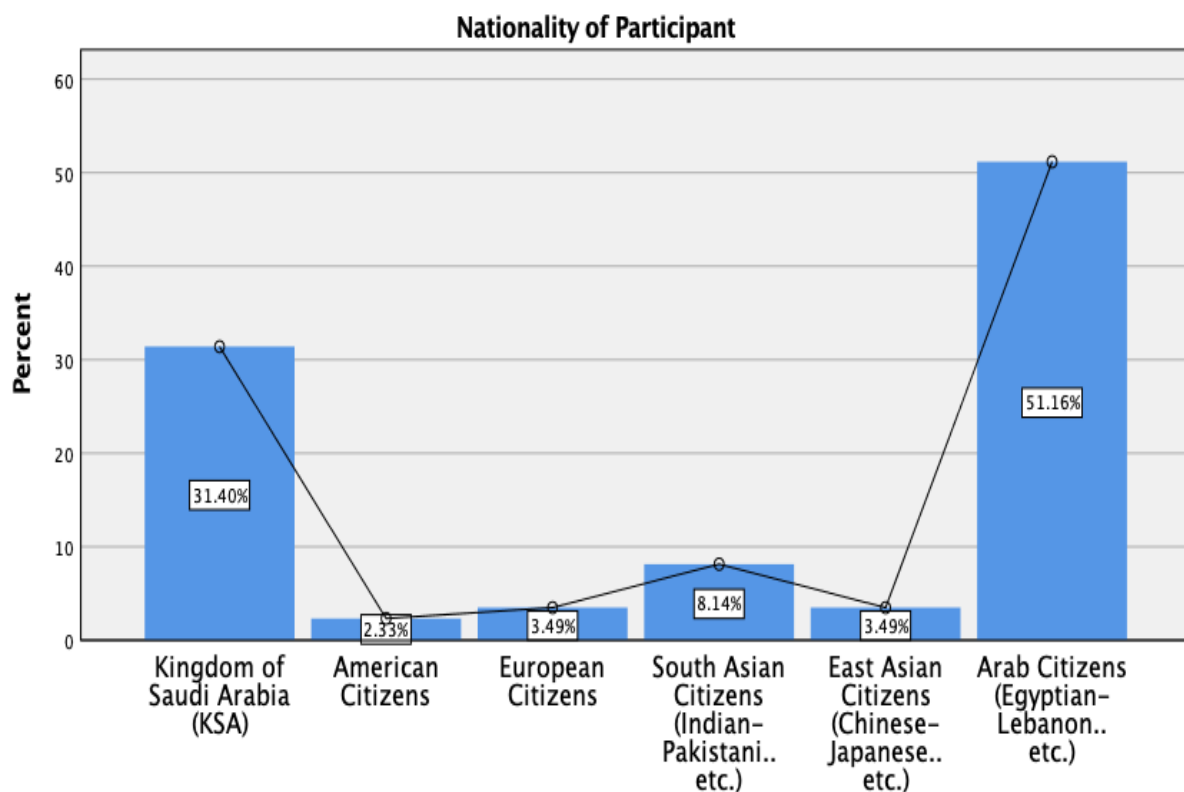


Figure 6.3: Nationality of Participant

Question 4: Highest level of Education

In terms of the education levels of participants outlined, the highest percentage of respondents belonged to those with Bachelor degrees (75.6%) and the lowest percentage comprised of those educated to high school level. Fewer respondents had Masters degree and Doctorates, with percentages of 14% and 2.3% respectively. On comparison with another study conducted in

KSA to determine the percentage of qualifications of Saudis workers who working either in the private sector or the public, which was conducted by General Organisation for Statistics (2016), the results of the survey show that holders of the bachelor's degree are the highest category among all those followed by the diploma below the university by 53%. This study as shown in figure 6.4 can confirm that 75% of respondents were have a bachelor's degree. This can illustrate a greater chance by them to be able to give accurate and appropriate answers to address research issues.

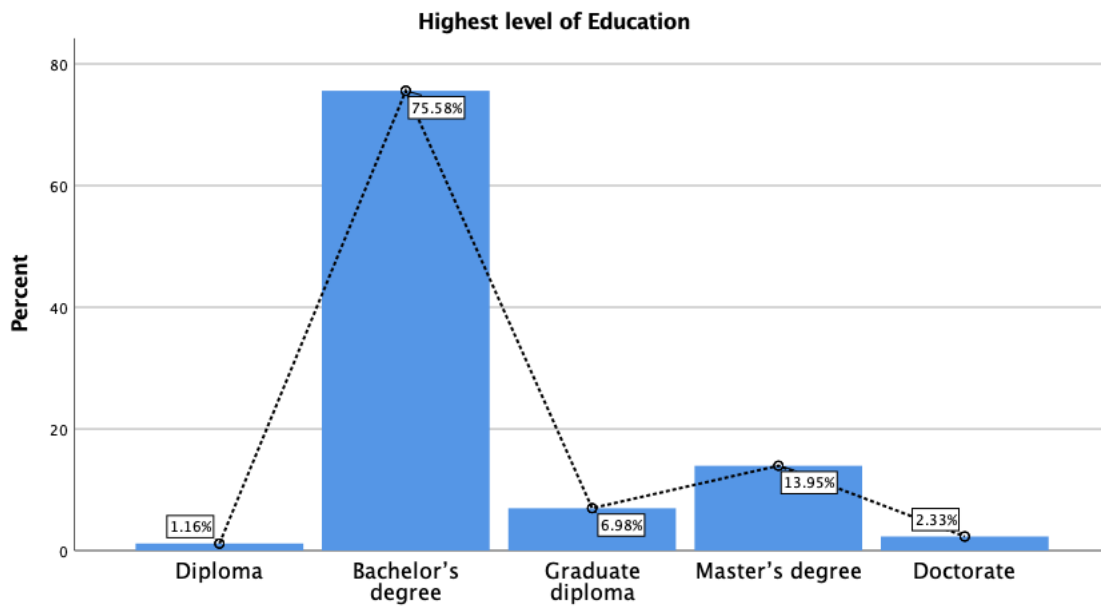


Figure 6.4: Highest level of Education

Question 5: Position in the Organisation

This question sought to appraise the spread of the respondent positions that took part in the survey. This was done to explore the different people working or dealing with different types of PMOs. It can be seen from the data in Table (6.4) that 36% were part of the PMO or Project Management Team group, where around 18% were represented by the Project Manager group. These findings could support the accuracy of findings as they might be familiar with the research directions. Moreover, table (6.5) shows an overview of other respondent positions, with four participants falling in different categories to those outlined in the questionnaire.

Position in the Organisation				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
CEO/President/Chairman	4	4.7	4.7	4.7
Project Manager	16	18.6	18.6	23.3
General Manager	5	5.8	5.8	29.1
Operations Manager	4	4.7	4.7	33.7
Finance/ Accounting Manager	3	3.5	3.5	37.2
Human Resource Manager	6	7.0	7.0	44.2
Engineer	13	15.1	15.1	59.3
PMO or Project Management Team	31	36.0	36.0	95.3
Other	4	4.7	4.7	100.0
Total	86	100.0	100.0	

Table 6.4: Position in the Organisation

Position in the Organisation (Other)				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
	82	95.3	95.3	95.3
Computer Programmer	1	1.2	1.2	96.5
Designer	1	1.2	1.2	97.7
Project Coordinator	1	1.2	1.2	98.8
Quality Supervisor	1	1.2	1.2	100.0
Total	86	100.0	100.0	

Table 6.5: Position in the Organisation (Other)

Question 6: Site (project) based or located in a regional or head office away from the project

An initial objective of the PMO was to coordinate and bridge the gap between projects that conducted at a distance from head office with their top management to achieve the entire organisation's needs. It is apparent from this table (6.6) that very few differences can be seen between the selected two main groups for distributing the data. The position was split into two major groups. The first group consists of employees who are located in a regional or head office away from the execution of projects (48,8%) such as the PMO team (36%) and CEO (4.7%), as presented previously in question five. The second group consists of employees working on the site of projects (51.2%), such as PMs (18.6%) and Engineers (15.1%). The demographic data collected revealed that the majority of the survey respondents were from the office-based group rather than the project-based group. However, as the difference between them is slight, it could be possible to play them against each other later in the inferential analysis to test the relationship among variables.

Site (project) based or located in a regional or head office away from the project				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Project based	44	51.2	51.2	51.2
Office based	42	48.8	48.8	100.0
Total	86	100.0	100.0	

Table 6.6: Site (project) based or located in a regional or head office away from the project

Question 7: Years of General Experience in business

The findings showed that most of respondents had over ten years of experience within the industry, with a percentage of 53.5, while the lowest rate of respondents had less than one year of experience (4.7%). Again, this question was presented to increase the accuracy of responses and to establish that respondents would have sufficient experience in managing projects. This can be related to question number two which analysed the average age of survey respondents as between 31-40 years (47.7%).

Years of Experience				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Less than one year	4	4.7	4.7	4.7
From 1-5 years	13	15.1	15.1	19.8
From 5-10 years	23	26.7	26.7	46.5
Over 10 years	46	53.5	53.5	100.0
Total	86	100.0	100.0	

Table 6.7: Years of Experience

Question 8: Years of Experience in the Construction Industry

Similarly, to the previous question, the data also revealed that 43% of respondents had been working in the construction industry for at least ten years. Surprisingly, the results shown in Figures (6.5) and previous table (6.7) reveal that the number of years increased gradually towards over 10 years of experiences in the construction sector. However, a few of the survey respondents had little experience (less than one year) in the construction industry (6%).

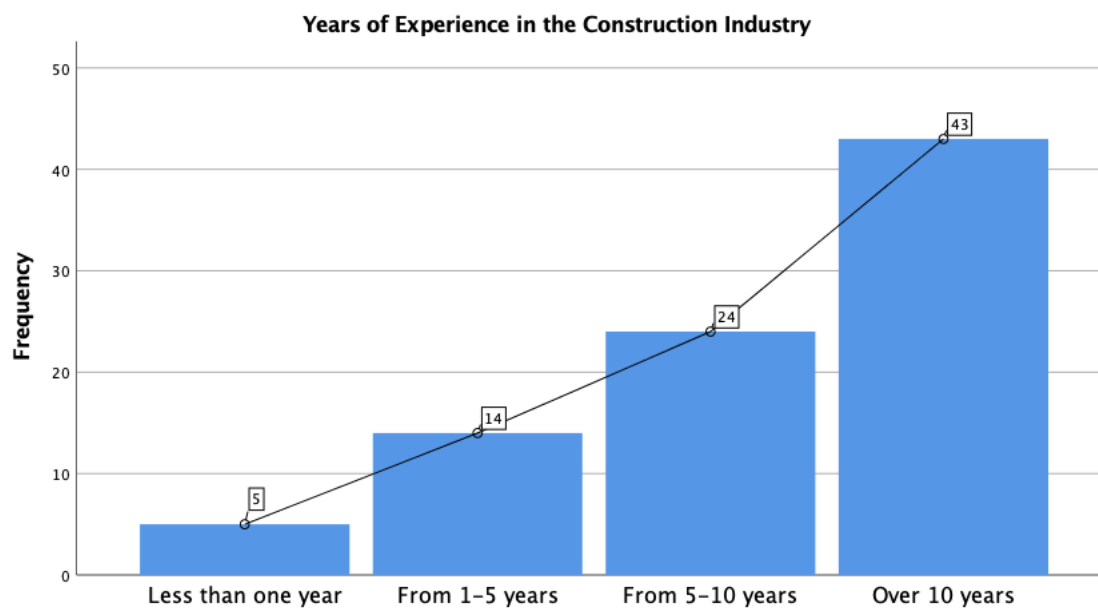


Figure 6.5: Years of Experience in the Construction Industry

Question 9: Thinking about the past 10 years (2007-2017), where you have been working most of the time

It was surprising to find that more than half of the respondents identified that had been working in the KSA for the past 10 years (2007-2017). This result suggests strong evidence of their knowledge and experience; they were important for their organisations to keep them for this period of time. By comparing the highest scored KSA group as almost 74% as in table (6.8) with the remaining groups 26%, it is evident that the KSA’s market is strong enough to retain and attract workers within the construction industry.

Thinking about the past 10 years (2007-2017) where have you been working most of the time				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Kingdom of Saudi Arabia (KSA)	64	74.4	74.4	74.4
American Countries	3	3.5	3.5	77.9
European Countries	3	3.5	3.5	81.4
South Asian Countries (India-Pakistan..etc.)	5	5.8	5.8	87.2
East Asian Countries (China- Japan..etc.)	2	2.3	2.3	89.5
Arab Countries (Egypt - Lebanon..etc.)	9	10.5	10.5	100.0
Total	86	100.0	100.0	

Table 6.8: Thinking about the past 10 years (2007-2017) where have you been working most of the time

Question 10: How long have you been working in that country (relate to Q9)?

This question followed up on question 9 to ascertain whether respondents would prefer to stay longer working in the same location. By asking respondents how long they had been working in different countries, as shown in figure (6.6), 34% of participants had been working in the previous selected country for more than 10 years. A good deal can also be seen with categories

from 5-10 years and from 1-5 years with 26.7% and 24.4 respectively to represent the years of staying in the same country. If this finding is related to the previous question and by comparing the highest scored in both questions, it is possible to conclude that people preferred to stay in the KSA market more than 10 years. However, by comparing this to the immigration control, as mentioned in question three, possibly more experiences and knowledge will be in high risk and needs to be properly coordinated as people stay working longer for the same location or even the same organisation.

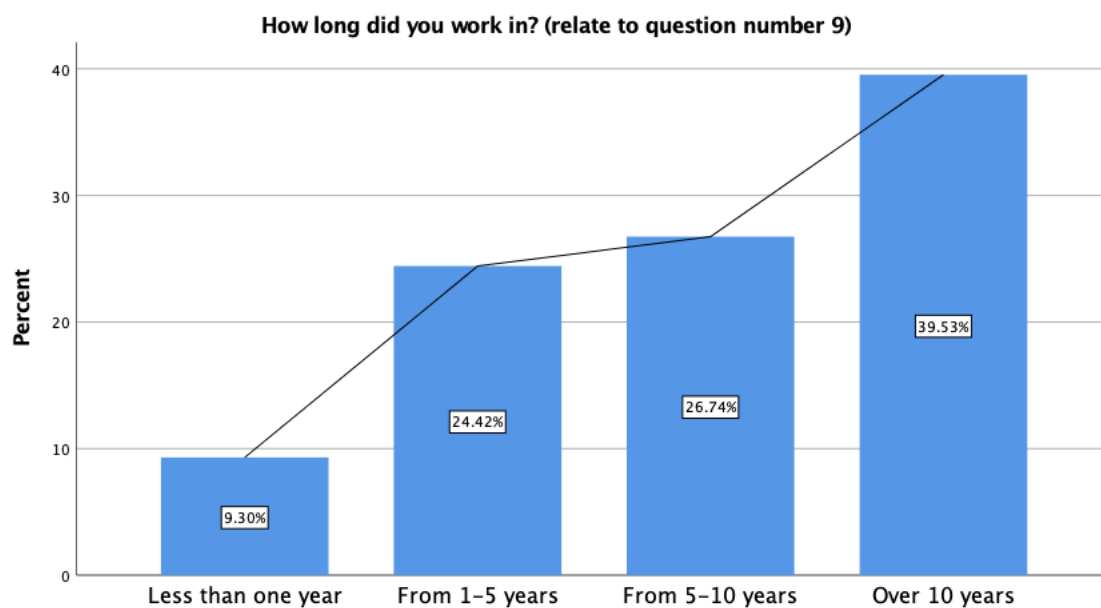


Figure 6.6: How long did you work in? (relate to question number 9)

Question 11: Employment arrangement of respondent

Construction firms deal with many parties when managing construction projects, for example Permanent Contract by hiring some specialist to provide such services. Therefore, as discussed in the literature review, the process and procedures of contracting knowledge is important. This type of knowledge relates to the execution of construction projects at different stages. For instance, this can include categories such as designing knowledge, planning knowledge, tendering knowledge, knowledge of methods and techniques used, and the knowledge of maintenance or operation processes. One unanticipated finding was that, even though the majority of the survey's respondents were working in private sectors, they still used

Governmental Contracts (the KSA’s national open-ended contract, while non-KSA nationals have to go for rolling annual contracts) with a high percentage of 50%. From the graph above it can also be seen that for many participants their type of employment was “Fixed hire” contracts (33.7%).

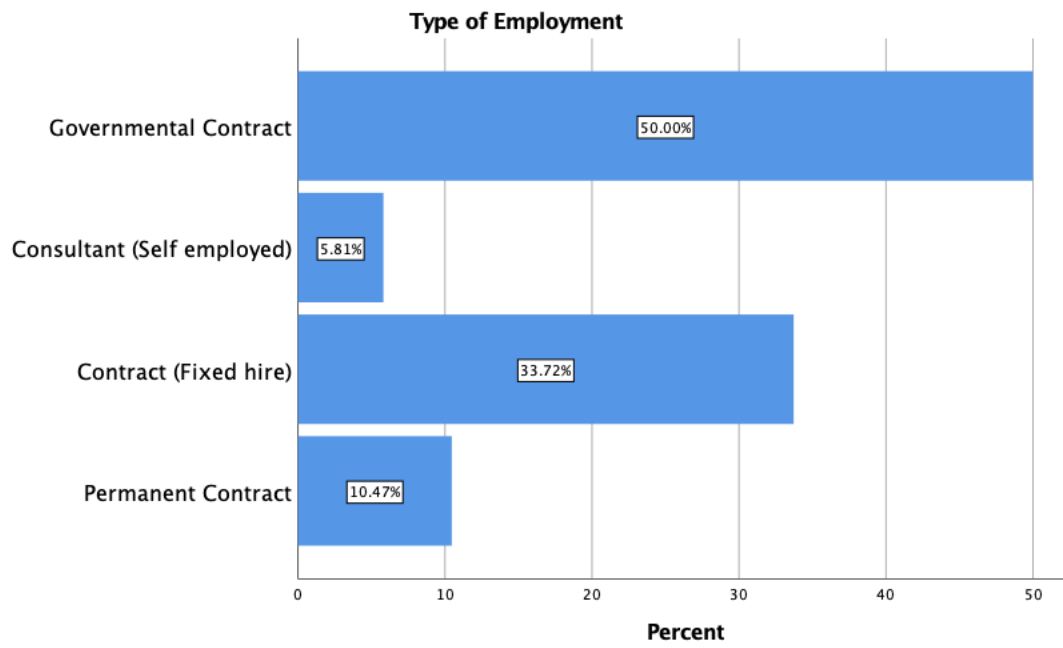


Figure 6.7: Type of Employment

Question 12: Number of years staying with current employer

As identified in the literature review, in chapters two and three, the shortcomings of current practice in the implementation of KM in the construction sector can be seen as there is a high staff turnover in construction firms that might weaken their competitive advantage. Partial loss of valuable knowledge and lessons learned is at the highest risk when the turnover of staff is high, either because the cost of maintaining PM professional staff is too high or in regard to the current governments’ policies to reserve a certain percentage of jobs for local citizens. Evidence to support this can be seen in the following table (6.9), as 55 respondents out of the 86 did not stay with their employers for more than 5 years. This can indicate that competition in construction sectors is high and the cost of maintaining professional staff also seems to be high. Therefore, the issue of employees moving from organisation to organisation requires the implementation of effective KM systems to retain the knowledge they have acquired before

they leave the organisation or even the country. However, there were few employees who preferred to stay with their employers for 5-10 and over 15 years with percentages of 18.6% and 12.8% respectively.

Number of years staying with current employer				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
0-5	55	64.0	64.0	64.0
5-10	16	18.6	18.6	82.6
10-15	4	4.7	4.7	87.2
Over15	11	12.8	12.8	100.0
Total	86	100.0	100.0	

Table 6.9: Number of years staying with current employer

Question 13: Number of Employees working for the current employer

There is no doubt that the majority of construction firms usually hire a large number of employees to execute larger project. However, very little was found in the literature on the question of who is responsible for dealing with KM. Currently there is no established group or method for implementing KM processes; it is left to the initiatives of employees to share their knowledge. Tacit knowledge is the hardest type of knowledge to share as it resides in the minds of individuals, whereas explicit knowledge tends to be poorly organised; currently there is a lack of suitable standards, policies, and procedures to capture, maintain, and disseminate project knowledge across entire organisations. The findings of the current study as shown in table (6.10) are consistent with those of the National Anti-Corruption Commission (NACC, 2016) discussed in the literature review. There are around 500 large contracting or construction companies in the KSA. As the highest category was the group of over 500 employees with a percentage of almost (68). This study will be focused mainly on larger organisations with a large number of employees; question 16 can illustrates only a few numbers of participants were working with small size of organisation. This positive skew towards large companies was unavoidable due to random sampling at the individual rather than the company level.

Number of Employees work for the current employer				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
0-49	4	4.7	4.7	4.7
50-199	6	7.0	7.0	11.6
200-299	3	3.5	3.5	15.1
300-399	7	8.1	8.1	23.3
400-499	7	8.1	8.1	31.4
Over 500	59	68.6	68.6	100.0
Total	86	100.0	100.0	

Table 6.10: Number of Employees work for the current employer

Question 14: Type of Client the Organisation deal with

As mentioned in the literature review, construction firms need to have reusable knowledge in place. Managing and executing similar projects or repeating business with the same type of clients can be facilitated through the use of previous knowledge and lessons learned. Through asking the respondents about the type of client the organisation deals with, the questionnaire found that the majority of the KSA's construction firms were working with Government "government-based projects" (83%) rather than working with private clients; of the latter, 7% were working with clients wanting assistance with their private properties and 9% with private companies, factories, or businesses undertaking a construction project. This finding corresponds with what one would expect given the KSA's governmental investment in a large number of projects, giving construction firms opportunities to win more tenders. This emphasises the importance of capturing knowledge and considering lessons learned.

Type of Client the Organisation deal with				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Private client (who needs assistance with their private properties)	6	7.0	7.0	7.0
Public client (company, factory, or business who seeks to undertake a construction project)	8	9.3	9.3	16.3
Government (government-based projects)	72	83.7	83.7	100.0
Total	86	100.0	100.0	

Table 6.11: Type of Client the Organisation deals with

Question 15: Type of Project the organisation has executed in the last 10 years

Client knowledge is one of the most important types of knowledge, as discussed in literature review. This knowledge is important for the success of business as it covers the clients' requirements and specifications. This knowledge might remain tacit until there is an interaction between people to deliver the project. However, one of the major issues affecting the completion of construction projects is organisations going for projects that are not suitable for their expertise and potential. As shown in Figure (6.8), Construction of Public Building was the highest targeted of KSA's organisations with a percentage of 50%. This can be also related to question number 14, as the respondents responded that Government agencies and projects were their largest client group. Of these, Civil Engineering Projects (Bridges, Roads ..etc) constituted 15% whereas Public Transport Projects constituted 11%. The remaining projects were commercial (Leisure, Hotels, Malls ..etc) (8%), Infrastructure Projects (7%), and both Industrial Projects and Oils and Gas Projects constituted 3.5%.

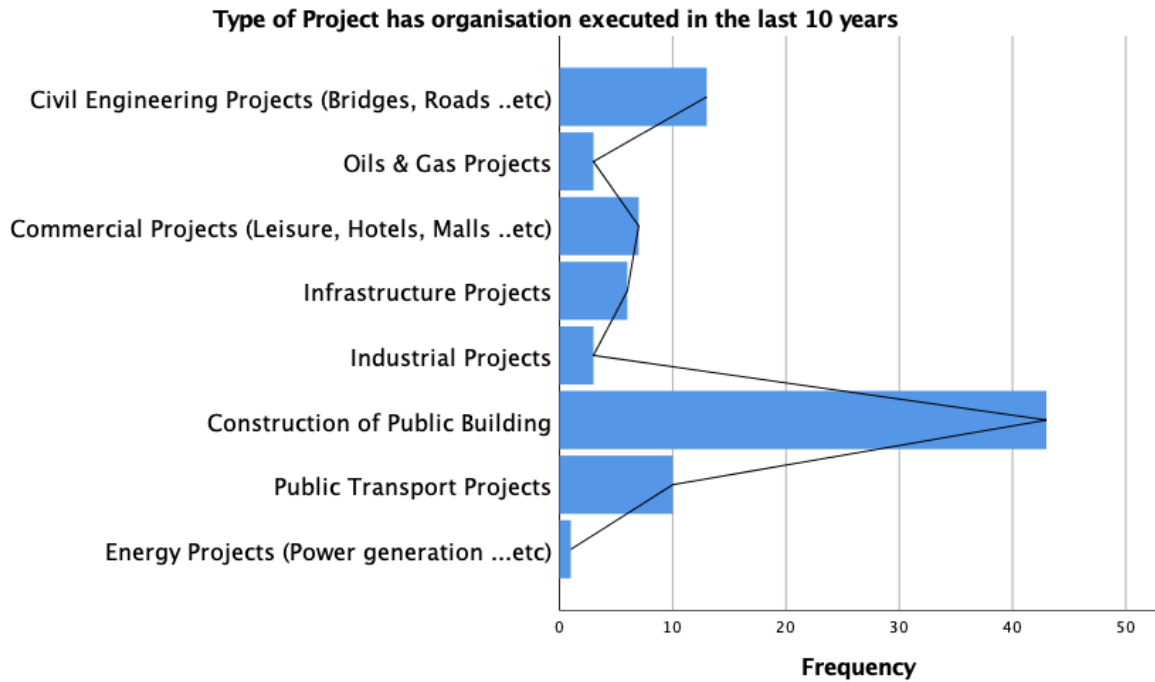


Figure 6.8: Type of Project organisation has executed in the last 10 years

Question 16: Size of Project that Firm has undertaken in the last 10 years

The table below (6.12) illustrates the size of projects currently executed in the KSA’s construction market. 76.7% of respondents said that the size of project that their firm normally undertook cost over 50 Million Saudi Riyal. The chosen sample suggests a boom in the construction sector. Costing and financial knowledge deals with a number of aspects such as knowledge of project location and knowledge of construction cost, methods, and resources. The knowledge of financial aspects can increase the ability of organisations to achieve low expenses and maximise benefits.

Size of Project that Firm has undertaken in the last 10 years				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
0 – 10 Million	6	7.0	7.0	7.0
10 – 20 Million	4	4.7	4.7	11.6
20 – 30 Million	2	2.3	2.3	14.0
30 – 40 Million	1	1.2	1.2	15.1
40 – 50 Million	7	8.1	8.1	23.3
Over 50 Million	66	76.7	76.7	100.0
Total	86	100.0	100.0	

Table 6.12: Size of Project that Firm has undertaken in the last 10 years

Question 17: Current Nature of Projects in the KSA

This question can be correlated to the previous question by analysing the current nature of project work between new, multi-phased or refurbishment projects. Table (6.13) below shows the breakdown between these pre-categorised types. Interestingly, new projects dominated, with a percentage of 73.3%. This suggests that the KSA is a developing country, investing more in new projects, rather than refurbishment projects, which represented only 4.7% of projects. However, there is still a good deal of multi-phased projects (22.1%). As a result, it is important to keep knowledge of statutory requirements and legal knowledge up to date as regulatory requirements change over time; companies need to keep up to date with knowledge of contracts, health, safety, and current codes of practice.

Current Nature of Project in the work				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
New Projects	63	73.3	73.3	73.3
Multi-Phased Projects	19	22.1	22.1	95.3
Refurbishment Projects	4	4.7	4.7	100.0
Total	86	100.0	100.0	

Table 6.13: Current Nature of Projects in the KSA

Question 18: Turnover of the Organisation

This question can be related to question 16 and its exploration of the size of projects firms are undertaking. Respondents in question 18 were asked to indicate whether the turnover of the organisation can be used to support the orientations of this survey is mainly distributed to large size organisation rather than small to medium organisation’s sizes. It is apparent from this table (6.14) that a very large percentage of respondents evaluated their turnover as over 100 million (73.3%). A strong relationship between maturity levels of organisations and the needs for PM practices has been reported in the literature. As the size of organisation increases, PM practices should be increased to manage and coordinate increasing numbers of daily tasks. Project Management best practice in terms of knowledge retention is important for developing company efficiency, enabling companies to consider factors that might affect the completion of projects such as risk management, change management, innovation, and problem solving.

Turnover of the Organisation				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
0 – 20 Million	6	7.0	7.0	7.0
20 – 40 Million	1	1.2	1.2	8.1
40 – 60 Million	4	4.7	4.7	12.8
60 – 80 Million	4	4.7	4.7	17.4
80 – 100 Million	8	9.3	9.3	26.7
Over 100 Million	63	73.3	73.3	100.0
Total	86	100.0	100.0	

Table 6.14: Turnover of the Organisation

Question 19: Level of Sub-contracting in current (most recent) project

As mentioned in the literature review, the suppliers and subcontractors’ knowledge are extremely important in order to have better estimation of their abilities. When organisations have sufficient knowledge about contractors, consultants, subcontractors, and suppliers; this can facilitate the appropriate selection of them for current and future projects. However, by

asking respondents to evaluate the level of sub-contracting in current (most recent) projects, generally, there was a negative feeling from respondents. 61.6% of respondents measured the level of sub-contractor from minimal to low (0-40%), whereas 24 out of 86 respondents had the feeling that sub-contractors' levels were moderate. A small number of participants believed the level of sub-contractor was very high by 3.5%.

Level of Sub-contracting in current (most recent) project				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Minimal (0-20%)	23	26.7	26.7	26.7
Low (20-40%)	30	34.9	34.9	61.6
Moderate (40-60%)	24	27.9	27.9	89.5
High (60-80%)	6	7.0	7.0	96.5
Very high (80-100%)	3	3.5	3.5	100.0
Total	86	100.0	100.0	

Table 6.15: Level of Sub-contracting in current (most recent) project

Question 20: Form of Contracts that organisation has to follow for implementing current or last project

This question sought to appraise the kinds of contracts that organisations used to implement their current or last project. Three pre-categorised form of contracts were proposed for respondents to choose between: FIDIC, ICC, and the Bispoke Governmental Contract based on a heavily amended form of the FIDIC red book. A few other types were provided as illustrated in table (6.16); one respondent mentioned International Exporting and another LSTK, which was discussed by the Project Contract (2015), as a combination of Lump Sum (LS) contract and Turnkey (TK). Respondents mostly fell within Governmental Contracts and FIDIC by 70% and 26% respectively. Only one respondent chose the ICC contract, which suggests that this form of contract is marginal within the KSA's construction market.

Therefore, statutory requirements and legal knowledge could focus principally on understanding the principle types of contracts and how regulatory requirements change over time. Therefore, companies need to keep up to date with knowledge of contracts, health, safety, and current codes of practice.

Form of Contracts that organisation has to follow for implementing current or last project				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
FIDIC	22	25.6	25.6	25.6
ICC	1	1.2	1.2	26.7
Governmental Contract	61	70.9	70.9	97.7
Other	2	2.3	2.3	100.0
Total	86	100.0	100.0	

Table 6.16: Form of Contracts that organisations have followed for implementing current or last project

Type of Contract (Other)				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
	84	97.7	97.7	97.7
International exporting	1	1.2	1.2	98.8
LSTK	1	1.2	1.2	100.0
Total	86	100.0	100.0	

Table 6.17: Type of Contract (Other)

Question 21: Type of Contract that Employees prefers

Data from Table 6.18 can be compared with the data in Table 6.16, which shows the type of contract that employees usually prefer. It is somewhat surprising that no major types of contracts the respondents scoring most than other. These statistics suggest that this question is hard to analyse and to draw firm conclusions from. However, Fixed-Price Contracts did score a little higher than the rest with a percentage of 29. This question was asked to investigate whether it may be possible to encourage people to share their valuable knowledge by giving them the type of contract they prefer.

Type of Contract that Employees prefers				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Fixed- Price Contracts	29	33.7	33.7	33.7
Joint-Venture Contracts	11	12.8	12.8	46.5
Negotiated Contracts	9	10.5	10.5	57.0
Turnkey Contracts	7	8.1	8.1	65.1
Prime contracting	14	16.3	16.3	81.4
Target cost	7	8.1	8.1	89.5
Guaranteed maximum price	9	10.5	10.5	100.0
Total	86	100.0	100.0	

Table 6.18: Type of Contract that Employees prefers

6.2.2 The evaluation of the KSA construction market and the success factors, function, establishment, and usage of PMOs (Questions from 22-28)

The following section presents the results of the context of the KSA's construction market and the usage of PMOs within this context. This is in order to understand what is currently happening in the KSA. The investigation of appropriate ways to improve construction in the KSA will be left for the qualitative analysis that represents phase two of this research project. This section investigates factors that were explored in the literature review and presented in the theoretical framework. In particular, the following main points will be covered and analysed in this section:

- Evaluating the difficulties and challenges faced in the KSA's construction market
- Evaluating the success factors of the PMO in improving business performance
- Evaluating the functions of PMOs for adopting PM practice
- Evaluating the establishment processes of PMOs
- Evaluating the existence of PMOs
- Evaluating people's knowledge of the PMO and its importance

6.2.2.1 Evaluating the difficulties and challenges of the KSA's construction market

The literature review explored how the majority of government projects in the KSA are suffering from the problem of faltering and delayed projects. The reasons for projects to be abandoned in the KSA can vary. The theoretical framework outlined eight major factors that caused delay and failure in many projects, namely; best practices of PM do not work as desired; lack of access to the database and not benefitting from the successful experiences and the experiences of others; entry in the competition without knowing if they are ready and compatible with this type of project; knowledge gained from previous projects is missing; poor coordination among various projects to link them as one whole project unit to deliver the entire organisation's needs; modest performance of PMs making decision individually and not maximizing the benefits of teamwork; communication system and knowledge sharing among projects is missing; and failure to provide senior management with the required project status reports. While the format of the questionnaire questions has been developed, some of the factors that have the same meaning as communication and coordination might be combined together.

These factors have been evaluated by asking respondents to evaluate the most-important and least-important practices in the management of construction projects in the KSA. From the chart, it can be seen that by far the greatest demand is for communication and coordination among various parties and projects, with a percentage of around 36%. The second was the knowledge gained from previous projects by 22%. The places of three, four, and five were the availability of PM practices (17%), benefit from the company's database and experiences (13%), and the possibilities and compatibility of the organisation to enter the competition of new projects (11%). The involvement of Senior Management and Project Managers scored only 1%, which indicates that this research will not considering this as an important factor based on the greater difference between the remaining factors and this one. Therefore, it could be by ranking these factors in order of important, these factors should be played against the outcome of PMO success factors as it will be discussed in the following section 6.2.2.2.

KSA Construction sector	Factor	Option												Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		6: Least Important	%	5	%	4	%	3	%	2	%	1: Most-Important	%					
Most-Important and Least-Important practices in the management of construction projects in the KSA	The availability of PM practices	13.0	15.10%	8	9.30%	11	12.80%	14	16.30%	26	30.20%	14	16.30%	3.14	2.79	1.67	2.00	4.00
	Benefit from the company's database and experiences.	10.0	11.90%	17	20.20%	13	15.50%	21	25.00%	12	14.30%	11	13.10%	3.51	2.44	1.56	2.00	5.00
	Possibilities and compatibility with entering the competition of new projects.	9.0	10.60%	16	18.80%	30	35.30%	11	12.90%	10	11.80%	9	10.60%	3.72	2.08	1.44	3.00	5.00
	Communication and coordination among various parties and projects.	2.0	2.40%	11	12.90%	12	14.10%	15	17.60%	14	16.50%	31	36.50%	2.58	2.31	1.52	1.00	4.00
	The involvement of Senior Management and Project Manager.	33.0	38.80%	23	27.10%	12	14.10%	10	11.80%	6	7.10%	1	1.20%	4.75	1.76	1.33	4.00	6.00
	Knowledge gained from previous projects.	18.0	20.90%	10	11.60%	6	7.00%	15	17.40%	18	20.90%	19	22.10%	3.28	3.43	1.85	2.00	5.00

Table 6.19: Evaluating the difficulties and challenges of KSA construction market

Please rank the following in order of importance when thinking about the management of construction projects, where 1 is most important to you and 6 is least important to you:

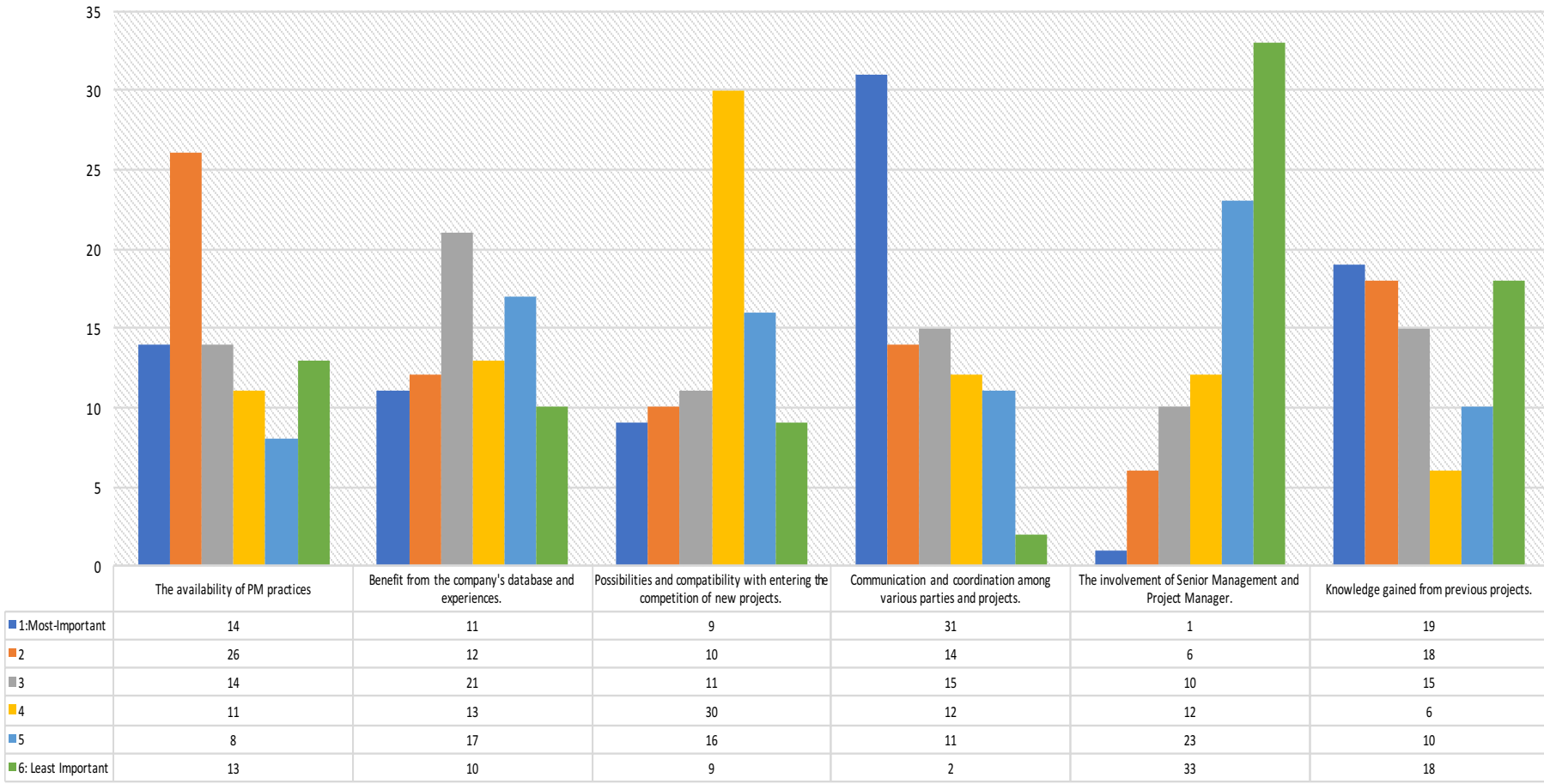


Figure 6.9: Evaluating the difficulties and challenges of KSA construction market

6.2.2.2 Evaluating the success factors of the PMO in improving business performance

As mentioned in the literature review, the PMO can be defined as the real helm for various organisations that pursue different types of management across projects. Regardless of the way in which researchers and experts emphasise different factors in how the PMO successfully improves business performance, its importance to the improvement of management in today's construction market is undoubtable. This research identifies eight of the key success factors of today's PMOs, as follows: the clarity of decision making processes; an effective tool to adopt PM practices; effective management of human resources, technical and financial aspects; the source of knowledge (center of excellence); supporting and providing current project information (regular and accurate reports); minimizing the expenses, costs, time, and reducing risk factors; increasing the performance of individuals, teamwork and the implementation of future projects; and more transparency and clarity to various project policies, standards and procedures.

Those factors have been evaluated by asking respondents to rank success factors in order of their importance based on the current or last project, where 1 is most important and 8 is least important. From the chart (6.10), it can be seen that the greatest demand is for clarity in the decision-making process, with a percentage of around 29%. The second was for an effective tool to adopt PM practices (24%), where more transparency and clarity to project policies, standards and procedures was a close third, with 22%. The places of four and five went for more transparency and clarity to various projects policies, standards and procedures (12%) and the source of knowledge (center of excellence) (10%). Far fewer respondents identified the following factors as key to the success of the PMO: effective management of human resources, technical and financial aspects (2%); support and providing current project information and regular and accurate reports (1%). However, increasing the performance of individuals, teamwork and the implementation of future projects had no scored value. These three least important factors of the PMO will be not considered when comparing these factors with others.

KSA Construction market	Factor	Options																Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		8: Least Important	%	7	%	6	%	5	%	4	%	3	%	2	%	1: Most-Important	%					
PMO Success Factors	The clarity of decision making process.	13	15.30%	4	4.70%	2	2.40%	2	2.40%	10	11.80%	7	8.20%	22	25.90%	25	29.40%	3.34	6.32	2.51	1.00	4.00
	An effective tool to adopt PM practices.	7	8.20%	13	15.30%	5	5.90%	2	2.40%	2	2.40%	11	12.90%	25	29.40%	20	23.50%	3.51	6.13	2.48	2.00	6.00
	Effective management of human resources, technical and financial aspects.	13	15.30%	10	11.80%	13	15.30%	10	11.80%	14	16.50%	13	15.30%	10	11.80%	2	2.40%	4.93	4.21	2.05	3.00	7.00
	The source of knowledge (center of excellence).	5	5.90%	9	10.60%	9	10.60%	16	18.80%	20	23.50%	14	16.50%	4	4.70%	8	9.40%	4.41	3.54	1.88	3.00	6.00
	Support and providing current project information (regular and accurate reports).	8	9.50%	2	2.40%	21	25.00%	25	29.80%	16	19.00%	7	8.30%	4	4.80%	1	1.20%	5.04	2.34	1.53	4.00	6.00
	Minimizing the expenses, costs, time, and reducing risk factors.	3	3.60%	16	19.00%	20	23.80%	16	19.00%	8	9.50%	8	9.50%	3	3.60%	10	11.90%	4.86	4.00	2.00	3.75	6.00
	Increasing the performance of individuals, teamwork and the implementation of future projects.	20	23.50%	19	22.40%	11	12.90%	8	9.40%	7	8.20%	6	7.10%	14	16.50%	0	0.00%	5.56	4.67	2.16	4.00	7.00
	More transparency and clarity to various projects policies, standards and procedures.	16	19.00%	12	14.30%	4	4.80%	4	4.80%	7	8.30%	18	21.40%	4	4.80%	19	22.60%	4.35	6.89	2.63	2.00	7.00

Table 6.20: Evaluating the success factors of PMO in improving business performance

The Project Management Office (PMO) approach is aiming to improve business performance by applying the factors above. Please rank the following success factors in order of their importance based on your current or last project, where 1 is most important t

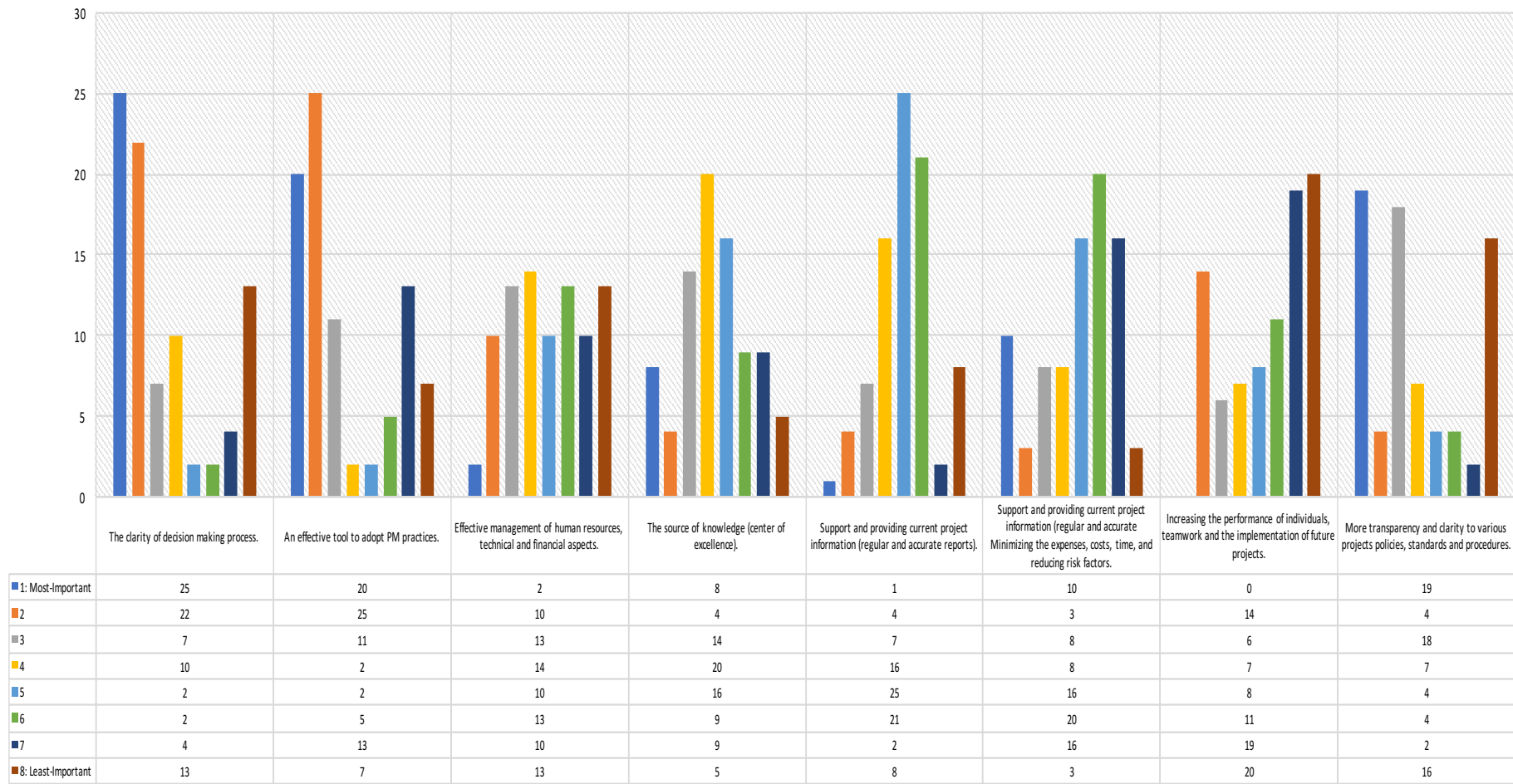


Figure 6.10: Evaluating the success factors of PMO in improving business performance

The value added by the PMO and its principles in improving organisational performance and increasing project success can be summarised in the proposed five factors that the majority of participants in questionnaires identified as the most important. The factors in section (6.2.2.1) surrounding the difficulties and challenges of the KSA’s construction market can be compared against this section’s (6.2.2.2) evaluation of the success factors of the PMO in improving business performance, by evaluating the mean ranking from highest to lowest. Table (6.21) shows that the factors in the left side can be addressed by the factors proposed in the right side, which will be mainly considered later on the second phase of this research (Personal Interviews), as follows:

R	Reasons behind Project to Failure in the KSA	R	Factors of PMOs in improving business performance
1	The involvement of Senior Management and Project Manager	2 3 6 8	Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects More transparency and clarity to various projects policies, standards and procedures The clarity of decision making process
2	Possibilities and compatibility with entering the competition of new projects	5	The source of knowledge (center of excellence)
3	Benefit from the company's database and experiences	5 6	The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures
4	Knowledge gained from previous projects	1 5 6	Increasing the performance of individuals, teamwork and the implementation of future projects The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures
5	The availability of PM practices	1 2 3 4 5 6 7 8	Increasing the performance of individuals, teamwork and the implementation of future projects Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects Minimizing the expenses, costs, time, and reducing risk factors The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures An effective tool to adopt PM practices The clarity of decision-making process
6	Communication and coordination among various parties and projects	1 2 3 5 6 8	Increasing the performance of individuals, teamwork and the implementation of future projects Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures The clarity of decision-making process

Table 6.21: Success factors of PMO Vs. Current challenges and difficulties in KSA

6.2.2.3 Evaluating the functions of the PMO for adopting PM practice

A large number of studies (see section 3.3) have suggested that when organisations start to adopt best practices in their management, it becomes easier to define the appropriate types and sizes of projects they can undertake. Quite recently in the KSA construction market, considerable attention has been given to how PMOs might be able to deliver best PM practices and to win the highest levels of project successes (Kendrick, 2009; Rouse, 2011; Almaghrabi, 2011; Dawson, 2012). Nowadays, PMOs are developing more areas of expertise, as discussed and presented in the theoretical framework. Table 6.22 summarises the effective functions of the PMO in construction organisations, as follows: Supporting Project Communication Management, Encouraging Project Knowledge Management, Improving Project Change Management (Training for PMs and Project Teams), Balancing Project Resources Management, Promoting Project Finance Management, and Identifying Project Risk Management.

Those factors have been evaluated by asking respondents to rank the previous practices in order of importance based on the current or the last project completed, where 1 is most important and 6 is least important. From chart 6.11, it can be seen that the greatest demand was by far for Knowledge Management, with a percentage of around 46%. The second was for Communication Management (21%), followed closely by Resource Management at 18%. Other factors such as Change Management (3%) scored much lower. The functions of PMOs can be presented at different levels: for example, in large companies that have in place a number of projects, the existence of PMOs at this level might have more responsibilities, which may include unifying practices, sharing resources, activating the roles of communication and cooperation to implement best PM practices. By contrast, in small companies that only deal with one project, the PMO's functions may be limited to controlling the project from inception to completion. This suggests the importance of using different maturity levels of PMOs to suits specific organisational needs. The qualitative analysis as it will be discussed in chapter 8 should consider the previous statement and focusing on the Knowledge Management as a key function of the PMO.

KSA	Construction	Factor	Option											Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
			6: Least Important	%	5	%	4	%	3	%	2	%	1: Most-Important					
PMO Functions	Communication Management	6.0	7.00%	4	4.70%	8	9.30%	11	12.80%	39	45.30%	18	20.90%	2.52	1.97	1.40	2.00	3.00
	Knowledge Management	1.0	1.20%	5	5.90%	5	5.90%	13	15.30%	22	25.90%	39	45.90%	2.04	1.56	1.25	1.00	3.00
	Change Management	15.0	18.10%	12	14.50%	22	26.50%	20	24.10%	11	13.30%	3	3.60%	3.89	1.95	1.40	3.00	5.00
	Resources Management	1.0	1.20%	8	9.60%	32	38.60%	22	26.50%	5	6.00%	15	18.10%	3.19	1.63	1.27	3.00	4.00
	Cost Management	13.0	15.30%	35	41.20%	14	16.50%	13	15.30%	4	4.70%	6	7.10%	4.26	1.93	1.39	3.00	5.00
	Risk Management	48.0	56.50%	21	24.70%	2	2.40%	5	5.90%	5	5.90%	4	4.70%	5.06	2.10	1.45	5.00	6.00

Table 6.22: Evaluating the functions of the PMO for adopting PM practice

The function of PMO is mainly focused in adopting and maintaining project management practices. Please rank the following practices in order of importance to you based on your current or the last project you completed, where 1 is most important to you and

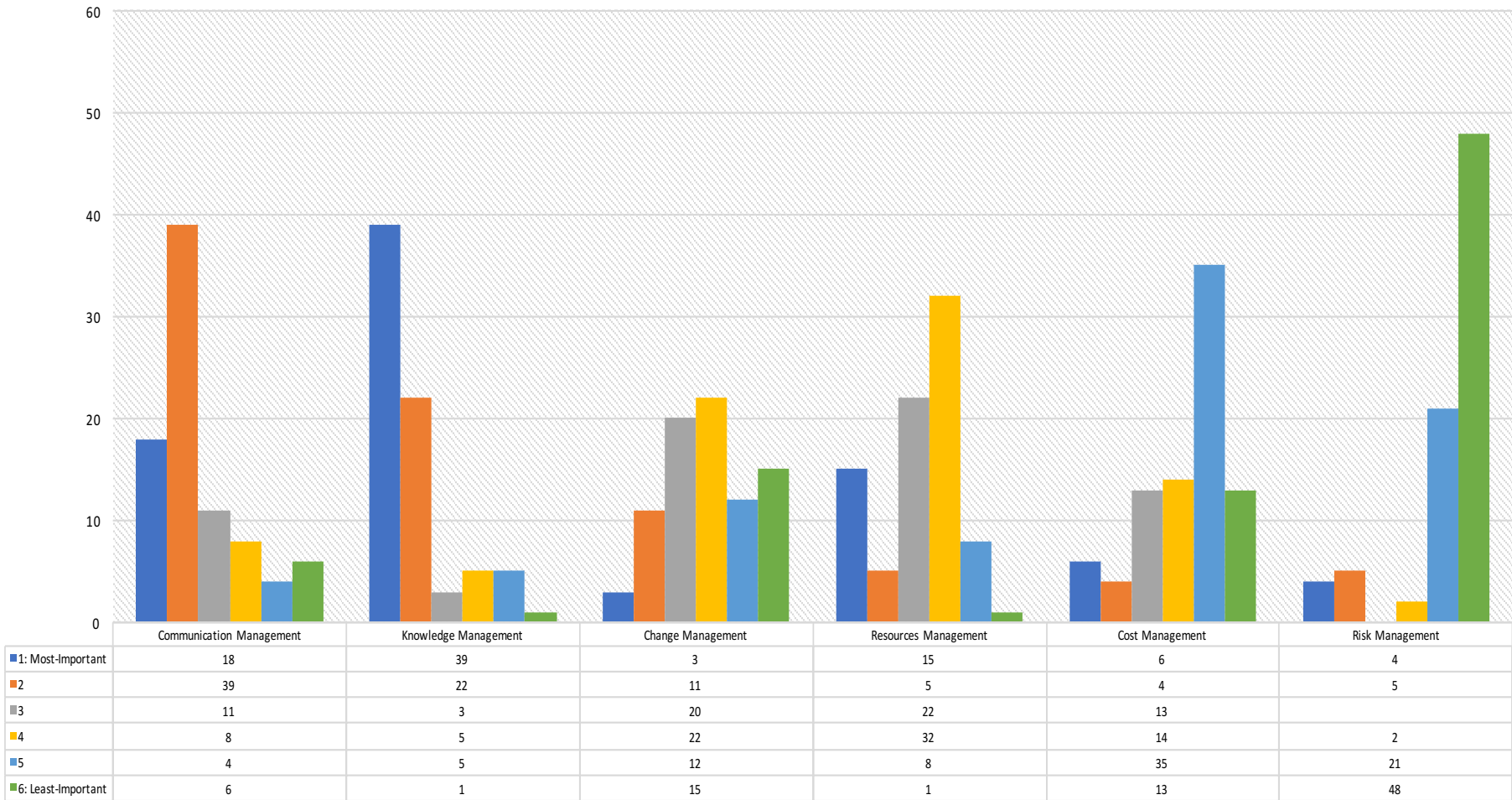


Figure 6.11: Evaluating the functions of the PMO for adopting PM practice

6.2.2.4 Evaluating the establishment processes of the PMO

After evaluating the success factors and functions of PMOs, it is important for organisations to understand the right procedures for establishing or developing the office. As a result of the discussion in section 3.2.4 of the literature review, six steps were identified as important for implementing a new PMO in construction firms, namely; identify PMOs mission, objectives, and strategies; define PMO processes, teams, and tools; obtain the necessary support (fully acknowledging the needs of involving top management and/or stakeholders); provide training and coaching programs to improve people skills and knowledge; and evaluate the PMOs; and provide regular meetings. However, as the research included the step of providing regular meetings and reports as a metric to evaluate PMOs performance, this factor should not be considered in the establishment of PMO. This question asked participants to rank the other five steps in order of importance when thinking about the establishment of the PMO, where 1 was the most important and 5 the least important, as illustrated in figure (6.12).

Table 6.23 shows that obtaining the necessary support and identifying PMO missions, objectives, and strategies scored the highest with 33% and 30% respectively. Providing training and coaching programs to improve people skills and knowledge and defining PMO processes, teams, and tools came next, scoring percentages of 22 and 13 respectively. Only 76 of respondents saw evaluating and updating PMOs as important with 90%. This suggests that the establishment and evaluation processes need to be isolated and divided into four main phases, which could result in the successful implementation and running of the PMO.

KSA Construction market	Factor	Options										Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		5: Least Important	%	4	%	3	%	2	%	1: Most-Important	%					
Steps and Procedures to establish PMO	Identify PMOs mission, objectives, and strategies.	3	3.60%	18	21.40%	27	32.10%	11	13.10%	25	29.80%	2.56	1.48	1.22	1.00	3.25
	Define PMOs Process, Team, Tools.	1	1.20%	6	7.10%	20	23.50%	47	55.30%	11	12.90%	2.28	0.67	0.82	2.00	3.00
	Obtain the Necessary Support (Fully acknowledge the needs of involving top management and/or stakeholders).	2	2.40%	2	2.40%	33	39.30%	19	22.60%	28	33.30%	2.18	1.00	1.00	1.00	3.00
	Provide training & coaching programs to improve people skills and knowledge.	2	2.40%	56	66.70%	3	3.60%	5	6.00%	18	21.40%	3.23	1.63	1.28	2.00	4.00
	Evaluate & Update PMOs.	76	90.50%	2	2.40%	1	1.20%	3	3.60%	2	2.40%	4.75	0.71	0.84	5.00	5.00

Table 6.23: Evaluating the establishment processes of PMO

Please rank the following in order of importance when thinking about the establishment of project management office (PMO), where 1 is most important to you and 5 is least important to you:

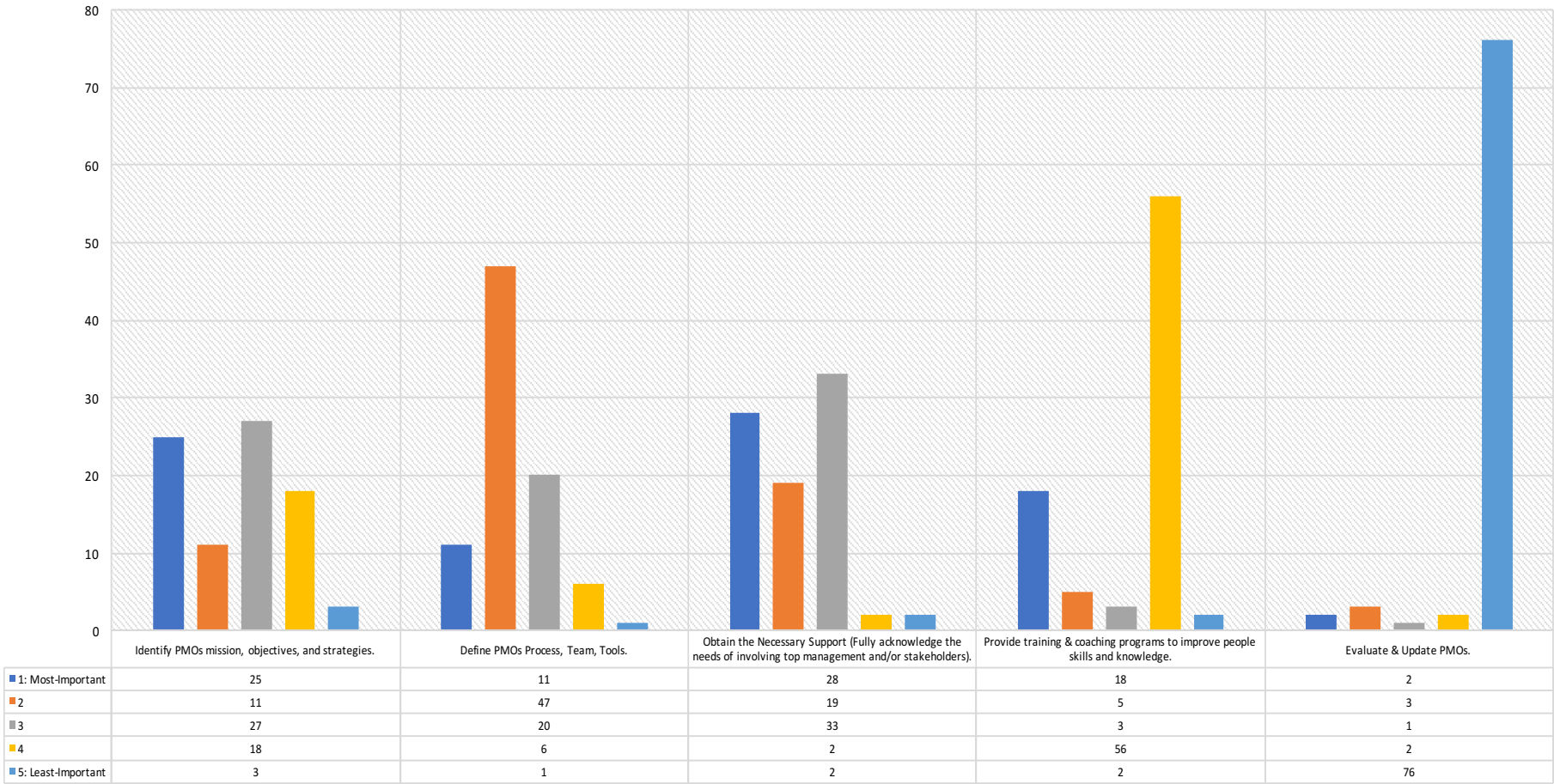


Figure 6.12: Evaluating the establishment processes of PMO

6.2.2.5 Evaluating the existence of the PMO

As mentioned in the literature review, according to the PMI's survey, focusing on the years from 2005 to 2010 and sampling 291 organisations to evaluate the state of PMOs and found that the percentages of failed PMOs are quite high. Around 50% of PMOs stopped working within the second year of their introduction. However, this research proposes that in order for PMOs to work to their full potential, certain steps of evaluating PMOs need to be in place. As discussed in the literature review, the following five steps were suggested as ways of ascertaining the success of the PMO (see section 3.2.5.2) and the questionnaire asked respondents to evaluate their importance namely; the success percentages of a company's projects that are delivered over time, the availability of PM practices implemented and worked across various projects, providing a check list form and regular reporting, the evaluation of staff attitudes, improvement and knowledge gained, and provide regular meetings and reports. Participants were asked to rank these factors in order of importance when thinking about the evaluation of PMO, where 1 was the most important and 5 the least important, as seen as in figure 6.13.

The rankings as presented in table 6.24 identified that the availability of PM practices on site and worked across various projects and the evaluation of staff attitudes, improvements and knowledge gained scored the highest and were seen as the most important, scoring 35% and 32% respectively. The success percentages of a company's projects delivered on time and the application of regular meetings and check lists were getting average scores with percentages of 24. However, 84 of respondents measured the availability of effective reporting as least important. This suggests that there is no obvious demand for construction firms to use this factor when evaluating the performance of the PMO.

KSA Construction sector	Factor	Options										Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		5: Least Important	%	4	%	3	%	2	%	1: Most-Important	%					
Steps and Procedures to evaluate/update PMO	The availability of PM practices on site are implemented and working across various projects.	21	24.70%	3	3.50%	23	27.10%	9	10.60%	29	34.10%	2.75	2.43	1.56	1.00	4.00
	The success percentages of company's projects that delivered over time.	1	1.20%	13	15.50%	9	10.70%	41	48.80%	20	23.80%	2.21	1.03	1.01	2.00	3.00
	The evaluation of staff attitudes, improvement and knowledge gained.	1	1.20%	8	9.50%	30	35.70%	18	21.40%	27	32.10%	2.26	1.10	1.05	1.00	3.00
	The availability of effective reporting lines.	7	8.30%	49	58.30%	12	14.30%	14	16.70%	2	2.40%	3.54	0.89	0.94	3.00	4.00
	The application of regular meetings and check list form.	54	65.10%	10	12.00%	10	12.00%	3	3.60%	6	7.20%	4.24	1.51	1.23	4.00	5.00

Table 6.24: Evaluating the existence of PMO

Please rank the following in order of importance when thinking about the evaluation of project management office (PMO), where 1 is most important to you and 5 is least important to you:

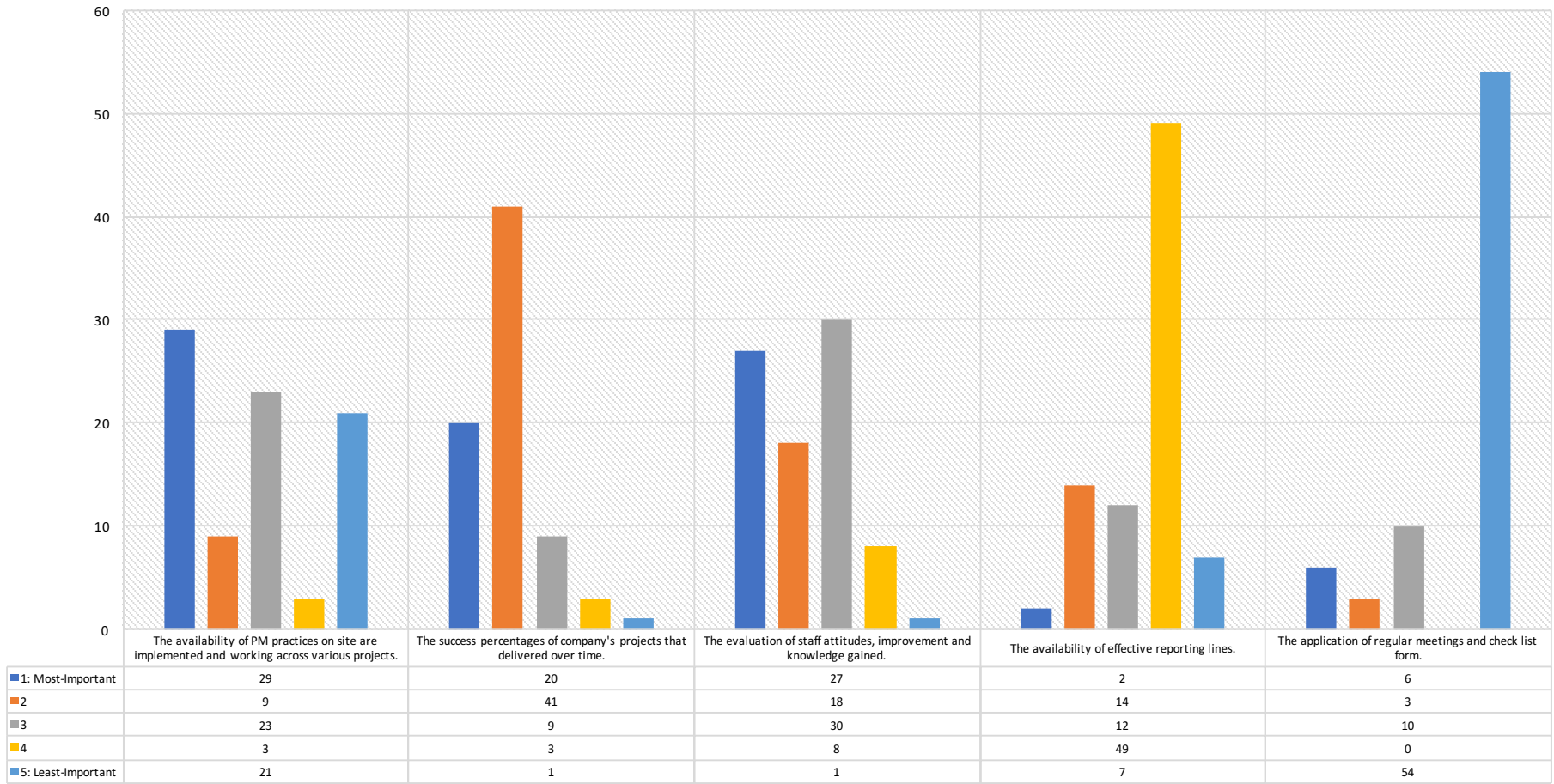


Figure 6.13: Evaluating the existence of PMO

As a result of analysing the previous sections (6.2.2.4 and 6.2.2.4), it is possible to relate the establishment and evaluation processes of PMOs as road-map structures. Figure 6.14 indicates that the journey of the PMO should progress step by step; the successful implementation of the PMO does not mean it will be the answer to all an organisation’s problems or take the place of the work of other departments. The establishment of the PMO needs to be followed by a successful evaluation to assess and increase its efficiency and to protect this concept from failures. Chart 6.14 shows that the factors of establishing PMO can be addressed by the factors proposed in the evaluation procedures of PMO. The latter will be considered in more detail in the second phase of this research (Personal Interviews).

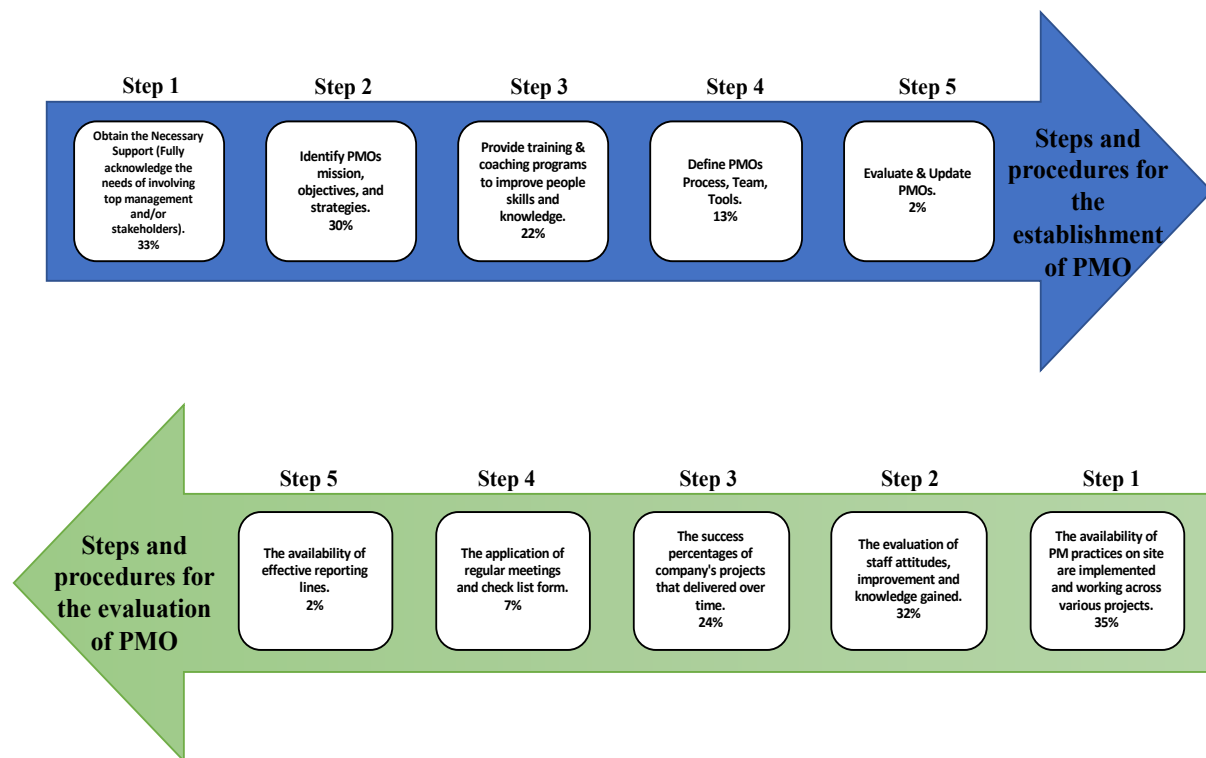


Figure 6.14: Steps and procedures to establish and evaluate/update PMOs

6.2.2.6 Evaluating people’s knowledge of the PMO and its importance

Knowledge Management and PMOs are closely related, as discussed in literature review (see section 3.5.2). People’s knowledge of the PMO is extremely significant to successfully implementing its roles. A likert scale was adopted for the responses collected for this question, which ranged from Do not know (0-20%) (0) to Excellent (80-100%) (5), as shown in Table 6.25. The highest score was scored by respondents who claimed to have excellent knowledge of the PMO, with a percentage of around 42%. The second highest score was those who said they had a good knowledge of the PMO (28%) and a similar percentage of respondents identified their knowledge as average (20%). Fewer respondents expressed having a low knowledge of the PMO with a percentage of 7%. Lastly, some of the participants said they had no knowledge of PMO at all (3%).

Evaluating people’s knowledge of PMO and its importance				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Do not know (0-20%)	2	2.3	2.3	2.3
Poor (20-40%)	7	8.1	8.1	10.5
Average (40-60%)	17	19.8	19.8	30.2
Good (60-80%)	24	27.9	27.9	58.1
Excellent (80-100%)	36	41.9	41.9	100.0
Total	86	100.0	100.0	

Table 6.25: Evaluating people’s knowledge of PMO

It can be seen from the data in chart 6.15 that the office-based group reported to be similar to the project-based group. For example, 19 out of 42 people in the office-based group evaluated their knowledge of the PMO as excellent, whereas 17 out of 44 people in the project-based group evaluated this as excellent. In the office-based group none of the respondents claimed to have no knowledge of the PMO, while two in the project-based group that they had no knowledge. Six of the respondents in the project-based group evaluated their knowledge as poor, whereas only one in the office-based group selected this criterion.

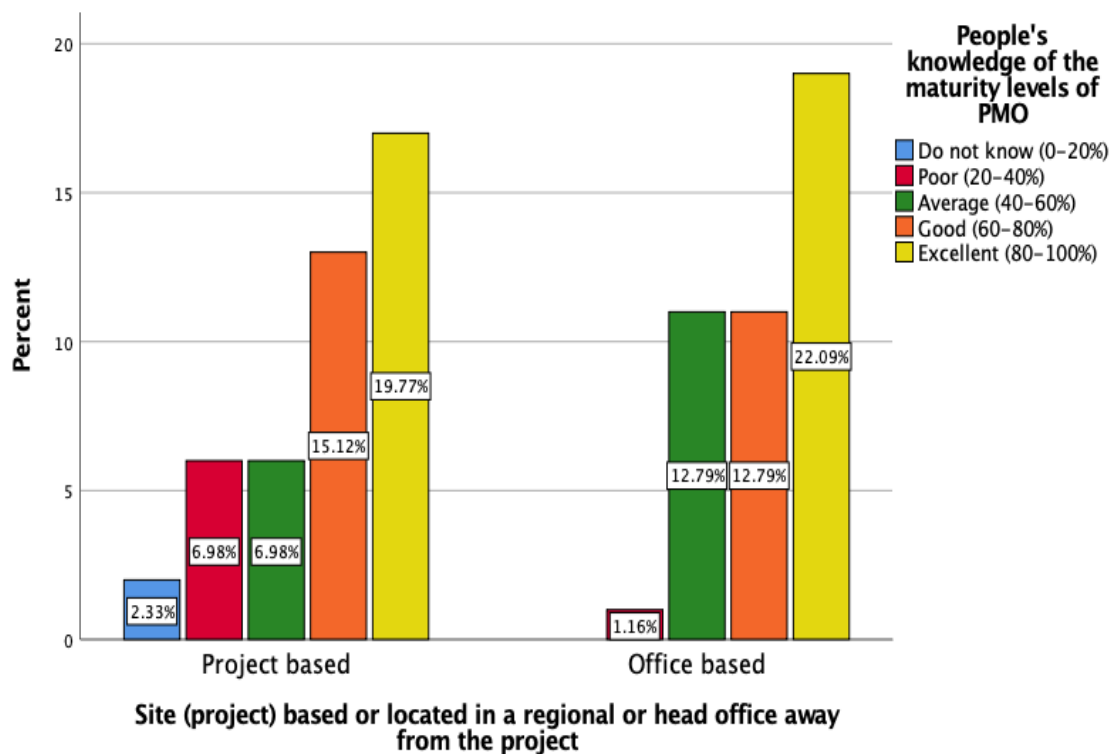


Figure 6.15: Evaluating people’s knowledge of PMO based on the location of work

Related to the importance of people’s knowledge of PMO is how they see its importance in terms of increasing business performance. A likert scale was adopted for the responses, which ranged from Unimportant (0-25%) (0) to Very Important (75-100%) (4), as shown in Table 6.26. The highest score was presented by “very important”, with a percentage of around 65%. The second highest score came from respondents rating it as “fairly important” (28%). However, a few respondents might expect the existence of PMO was “slightly important” (6%) and few other respondents felt it was “unimportant”, with a percentage of 1%.

Evaluating the Importance of PMO				
Factor	Frequency	Percent	Valid Percent	Cumulative Percent
Unimportant (0-25%)	1	1.2	1.2	1.2
Slightly Important (25-50%)	5	5.8	5.8	7.0
Fairly Important (50-75%)	22	25.6	25.6	32.6
Very Important (75-100%)	58	67.4	67.4	100.0
Total	86	100.0	100.0	

Table 6.26: Evaluating the importance of PMO

The bar chart 6.20 shows that the office-based group reported that the PMO was slightly different than the project-based group. For example, no scored was found in the office-based group evaluated PMO as unimportant as there was one in the project based. However, 4 of respondents also in the project-based group evaluating the PMO as slightly important whereas only one in the office-based group selected this criterion. Similar scored were found in seeing PMO as very important with a count of 29 people out of 42 in the office-based group and 29 people out of 44 in the project-based group.

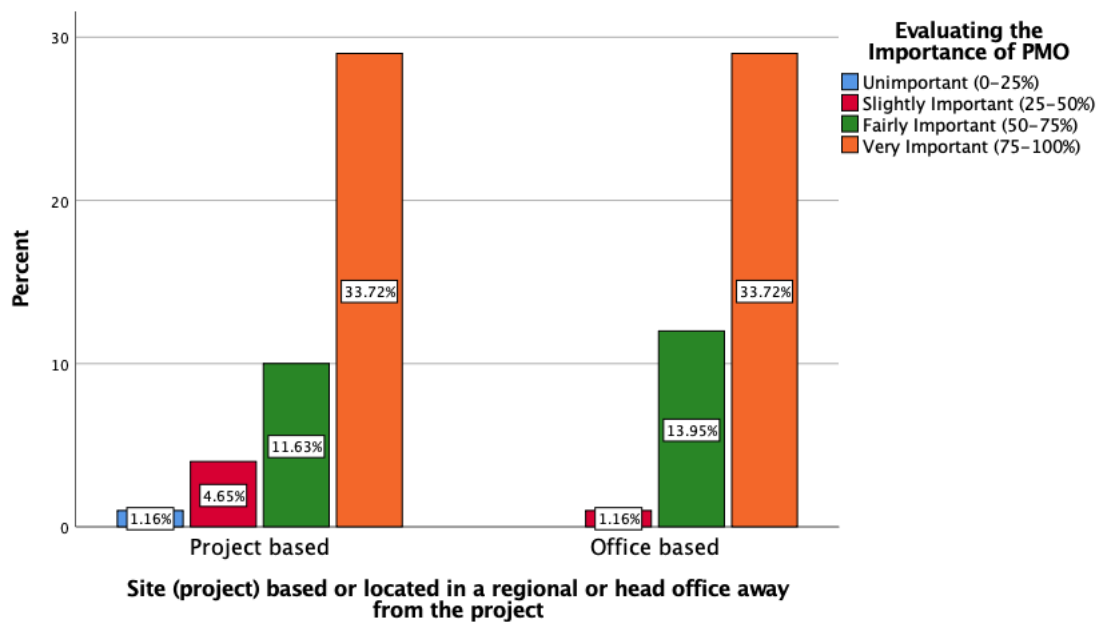


Figure 6.20: Evaluating the importance of PMO based on the location of work

6.2.3 The evaluation of KM processes, components, and the necessary perspectives to adopt and facilitate its implementation (Analysing questions 29-38)

This section analyses two aspects of KM. Firstly, it evaluates the processes of KM. Secondly, it investigates the important components and perspectives that facilitate KM implementation. A likert scale was adopted for the responses, which ranged from strongly disagree (0) to strongly agree (5), as shown in Table 6.27.

6.2.3.1 KM processes (Analysing questions from 29-32)

This section will analyse different processes of KM and identify its relation to the research by considering several aspects. Firstly, knowledge creation should consider the organisation's need to disseminate knowledge across the organisation and its need to generate new knowledge from existing knowledge. Secondly, knowledge sharing should have a specific process for organising and filtering knowledge; organisations need to transfer explicit knowledge to individuals and to collect tacit knowledge from individuals which can then be fed back into the organisation. Thirdly, knowledge application should improve efficiency by matching problems and challenges to the source of knowledge; the development of new services, policies, and strategies should be based on the knowledge gained. Fourthly, there is a need to develop processes that protect knowledge from inappropriate use inside and outside the organisation; the organisation should have in place effective policies and procedures to protect its trade secrets.

As shown in Figure 6.21, this study has found that most of the respondents strongly agreed with the statement provided in the transferring processes. Most respondents either agreed or strongly agreed that organisations should have a specific process in place to transfer explicit knowledge to individuals (88%). By contrast, most participants strongly disagreed about the statement presented in the acquisition and protection processes. For example, the statement of providing a set of process to protect knowledge from inappropriate use inside and outside the organisation represented that 18% were strongly disagree and 32% were disagree about the existence of this factor. It can be seen also from the chart below that most respondents thought that the organisation should have a specific process in place to collect tacit knowledge from individuals so that this can be incorporated into organisational knowledge, (56%). It was surprising to find that only one person strongly agreed that it was important to have a set of processes to disseminate knowledge across the organisation.

KM Process	Factors	Option										Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		Strongly Disagree	%	Disagree	%	Neither Agree nor Disagree	%	Agree	%	Strongly Agree	%					
Creation & Acquisition Process	There is a set of processes in my organisation to acquire knowledge about our suppliers and customers.	22	25.9%	29	34.10%	21	24.70%	11	12.90%	2	2.40%	2.32	1.13	1.07	1.00	3.00
	There is a set of processes in my organisation to disseminate knowledge across the organisation.	24	28.60%	28	33.30%	20	23.80%	11	13.10%	1	1.20%	2.25	1.09	1.05	1.00	3.00
	There is a set of processes in my organisation to generate from existing knowledge some types of new knowledge.	21	25%	27	32.10%	19	22.60%	14	16.70%	3	3.60%	2.42	1.29	1.14	1.75	3.00
Transferring & Conversion Process	Organisation should have a specific process for organising and filtering knowledge.	4	4.80%	2	2.40%	5	6%	35	41.70%	38	45.20%	4.20	0.99	1.00	4.00	5.00
	Organisation should have a specific process to transfer explicit knowledge to individuals.	1	1.20%	3	3.50%	5	5.90%	28	32.90%	48	56.50%	4.40	0.71	0.84	4.00	5.00
	Organisation should have a specific process to collect tacit knowledge from individuals into the organisation.	3	3.60%	4	4.80%	1	1.20%	32	38.60%	43	51.80%	4.30	0.96	0.98	4.00	5.00
Re-using & Application Process	The utilisation of knowledge management can improve efficiency by matching problems and challenges to the source of knowledge.	3	3.60%	2	2.40%	4	4.80%	36	43.40%	38	45.80%	4.25	0.86	0.93	4.00	5.00
	The development of new services, policies, and strategies should be based on the knowledge gained.	1	1.20%	2	2.40%	6	7.20%	34	41%	40	48.20%	4.33	0.65	0.81	4.00	5.00
Capturing & Protection Process	There is a set of process to protect knowledge from inappropriate use inside and outside the organisation.	15	18.10%	27	32.50%	32	38.60%	7	8.40%	2	2.40%	2.45	0.92	0.96	2.00	3.00
	Organisation should have policies and procedures to protect its trade secrets.	1	1.20%	8	9.50%	7	8.30%	35	41.70%	33	39.30%	4.08	0.96	0.98	4.00	5.00

Table 6.27: The evaluation of KM processes

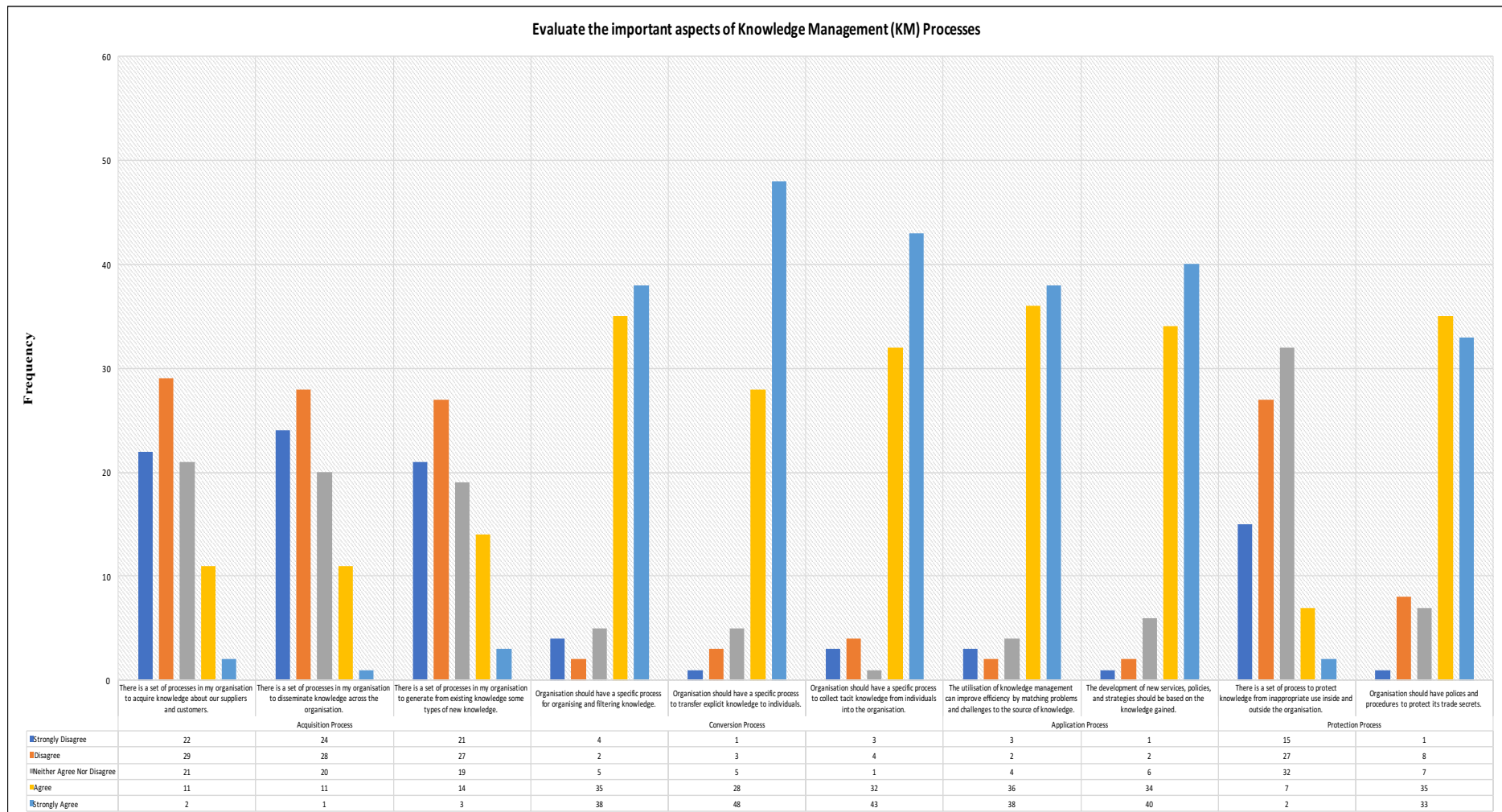


Figure 6.21: The evaluation of KM processes

6.2.3.2 KM components and organisational learning (Analysing questions 33 and 34)

This section will analyse the different components of KM and to identify their relation to organisational learning by considering several aspects. Firstly, knowledge components need to evaluate how people in the organisation can perform and understand their own and other people's tasks; to evaluate how people in the organisation can communicate easily with specialists in the field to gain knowledge; and to evaluate the need of the organisation to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation. Secondly, organisational learning should consider the availability of different workshops, seminars, and conferences to acquire knowledge; the availability of different internal training programs and coaching sessions for staff, as well as the awareness of employees about the organisational goals and strategies and how these result in effective organisational learning.

As can be seen from the table 6.28, this study has found that most participants did not strongly agree with the statement provided for evaluating both KM components and organisational learning. Respondents when asked about the need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation were strongly agreed by 39%. One of the more significant findings to emerge from this study was that participants were quite unhappy and dissatisfied with the contribution and level of support they get from their organisations. For instance, around 48% were disagreed to evaluate that employees in their organisation are aware of the goals and strategies of the organisation. Many respondents said that organisations did not frequently provide internal training programs and coaching sessions for staff or send employees to workshops, seminars, and conferences to acquire knowledge. The present study provides additional evidence that people in the organisation do not feel that they can communicate easily with specialists in the field; 42% of participants were disappointed and disagreed that these learning supports were true of their organisation. As well as people evaluated that in the organisation they cannot perform and understand their own and other's tasks by 32 out of 86 were disagreed. It was also shown that, in many cases, employees were unaware of the goals and strategies of their organisation.

KM Components and Organisational Learning	Factors	Option										Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		Strongly Disagree	%	Disagree	%	Neither Agree nor Disagree	%	Agree	%	Strongly Agree	%					
Knowledge Components	People in my organisation can perform and understand their own and other's tasks.	17	20.20%	32	38.10%	22	26.20%	10	11.90%	3	3.60%	2.40	1.10	1.05	2.00	3.00
	People in my organisation can communicate easily with specialists in the field to gain knowledge.	20	2.40%	35	42.20%	14	16.90%	12	14.50%	2	2.40%	2.29	1.12	1.06	2.00	3.00
	There is a need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation.	3	3.60%	6	7.20%	10	12.00%	31	37.30%	33	39.80%	4.02	1.13	1.06	4.00	5.00
Organisational Learning	My organisation often sends employees to different workshops, seminars, and conferences to acquire knowledge.	11	13.30%	34	41.00%	23	27.70%	13	15.70%	2	2.40%	2.53	0.97	0.99	2.00	3.00
	My organisation is frequently providing internal training programs and coaching sessions for staff.	13	15.50%	32	38.10%	22	26.20%	15	17.90%	2	2.40%	2.54	1.06	1.03	2.00	3.00
	In our organisation, employees are aware of the goals and strategies of the organisation.	11	13.30%	40	48.20%	20	24.10%	10	12.00%	2	2.40%	2.42	0.89	0.95	2.00	3.00

Table 6.28: The evaluation of KM components and Organisational Learning

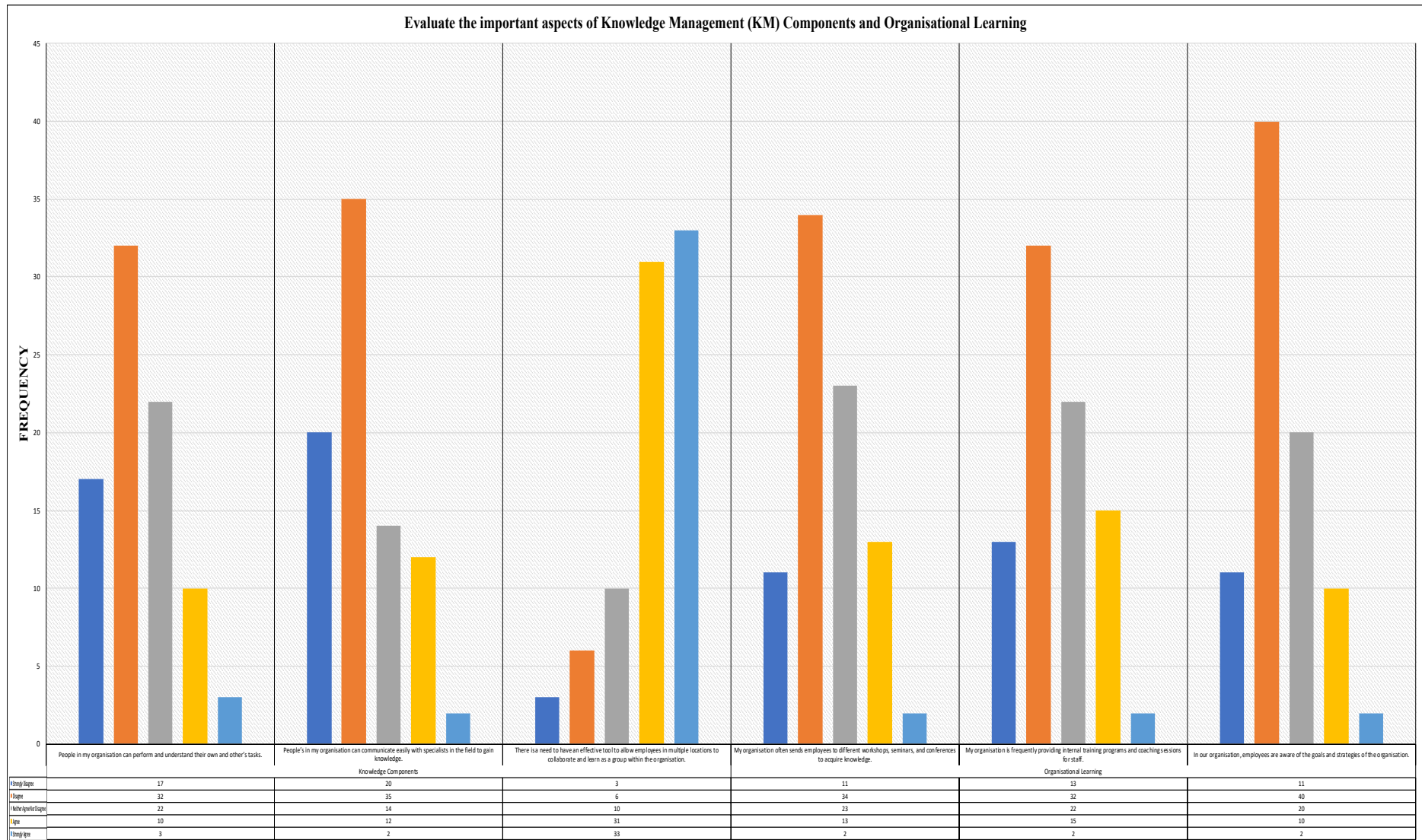


Figure 6.22: The evaluation of KM components and Organisational Learning

6.2.3.3 Perspectives necessary for KM implementation (Analysing questions 35-38)

This section will analyse the necessary perspectives that facilitate the adoption of KM processes by considering several aspects. Firstly, organisational culture should evaluate how collaboration and team work is being used to capture and disseminate knowledge in the organization; to assess whether employees understand the need for knowledge management to improve a company's performance; and to evaluate whether senior management and PMs are encouraging knowledge management in their teams and across the organisation. Secondly, the sharing of knowledge should be supported by a standardised reward system within the organisational structure; there is a need to have well-designed processes to facilitate the exchange of knowledge throughout the organization; and the organisation's structure should facilitate the discovery, creation, and transfer of new knowledge. Thirdly, Human Resource Management needs to evaluate how it can become a knowledge facilitator that gets all the information needed to the right people at the right time and to evaluate how knowledge management practices can contribute to human resource development. Fourthly, the perspective of using competitive advantage needs to be evaluated by measuring if the organisation has difficult and expensive knowledge management systems that are difficult for rivals to duplicate and to evaluate if the organisation uses knowledge management to increase its market position.

As shown in Figure 6.23, this study has found that most respondents agreed about the important of these perspectives to improve and encourages the various KM processes. Most participants thought that it was important to facilitate the exchange of knowledge throughout the organisation. An overwhelming majority of participants said that there is a need to have well designed processes (93%). However, most participants disagreed with the statement that senior management and project managers were encouraging knowledge management in their teams and across the organisation. It can also be seen from the chart below that a high percentage of respondents thought that to facilitate the exchange of knowledge throughout the organisation, there is a need to have well designed processes (57%). surprisingly, only a few respondents thought that the availability of organisation to have difficult and expensive knowledge management systems that are difficult for rivals to duplicate as the lowest factor where only two people who were strongly agree about this.

Perspectives that necessary for KM implementation	Factors	Option										Mean rank	Variance	Standard Deviation	Lower Quartile	Upper Quartile
		Strongly Disagree	%	Disagree	%	Neither Agree nor Disagree	%	Agree	%	Strongly Agree	%					
Organisational Structure	Sharing knowledge should be supported by a standardised reward system.	2	2.40%	1	1.20%	3	3.60%	46	55.40%	31	37.30%	4.24	0.62	0.79	4.00	5.00
	To facilitate the exchange of knowledge throughout the organisation. There is a need to have well designed processes.	1	1.20%	2	2.40%	2	2.40%	31	36.90%	48	57.10%	4.46	0.58	0.76	4.00	5.00
	The organisation's structure can facilitate the discovery, creation, and transfer of new knowledge.	1	1.20%	3	3.60%	4	4.80%	35	41.70%	41	48.80%	4.33	0.67	0.82	4.00	5.00
Organisational Culture	Collaborative and team working is frequently used in my organisation to capture and disseminate knowledge.	10	11.90%	34	40.50%	27	32.10%	10	11.90%	3	3.60%	2.55	0.94	0.97	2.00	3.00
	Employees understand the need for knowledge management to improve company's performance.	7	8.40%	26	31.30%	30	36.10%	17	20.50%	3	3.60%	2.80	0.96	0.98	2.00	3.00
	Senior management and project managers are encouraged knowledge management in their teams and across the organisation.	12	14.50%	36	43.40%	21	25.30%	9	10.80%	5	6.00%	2.51	1.12	1.06	2.00	3.00
Human Resources	Human resource management can be a knowledge facilitator by getting all the information needed to the right people at the right time.	2	2.40%	4	4.80%	5	6.00%	45	54.20%	27	32.50%	4.10	0.79	0.89	4.00	5.00
	The implication of knowledge management practices can contribute to human resource development.	1	1.20%	3	3.60%	4	4.80%	37	44.00%	39	46.40%	4.31	0.67	0.82	4.00	5.00
Competitive Advantage	My organisation has difficult and expensive knowledge management systems that are difficult for rivals to duplicate.	22	26.20%	34	40.50%	20	23.80%	6	7.10%	2	2.40%	2.19	0.96	0.98	1.00	3.00
	The organisation uses knowledge management to increase market position.	0	0.00%	3	3.60%	12	14.50%	34	41.00%	34	41.00%	4.19	0.66	0.81	4.00	5.00

Table 6.29: Perspectives are necessary for KM implementation

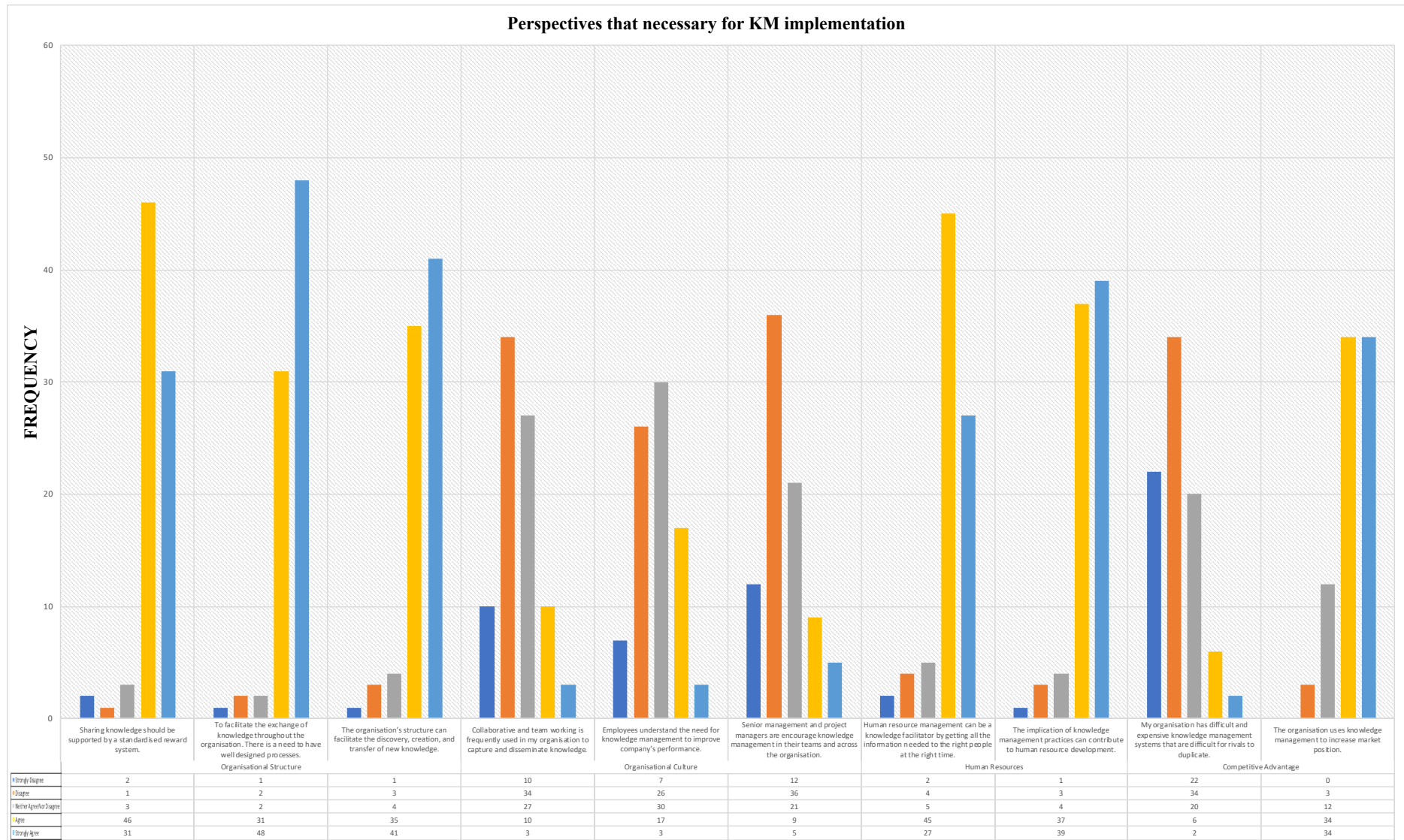


Figure 6.23: Perspectives that necessary for KM implementation

Section Summary

To sum up, the most interesting finding was that the application of KM processes needs to be supported by the research proposed perspectives where discussed as in Table 6.29 to facilitate its implementation. Another important finding was that the components of knowledge as discussed in Table 6.28 are key factors to enable KM existence and to achieve organisational learning based on knowledge captured. This finding also confirms the association between the literature review and those findings can be relatively close as there was no optimal use of KM processes and practices in the KSA. The findings further support the idea of using the proposed perspectives to facilitate KM adoption. It is therefore likely to suggest that such connections should exist between KM processes and perspectives to KM adoption via PMO can be an appropriate solution as shown in table (6.30). A possible explanation for these results may be the lack of adequate processes to create knowledge across the organization; in order to facilitate the circulation of knowledge throughout the organisation, there is a need to have well designed processes.

KM Processes		Perspectives necessary to KM adoption	
Knowledge Creation Process	There is no set of processes to acquire knowledge about suppliers and customers.	Organisational Structure	Creating knowledge should be supported by a standardised reward system.
	There is no set of processes to create knowledge across the organisation.		To facilitate the creation of knowledge throughout the organisation. There is a need to have well designed processes.
	There is no set of processes to generate from existing knowledge some types of new knowledge.		The organisation's structure should facilitate the discovery, creation, and transfer of new knowledge.
Knowledge Transferring Process	Organisation should have a specific process for organising and filtering knowledge.	Organisational Culture	There is a limitation to frequently used Collaborative and team working to capture and disseminate knowledge.
	Organisation should have a specific process to transfer explicit knowledge to individuals.		There is a limitation of Employees to understand the need for knowledge management to improve company's performance.
	Organisation should have a specific process to collect tacit knowledge from individuals into the organisation.		There is a limitation of Senior management and project managers to encourage knowledge management in their teams and across the organisation.
Knowledge Reusing Process	The utilisation of knowledge management can improve efficiency by matching problems and challenges to the source of knowledge.	Human Resources	Human resource management should be a knowledge facilitator by getting all the information needed to the right people at the right time.
	The development of new services, policies, and strategies should be based on the knowledge gained.		The implication of knowledge management practices should contribute to human resource development.
Knowledge Capturing Process	There is no set of process to protect knowledge from inappropriate use inside and outside the organisation.	Competitive Advantage	There is a limitation of organisation to have difficult and expensive knowledge management systems that are difficult for rivals to duplicate.
	Organisation should have policies and procedures to protect its trade secrets.		The organisation should uses both knowledge management and competitive advantage to increase market position.
Knowledge Components	People cannot perform and understand their own and other's tasks.	Organisational Learning	There is a limitation to often sends employees to different workshops, seminars, and conferences to acquire knowledge.
	People cannot communicate easily with specialists in the field to gain knowledge.		There is a limitation to frequently providing internal training programs and coaching sessions for staff.
	There is a need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation.		There is a limitation to make employees aware of the goals and strategies of the organisation.

Table 6.30: Synthesis of KM implementation based on quantitative analysis

6.3 Analysis

To draw a conclusion representing the wider population, inferential statistical analysis is provided in this section to explore the relationships among variables and to compare groups. Using inferential statistical analysis enables us to make a judgment of probabilities. There is a possibility that observed differences between the identified factors are depending on each other or there is no obvious relationship between them.

6.3.1 Generation of Hypotheses

Upon the analysis of findings, there no possibility to prove the hypothesis is correct. However, it is possible to indicate if the hypothesis is to be rejected and never to be proven (Fellows and Liu (2008:127)). Therefore, in this research the null hypotheses are to be tested. A number of fourteen hypotheses were proposed and examined. In line with Ghasemi (2012), when there is no statistical significance between the two variables, a null hypothesis should take place. Otherwise, when there is a statistically significant relationship between two variables, an alternative hypothesis is the one to be accepted. Abowitz and Toole (2010) propose that, in the presence of a P value of 0.05, there is still a chance of an error occurring by 1 in 20 or 5%. It is widely known that a P-value of 0.05 or less is considered significant in the Social Sciences, and despite the risk of statistical error, the null hypothesis is to be rejected. However, according to Henderson (2006), who discusses when to accept or reject null hypothesis, if the p-value is less than 0.05, it is possible to reject the null hypothesis, and accept the alternative hypothesis. However, if the p-value is more than 0.05, it is not possible to reject the null hypothesis as there is not enough evidence to reject its statement and prove it wrong. To explore the relationships among variables and comparison groups, the following hypotheses were identified:

- H1: Larger, government-based projects have a higher propensity to invest in the construction of public building and civil engineering projects (Bridges, Roads .. etc).
- H2: Organisations that undertake large projects are likely to deal more with government-based projects.
- H3: Organisations with a higher turnover are likely to invest more in new projects rather than in refurbishments or multi-phased projects.
- H4: Respondents with more experience of working in the construction industry have a higher propensity to evaluate the level of sub-contracting as very low.

- H5: Generally, most employees working in the Kingdom of Saudi Arabia (KSA) are likely to stay working there more years.
- H6: The type of employment has an impact on the willingness of employees to stay with their current employer.
- H7: The type of client has an impact on the form of contracts that the organisation uses.
- H8: Senior respondents prefer to have fixed-price contracts over others.
- H9: Organisations with the highest turnover are likely to have larger number of employees.
- H10: Respondents working within the head office understand the roles of the PMO more than respondents who work away on project sites.
- H11: Senior management is more likely to see the PMO as very important.
- H12: Respondents with the highest age have the lowest willingness to engage in KM processes.
- H13: Respondents with the highest levels of experience are less likely to support the important of knowledge management components.
- H14: Respondents working in the project based away from the head office are less likely to see the importance of KM for improving their organisational learning.

6.3.2 Test for Normality:

To test if the data is normally distributed, this research project followed the procedures suggested by Pallant (2016). Firstly, to assess the availability of data, the case processing summary was used to confirm that there is no missing value. Secondly, through the descriptive table, it is possible to test the normality by using the Skewness test. Thirdly, Kolmogorov-Smirnov and Shapiro-Wilk were also used to support the findings of the previous test. Fourthly, the normal Q-Q and de-trended normal Q-Q plot were used to visualize the result. Based on the result, the research will evaluate the parametric and non-parametric test, which each has different types of tests. The results of the Case Processing Summary as shown in table 6.31 is used to check the information about the sample and that the number of cases (N) is correct, which is represented by 86 and there was no missing data.

Case Processing Summary	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Type of Project has organisation executed in the last 10 years	86	100.0%	0	0.0%	86	100.0%
Position in the Organisation	86	100.0%	0	0.0%	86	100.0%
Nationality of Participant	86	100.0%	0	0.0%	86	100.0%

Figure 6.24: Case Processing Summary

Bernold (2007) defined the Skewness test as a measure of the asymmetry of the distribution. To identify the normal distribution of data, the value of skewness should be zero. The distribution of data on the right or left side can be used to assess if there is a positive skew or a negative one. As provided in table 6.31, the skew of the three questions did not have a zero value, which indicates that the data was not normally distributed. Therefore, it is not possible to prove normal univariate distribution. For this reason, another type of test was used to assess the normality of data.

Descriptive		Statistic	Std. Error	
Type of Project has organisation executed in the last 10 years	Mean		4.17	.221
	95% Confidence Interval for Mean	Lower Bound	3.73	
		Upper Bound	4.61	
	5% Trimmed Mean		4.10	
	Median		3.00	
	Variance		4.216	
	Std. Deviation		2.053	
	Minimum		1	
	Maximum		8	
	Range		7	
	Interquartile Range		3	
	Skewness		.886	.260
	Kurtosis		-.649	.514
Position in the Organisation	Mean		5.73	.283
	95% Confidence Interval for Mean	Lower Bound	5.17	
		Upper Bound	6.30	
	5% Trimmed Mean		5.81	
	Median		7.00	
	Variance		6.904	
	Std. Deviation		2.628	
	Minimum		1	
	Maximum		9	
	Range		8	
	Interquartile Range		5	
	Skewness		-.566	.260
	Kurtosis		-1.325	.514
Nationality of Participant	Mean		4.03	.243
	95% Confidence Interval for Mean	Lower Bound	3.55	
		Upper Bound	4.52	
	5% Trimmed Mean		4.09	
	Median		6.00	
	Variance		5.093	
	Std. Deviation		2.257	
	Minimum		1	
	Maximum		6	
	Range		5	
	Interquartile Range		5	
	Skewness		-.459	.260
	Kurtosis		-1.655	.514

Table 6.31: Skewness: Test for Normality

To appraise the data's suitability, different tests were used to determine normality, which is defined by the data distribution. If the data characterised is symmetrical, this is a sign of normal distribution. Table 6.32 illustrates the Tests of Normality for the chosen three groups of samples, namely; Nationality of Participant, Position in the Organisation, and Type of Project organisation has executed in the last 10 years. This significance tests are used to determine if the data depart from normality. Researchers have shown that the Shapiro-Wilk test and the Kolmogorov-Smirnoff test are two of the most popular tests for normality (Ghasemi and Zahediasl, 2012; Pallant, 2016). The Shapiro-Wilk test was applied to a range of three questions to establish if the data was normally distributed. The statistics for the three group samples studied are in Table 6.33. The results for the proposed variables above; Nationality of Participant, Position in the Organisation, and Type of Project has organisation executed in the last 10 years, indicated that the $P < 0.05$, which is non-normality duo to the low P values were (.000) for all questions indicate that the data is not normally distributed.

Tests of Normality	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Nationality of Participant	.320	86	.000	.712	86	.000
Position in the Organisation	.243	86	.000	.823	86	.000
Type of Project has organisation executed in the last 10 years	.344	86	.000	.790	86	.000
a. Lilliefors Significance Correction						

Table 6.33: Tests of Normality

The plot in the corresponding Q-Q-plots as in Figure 6.25 show the shape of A Normal Q-Q and A De-trended Normal Q-Q plot. This clearly suggests that the data are not normally distributed, as the plots deviate from the straight-line plot. This also indicates that the parametric tests cannot be applied.

Nationality of Participant: (Question 3)

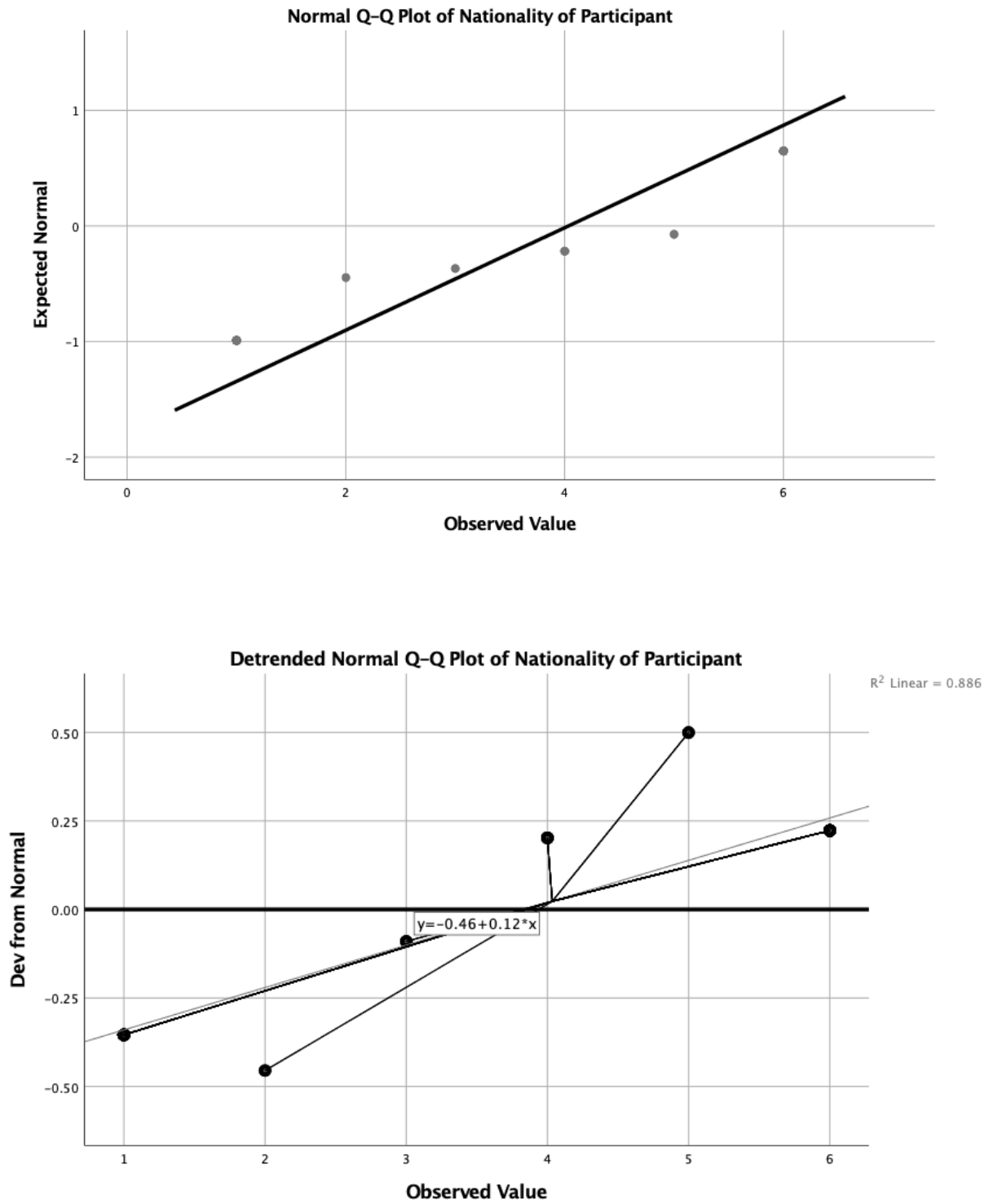


Figure 6.25: Normal Q-Q and De-trended Normal Q-Q plot for Nationality of Participant

Position in the Organisation: (Question 5)

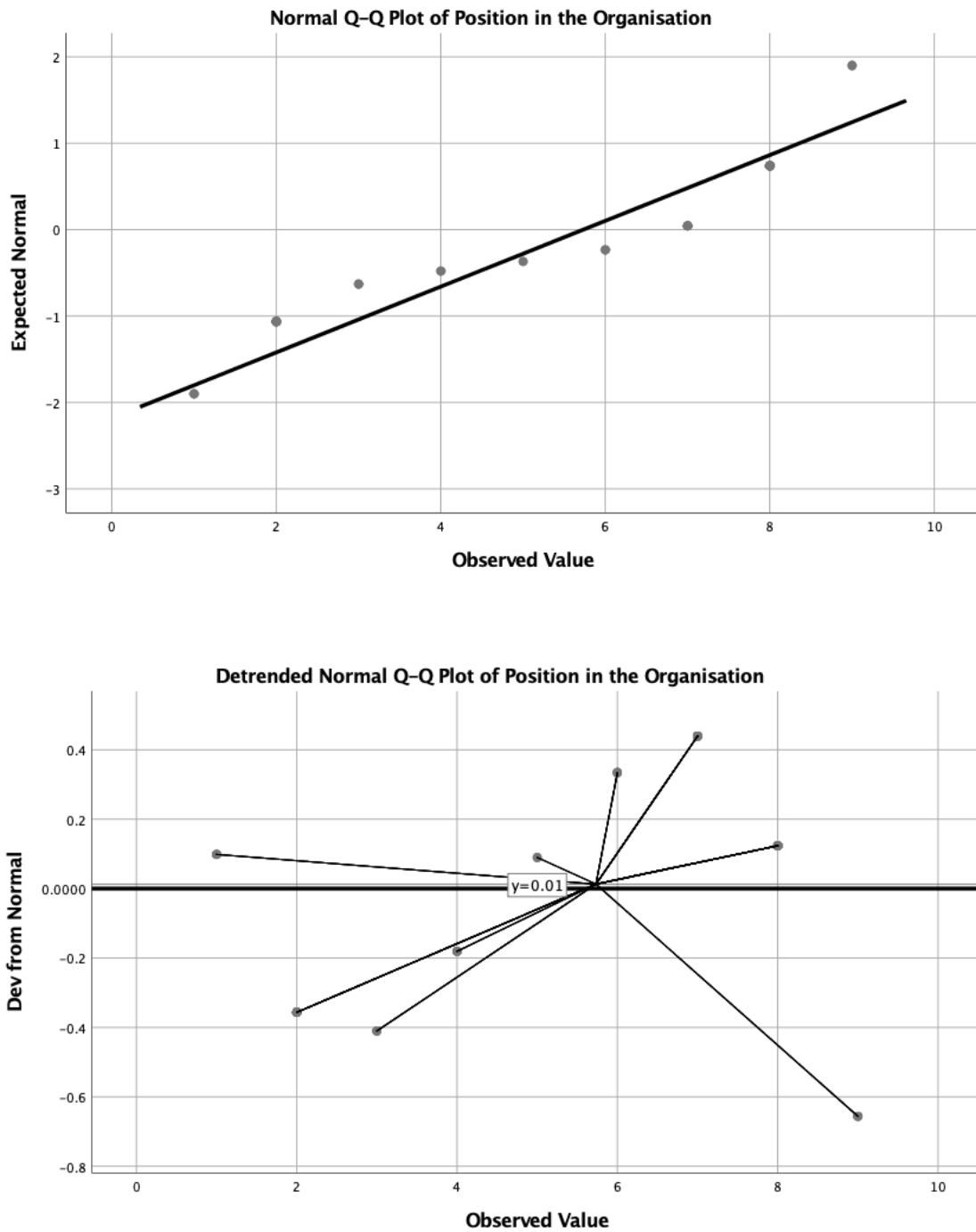


Figure 6.26: Normal Q-Q and De-trended Normal Q-Q plot for Position in the Organisation

Type of Project: (Question 15)

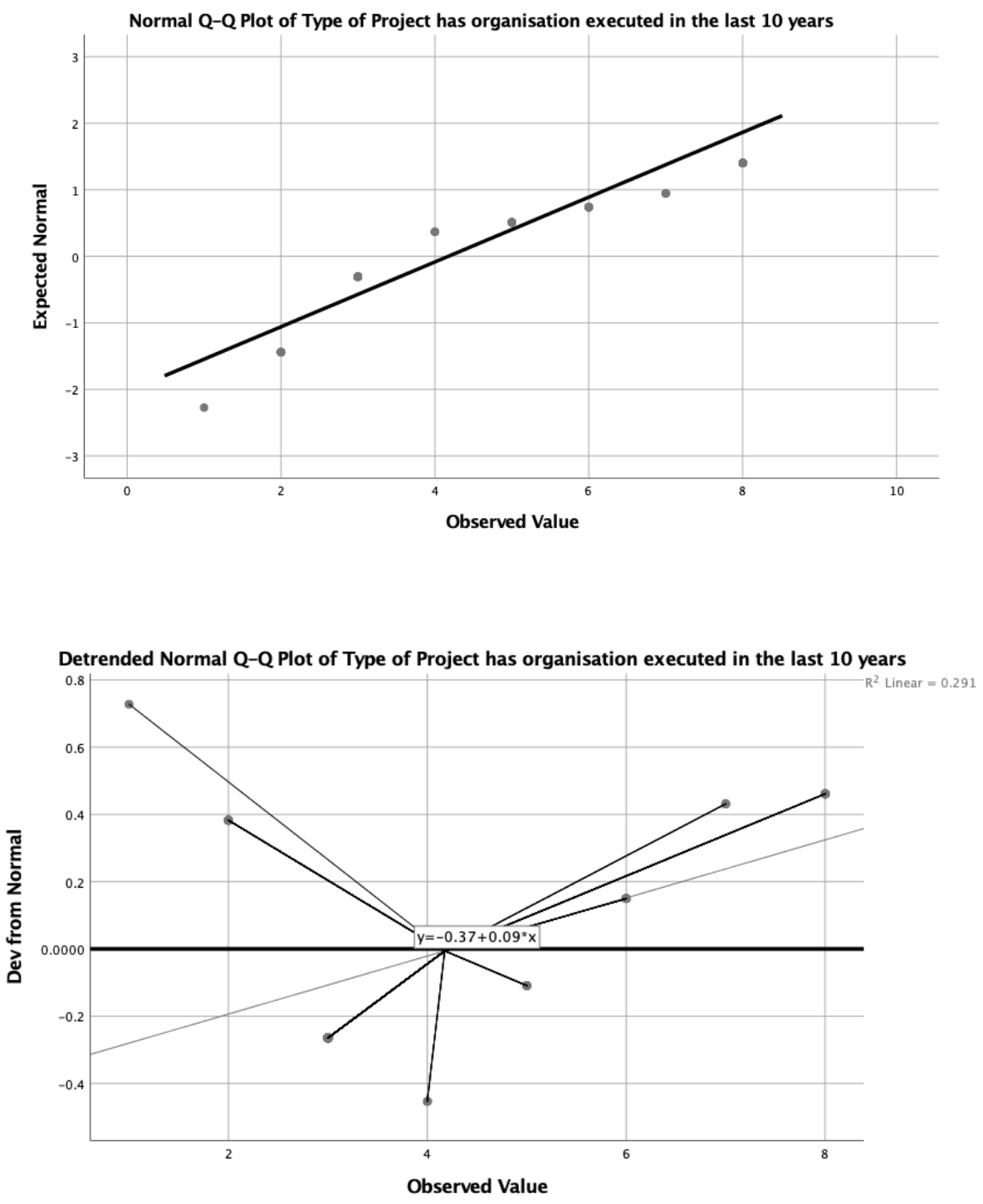


Figure 6.27: Normal Q-Q and De-trended Normal Q-Q plot for Type of Project

6.3.3 Parametric or Non-Parametric Data

Statistical tests have been used to make generalisations about the population from the sample. For assessing the reasonableness of the hypothesis, the statistical test is a formal technique that can be used, and which relies on the probability distribution. Surbhi (2016) highlights that statistical tests are normally classified into parametric or non-parametric forms. The hypothesis test that provides generalisations to make statements for the mean of the wider population is known as a parametric test. This test is generally proposed to deal with variables of interest as measured on an interval scale. By contrast, the hypothesis test that is not based on underlying assumptions about specific parameters is defined as a nonparametric test, which is alternately known as the distribution-free test. This test is likely to be used with variables that measured on a nominal or ordinal level. Table 6.34 illustrates the fundamental characteristics that define parametric and nonparametric tests. Firstly, to differentiate the meaning of these statistical tests, by making specific assumptions about the population, the parametric mostly used. In the case of independent variables, the non-parametric test is suggested. Secondly, based on the distribution, the test statistic can be identified. Thirdly, the type of measurement levels can also suggest which is the most suitable test to be applied. Fourthly, measure of central tendency in the parametric test deals with the mean, which is opposed to the nonparametric test that deals with the median. Fifthly, based on the complete or unavailability of information about the population, the proposed type of test can be chosen. Lastly, through the applicability of variables and testing both variables; researchers usually can determine their choice. The Correlation test in this table (6.34) was given as an example of the suitable statistical techniques that can be applied, whether in a parametric or a non-parametric test.

BASIS FOR COMPARISON	PARAMETRIC TEST	NONPARAMETRIC TEST
Meaning	A statistical test, in which specific assumptions are made about the population parameter is known as parametric test.	A statistical test used in the case of non-metric independent variables, is called non-parametric test.
Basis of test statistic	Distribution	Arbitrary
Measurement level	Interval or ratio	Nominal or ordinal
Measure of central tendency	Mean	Median
Information about population	Completely known	Unavailable
Applicability	Variables	Variables and Attributes
Correlation test	Pearson	Spearman

Table 6.34: Key Differences Between Parametric and Nonparametric Tests (Surbhi, 2016)

6.3.4 Data Analysis Techniques

The non-parametric test was selected, and three different tests were used, namely; Chi-Square Tests, Spearman's rho correlation coefficient, and Kendall's tau-b correlation coefficient. Pallant (2016) defined the Chi Square as a test for independence that can be used when researchers wish to explore the relationship between two or more variables. The Chi-Square test for the null hypothesis assumes there is no relationship existing between the selected categorical variables in the population, which confirms they are independent of each other. Cross tabulation presents the distributions of two categorical variables simultaneously. The process of comparing the observed data of responses in the cells to the pattern that would be predicted in cases, the variables can be then tested as truly independent of each other or dependent. To assess the association that exists between the two variables, the Test of Independence is used. Hence the researcher can see whether the observed cell counts are significantly different from the expected cell counts. The second test that used was a Spearman correlation coefficient.

According to Pallant (2016), Spearman's rho is similar to Pearson's correlation coefficients, but Spearman's rho can measure the strength of relationship between two or more variables. This test is useful when the researcher needs to assess the strength of correlation between two independent variables and the type of data is an ordinal level. The strength of association between two variables can be expressed in a single value between (-1 and +1), which is known as the correlation coefficient. The Spearman's rho correlation coefficient can be negative, indicating a negative correlation between the two variables, which means the variables have a reciprocal relationship, or it can be positive, indicating a positive correlation between the two variables, which means the variables rise and fall together. A correlation coefficient represented by zero indicates that no association exists between the selected variables. But it could be used to assume the linear relationship between variables. The third test used was Kendall's tau-b (τ_b) correlation coefficient, which is a nonparametric measure of the strength and direction of association that exists between two variables measured on at least an ordinal scale. When the data has failed or not suitable using Person's correlation or Spearman's rho, Kendall's tau-b is used as a nonparametric alternative. According to Pallant (2016), correlation is generally used when the researcher describes the strength and direction of the linear relationship between two variables. Kendall's tau-b (τ_b) correlation coefficient it is also known as a statistical technique that explores relationships among variables.

6.3.5 Hypothesis:

Hypothesis 1: Larger, government-based projects have a higher propensity to invest in the construction of public building and civil engineering projects (Bridges, Roads .. etc).

The literature review outlined how the KSA's construction market is likely to become one of the largest emerging markets in the Middle East, with the KSA government set to increase its spending to \$385 billion in the next ten years, as stated in section 2.4.1. In order to benefit from this, KSA construction firms are beginning to execute more than one project at the same time. As a result, companies are engaging in more types of projects than is usual for their size, or with insufficiently experienced professionals to lead their specific types of projects. It was therefore resolved to examine if this potential relationship between the type of projects and the type of clients was statistically significant. A null hypothesis was developed that predicted that larger, government-based projects have a higher propensity to invest in the construction of public building and civil engineering projects (Bridges, Roads .. etc). The relationship between the type of client that the organisation deals with and the type of project that the organisation has executed in the last ten years was investigated using a Pearson Chi-Square test. The results are shown in the Chi-Square tests table 6.35. The chi-square value was 24.799 and the result of p value .037, which is significant as this value is less than the designated alpha value 0.05.

This means the null hypothesis can be rejected asserting that the two variables are dependent on each other. To test the strength of association, Phi and Cramer's V were used, as shown in the Symmetric Measures table 6.36. The value of Phi was (.53) and by Following Cohen's recommendations on the interpretation of effect size for behavioral and psychological studies (1988, p. 25). There is a large association between the two variables suggesting quite a strong relationship between the type of client that the organisation deals with and the type of project that the organisation has executed in the last ten years. The clustered bar chart (Figure 6.28) highlights the group categories and the frequency of counts in these groups. The government-based projects were the principle client that the majority of KSA's organisations deal with. It can be seen that the construction of public building (Green color) and civil engineering projects (Purple color) represented the highest count. This means that changes in the type of client the organisation deals with correlate with changes in the type of project the organisation has executed in the last ten years; it could be concluded that the two variables were strongly

correlated. As a result, in this hypothesis, the p-value is less than 0.05, and so the null hypothesis is rejected, and the alternative hypothesis is accepted.

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.799 ^a	14	.037
Likelihood Ratio	20.789	14	.107
Linear-by-Linear Association	.368	1	.544
N of Valid Cases	86		

a. 19 cells (79.2%) have expected count less than 5. The minimum expected count is .07.

Table 6.36: Chi-Square Tests: Type of client and type of project

Symmetric Measures	Value	Approximate Significance
Nominal by Nominal	Phi	.537
	Cramer's V	.380
N of Valid Cases	86	

Table 6.37: Symmetric Measures: Type of client and type of project

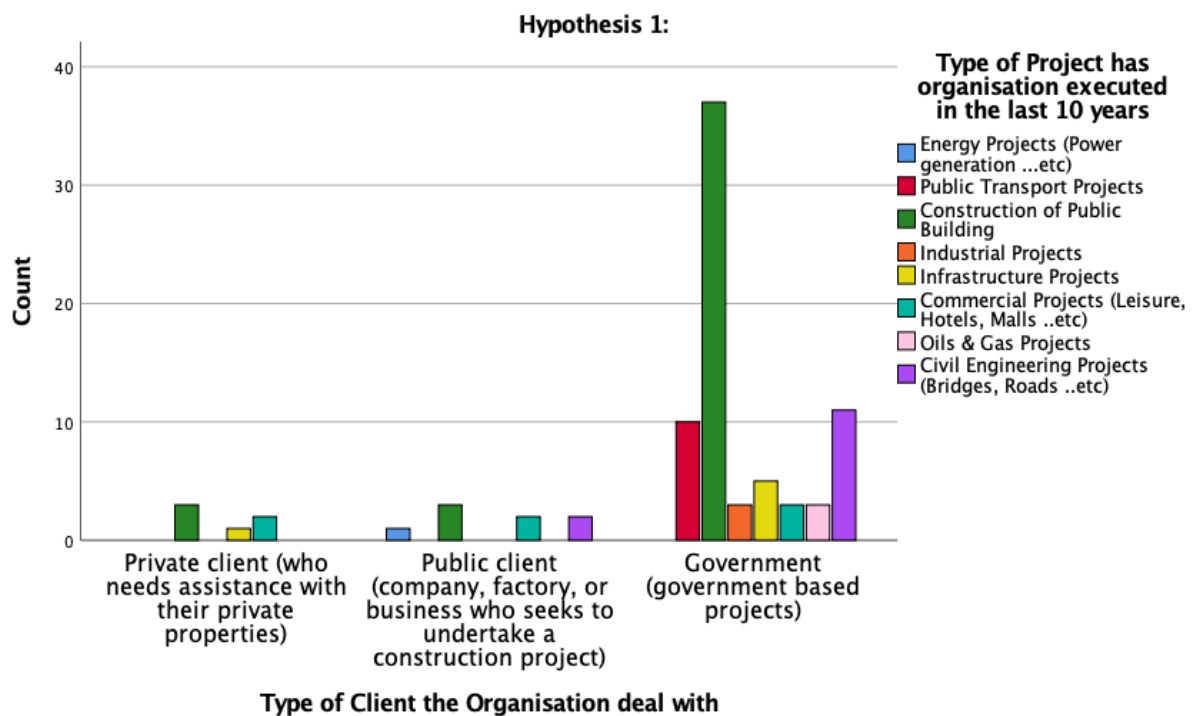


Figure 6.28: Type of client and type of project

Hypothesis 2: Organisations that undertake large projects are likely to deal more with government-based projects.

The literature reported in Section 2.4.3 provides evidence that the KSA government adopted "Saudi Arabia's 2030 Vision" to increase its economic and developmental success. This vision is used as a roadmap and methodology to identify the general policies, direction, goals, and objectives which aim to gain the KSA a leading position in all sectors. The KSA ministers, government entities, and institutions have had to restructure their processes and align them with the vision. The outcome is likely to encourage the larger construction firms to expand their competencies, enhance the level and quality of services and achieve sustainable development. Therefore, to examine if there is a relation between the size of project that firms undertook in the last 10 years and the type of client the organisation deals with was investigated using a Pearson Chi-Square test. A null hypothesis was developed, and it was found that organisations that undertook large projects are more likely to deal with government-based projects. The results are shown in the Chi-Square tests, Table 6.38.

The chi-square value was 29.610 and the result of p value .001, which is significant as this value is less than the designated alpha value of 0.05. This means the null hypothesis can be rejected asserting that the two variables are dependent on each other. To test the strength of association, Phi and Cramer's V were used as shown in the Symmetric Measures table 6.39. The value of Phi was (.587) and by relating this to Cohen (1988, p. 25), which suggested that the interpretation of effect size for behavioral and psychological studies, there is a large association between the size of project that firms undertook in the last ten years and the types of client they dealt with. The clustered bar chart (Figure 6.29) highlights the group categories and the frequency of counts in these groups. The most common size of project that firms undertook is related to the type of client. Specifically, between the government-based project with the size of project that organisations were undertaken in the last ten years over 50 million (light green color). This means that changes in the type of client the organisation deals with correlate with changes in the size of project organisations have executed in the last ten years; it could be concluded that the two variables were strongly correlated. As a result, in this hypothesis, the p -value is less than 0.05, and so the null hypothesis is rejected, and the alternative hypothesis is accepted.

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.610 ^a	10	.001
Likelihood Ratio	19.902	10	.030
Linear-by-Linear Association	8.825	1	.003
N of Valid Cases	86		
a. 14 cells (77.8%) have expected count less than 5. The minimum expected count is .07.			

Table 6.39: Chi-Square Tests: Client type and Size of project

Symmetric Measures		Value	Approximate Significance
Nominal by Nominal	Phi	.587	.001
	Cramer's V	.415	.001
N of Valid Cases		86	

Table: Symmetric Measures: Client type and Size of project

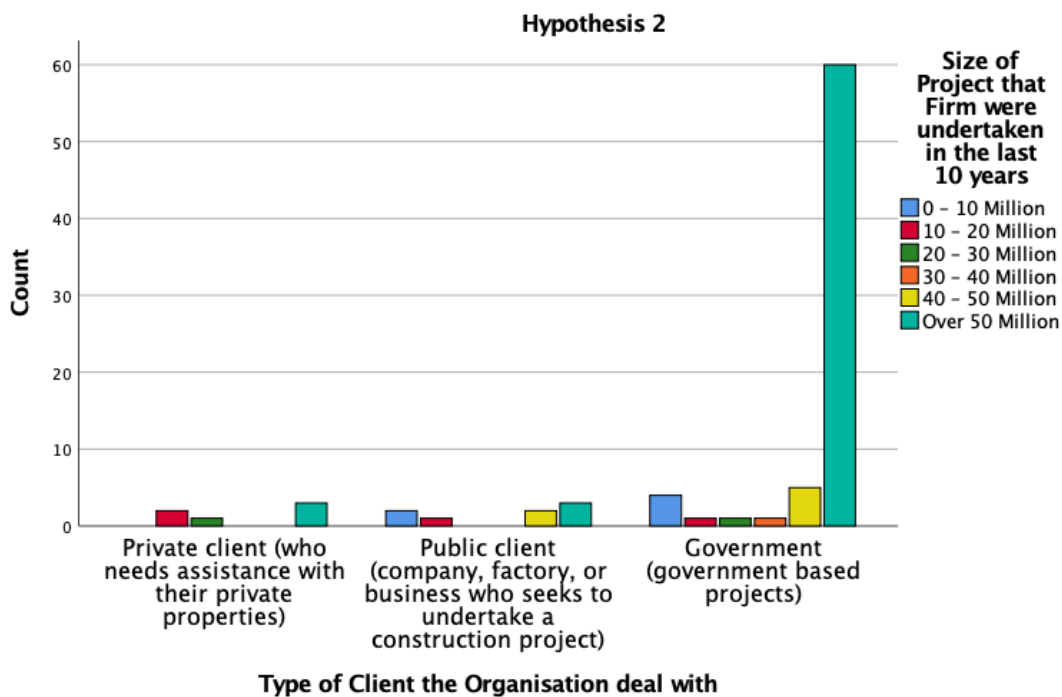


Figure 6.29: Client type and Size of project

Hypothesis 3: Organisations with higher turnover are likely to invest more in new projects rather than refurbishments or multi-phased projects.

The literature review revealed that one of the reasons and challenges behind failing and abandoned projects in the KSA was the inappropriate entry into new project without the clear understanding they are compatible and ready to execute this type and size of project. This can be further investigated by examining if this potential is more likely to be high based on the high execution of new projects rather than refurbishments projects that organisations might execute a number of similar projects. Therefore, a null hypothesis was developed that predicted organisations with a higher turnover are likely to invest more in new projects rather than refurbishments or multi-phased projects. A Chi-Square test was conducted to establish if any significant relationship existed. The chi-square value is 19.669 and the p value that appears in the same row is 0.033. The result is significant as this value is equal to or less than (0.05), the designated alpha value for this research. This means the null hypothesis can be rejected asserting that the two variables are dependent on each other. To test the strength of association, Phi and Cramer's V were used as shown in the Symmetric Measures table 6.40.

However, by applying Cohen's recommendations on the interpretation of effect size for behavioural and psychological studies (1988, p. 25). The value of Phi was (.478), which indicates a medium association between the size of projects that firms undertook in the last 10 years and the type of clients the organisation dealt with. The clustered bar chart (Figure 6.30) highlights the group categories and the frequency of counts in these groups. Most organisations with a turnover of more than 100 million are likely to invest in the execution of new projects rather than other types. The correlation in new projects and their relationship with higher turnover organisations can be seen in chart 6.30 (blue colour). This means that changes in turnover of the organisation are correlated with changes in the current nature of project in the work and could be concluded that the two variables were strongly correlated. As a result, in this hypothesis, the p -value is less than 0.05, which is possible to reject the null hypothesis, and accept the alternative hypothesis.

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	19.669 ^a	10	.033
Likelihood Ratio	16.375	10	.089
Linear-by-Linear Association	6.073	1	.014
N of Valid Cases	86		
a. 15 cells (83.3%) have expected count less than 5. The minimum expected count is .05.			

Table 6.41: Chi-Square Tests: Turnover of the organisation and nature of project

Symmetric Measures		Value	Approximate Significance
Nominal by Nominal	Phi	.478	.033
	Cramer's V	.338	.033
N of Valid Cases		86	

Table 6.42: Symmetric Measures: Turnover of the organisation and nature of project

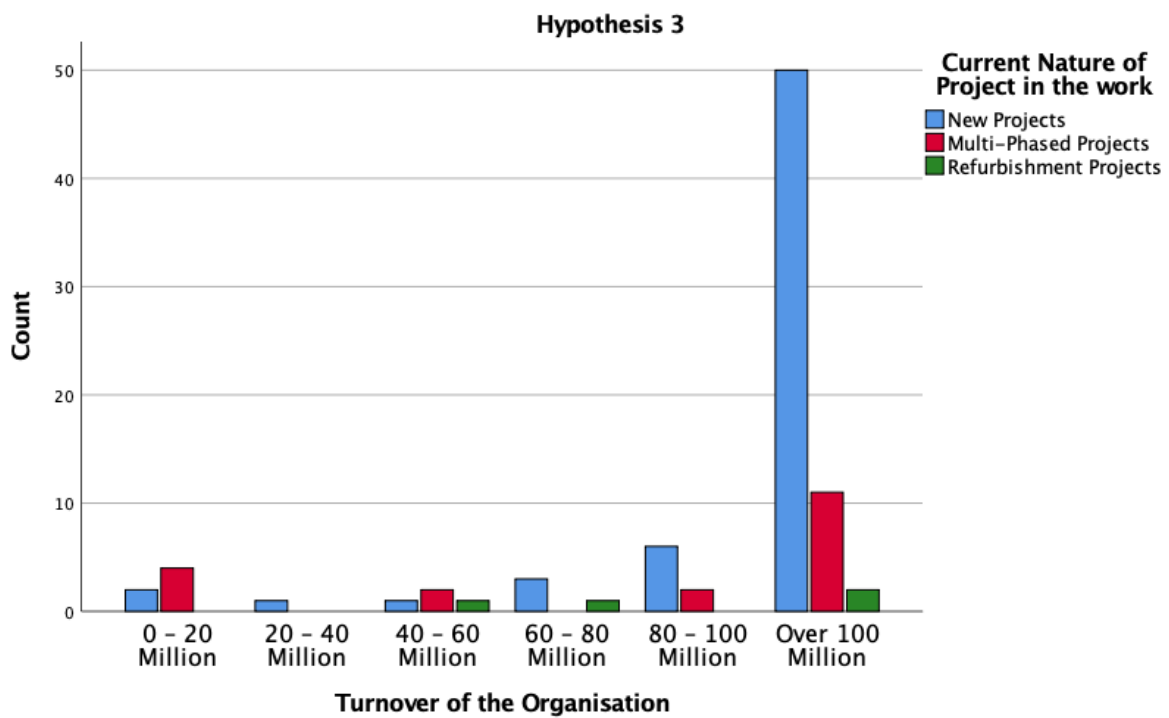


Figure 6.30: Turnover of the organisation and nature of project

Hypothesis 4: Respondents with more experience of working in the construction industry have a higher propensity to evaluate the level of sub-contracting as very low.

The literature review has revealed that one of the most important type of project knowledge widely used in the construction industry is suppliers and subcontractors' knowledge. Better knowledge about contractors, consultants, subcontractors, and suppliers can facilitate the selection of them in future projects. It was therefore resolved to examine if this potential is more likely to be high. Therefore, a null hypothesis was developed that predicted respondents with more experience of working in the construction industry are more likely to evaluate the level of sub-contracting as very low. A Chi-Square test was conducted to establish if any significant relationship existed. The chi-square value is 17.675^a and the *p* value appears in the same row is as 0.126. The result is not significant as this value is larger than (0.05), the designated alpha value for this research. This means the null hypothesis could be accepted asserting that the two variables are independent of each other. In this hypothesis the *p*-value is more than 0.05, therefore it is not possible to reject the null hypothesis.

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.675 ^a	12	.126
Likelihood Ratio	20.054	12	.066
Linear-by-Linear Association	.044	1	.834
N of Valid Cases	86		
a. 14 cells (70.0%) have expected count less than 5. The minimum expected count is .17.			

Table 6.44: Chi-Square Tests: Years of experience and level of sub-contracting

Symmetric Measures		Value	Approximate Significance
Nominal by Nominal	Phi	.453	.126
	Cramer's V	.262	.126
N of Valid Cases		86	

Table 6.45: Symmetric Measures: Years of experience and level of sub-contracting

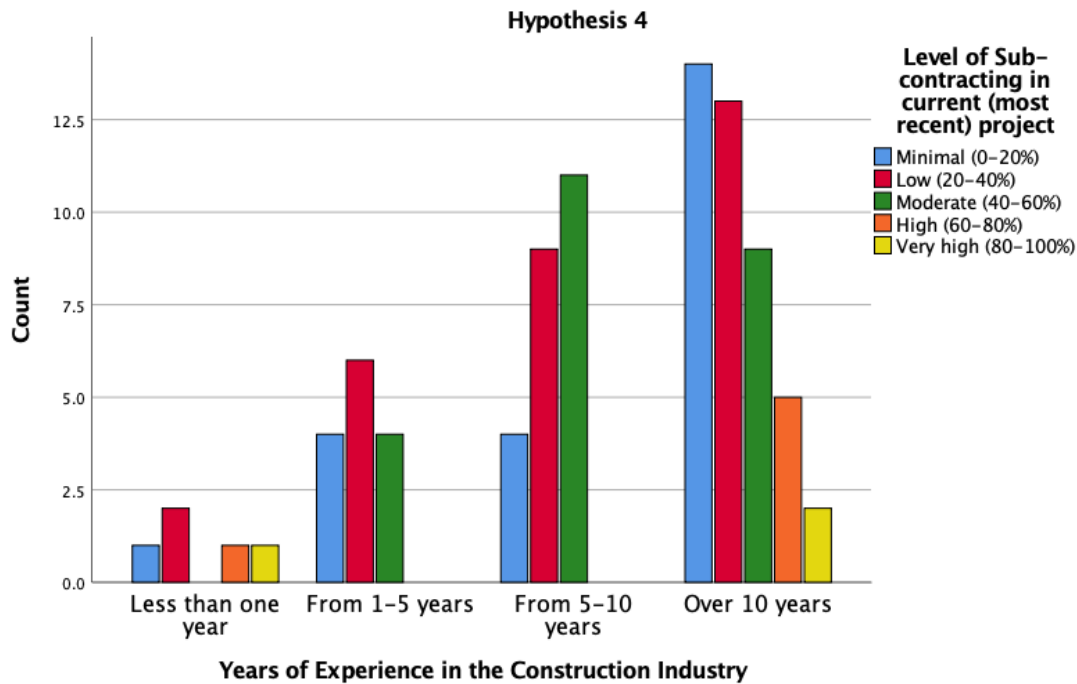


Figure 6.31: Years of experience and level of sub-contracting

Hypothesis 5: Employees working in the Kingdom of Saudi Arabia (KSA) are likely to stay working there more years than in other countries.

The outcome of the literature review has revealed that, the biggest challenge currently facing the KSA’s construction firms is the introduction of immigration controls in 2012, which state that only a maximum of 50% of employees can originate from outside the KSA. Given that most Project Management staff are either European or American citizens, this, together with the temporary and transient nature of construction projects, is causing a significant challenge to most medium to large construction firms operating in the KSA. As a result, the KSA’s construction firms are now facing a skills and knowledge drain as Project Management staff leave both the organisation and the country. Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival. This can be confirmed through investigating that, through a null hypothesis, employees working in the Kingdom of Saudi Arabia (KSA) are likely to stay working there more years than in other countries. It was therefore resolved to examine the relationship between location of work and the number of years employees stayed; this was investigated using Spearman's rho correlation coefficient. The results for Spearman's rho correlation are shown in table 6.47. Firstly, by checking the information about the sample, the number of cases (N) is correct, as represented by 86.

Secondly, to determine the direction of the relationship, the Spearman's rho correlation coefficient (-.018) is negative, indicating a negative correlation between the two variables, which means the variables have a reciprocal relationship; as one variable increases in value, the second variable decreases in value. Thirdly, when determining the strength of the relationship, there is a small correlation relationship between the two variables, which can be fallen under the criteria that suggested by Cohen's (1988, p. 25). This means that changes in the location of the work are not correlated with changes in the number of years. This research may be further examined when considering the likelihood and possibility of employees working across countries. Pearson's r was -.018, which could be conclude that the two variables were not strongly correlated. As a result, in this hypothesis, the p-value is less than 0.05, therefore it is possible to reject the null hypothesis, and accept the alternative hypothesis.

Correlations			Thinking about the past 10 years (2007-2017) where have you been working most of the time	How long did you work in? (relate to question number 9)
Spearman's rho	Thinking about the past 10 years (2007-2017) where have you been working most of the time	Correlation Coefficient	1.000	-.018
		Sig. (2-tailed)	.	.868
		N	86	86
	How long did you work in? (relate to question number 9)	Correlation Coefficient	-.018	1.000
		Sig. (2-tailed)	.868	.
		N	86	86

Table 6.47: Spearman's rho: Location of work and the number of years

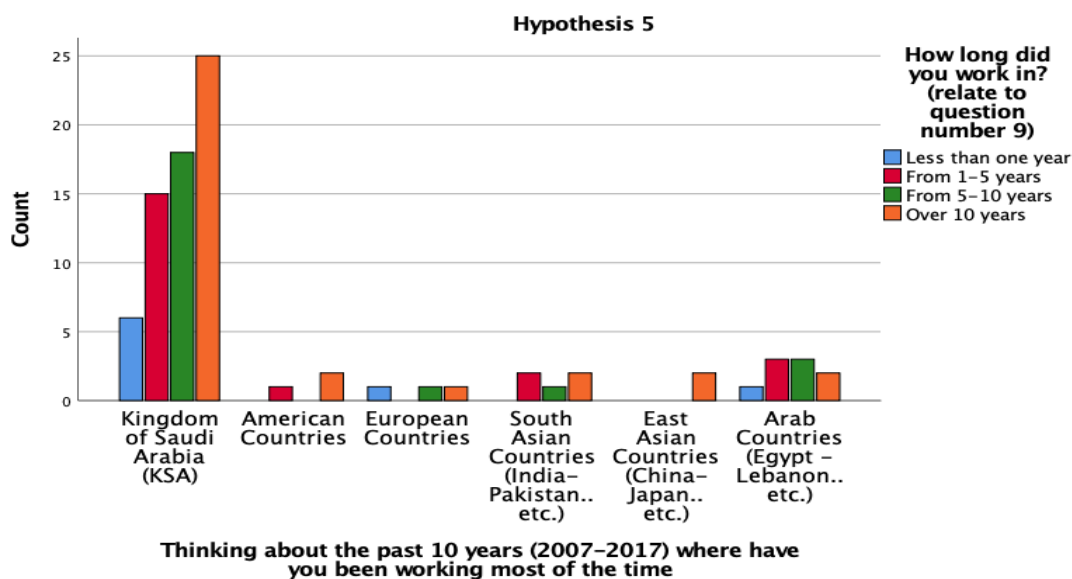


Figure 6.32: Location of work and the number of years

Hypothesis 6: Government contracts as a type of employment has an impact on the willingness of employees to stay within their current employer.

As discussed in the literature review, in section 3.5.6.2, lessons learned can be used to maintain valuable knowledge if current employees are not willing to stay with their current employer. This can be seen as one of the hardest things for the PMO to adopt. Construction firms, in order to avoid repeating unsuccessful experiments, need to create memory and databases for the organisation. PMO leaders should be engaged with projects teams in explaining the reasons why certain types of project are successful or unsuccessful, rather than only making the process of learning more effective. Therefore, it is important to evaluate if there is a relationship between the type of employment and contract and encouraging professional staff to stay. A null hypothesis was developed suggesting that type of contract has an impact on the willingness of employees to stay within their current employer. It was therefore resolved to examine the relationship between the type of employment and the number of years employees stayed with their employer, which was investigated using Kendall's tau-b correlation coefficient.

The results for Kendall's tau-b correlation are shown in table 6.48. Firstly, by checking the information about the sample, the number of cases (N) is correct, as represented by 86. Secondly, to determine the direction of the relationship, the Kendall's tau-b correlation coefficient (.006) are positive, indicating a positive correlation between the two variables, which means the variables rise and fall together, as the type of employment scores increases, the number of years scores also increases, as illustrated in figure 6.33. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables (Cohen,1988). This means that changes in type of contract are correlated with number of years staying with current employer. Kendall's tau-b was (.006); it could therefore be concluding that the two variables were correlated. As a result, in this hypothesis, the p-value is less than 0.05, which means that it is possible to reject the null hypothesis and accept the alternative hypothesis.

Correlations			Type of Employment	Number of years staying with current employer
Kendall's tau-b	Type of Employment	Correlation Coefficient	1.000	.006
		Sig. (2-tailed)	.	.950
		N	86	86
	Number of years staying with current employer	Correlation Coefficient	.006	1.000
		Sig. (2-tailed)	.950	.
		N	86	86

Table 6.48: Kendall's tau-b: Type of employment and number of years staying with employer

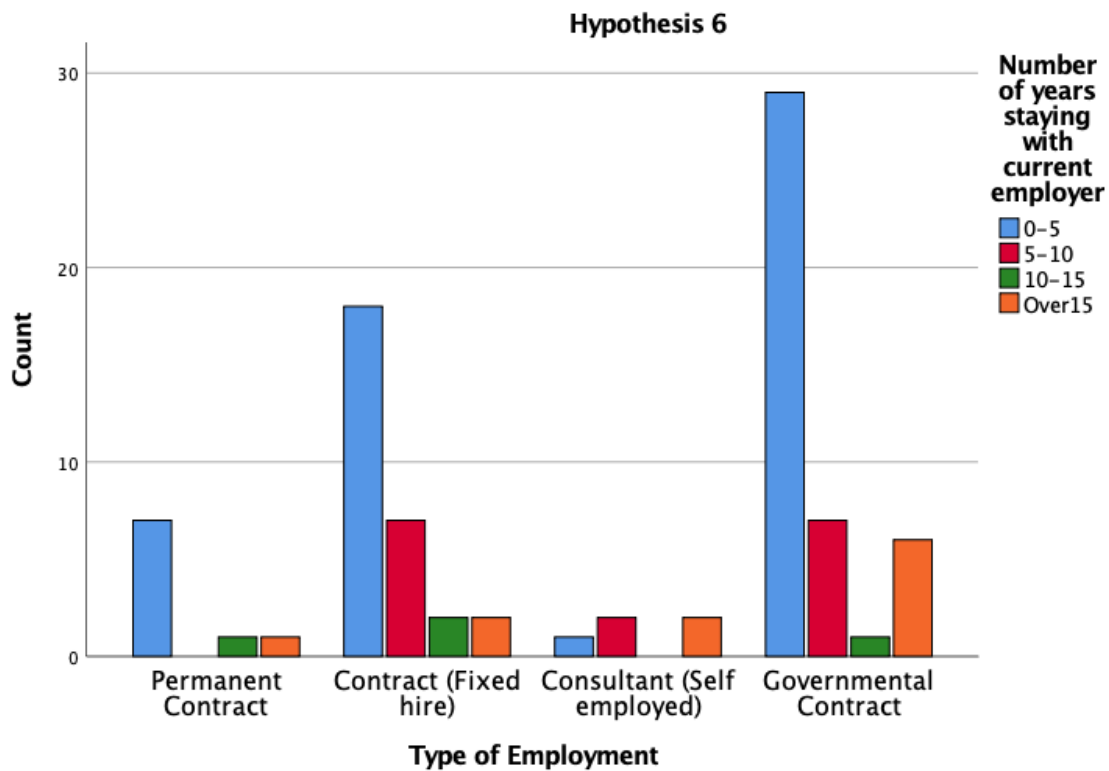


Figure 6.33: Type of employment and number of years staying with employer

Hypothesis 7: Type of client has an impact on the form of contracts that the organisation has to follow.

The literature review, in section 4.2.4, revealed that different types knowledge in construction projects should mainly consider the suppliers and subcontractors' knowledge: Better knowledge about contractors, consultants, subcontractors, and suppliers can facilitate the selection of them in future projects. A null hypothesis was developed that the type of client has an impact on the form of contracts that the organisation has to follow. It was therefore resolved to examine the relationship between the type of client and the form of contracts, which was investigated using Kendall's tau-b correlation coefficient. The results for Kendall's tau-b correlation are shown in table 6.49. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86. Secondly, to determine the direction of the relationship, the Kendall's tau-b correlation coefficient (.304) are positive, indicating a positive correlation between the two variables, which means the variables rise and fall together, as the scores of type of client increase, the form of contract that the organisation has to follow increases as illustrated in figure 6.34.

Thirdly, for determining the strength of the relationship, there is a medium correlation between the two variables (Cohen, 1988). This means that changes in the type of client the organisation deals with are correlated with the form of contract that organisation uses when implementing current or last project. Kendall's tau-b was (.304), which suggests that the two variables were strongly correlated. As a result, in this hypothesis the p-value is more than 0.05, which means that it is not possible to reject the null hypothesis. The direction of the variable relationship is difficult to predict on this study therefore showing a two tailed hypothesis.

Correlations			Type of Client the Organisation deal with	Form of Contracts that organisation has to follow for implementing current or last project
Kendall's tau-b	Type of Client the Organisation deal with	Correlation Coefficient	1.000	.304**
		Sig. (2-tailed)	.	.004
		N	86	86
	Form of Contracts that organisation has to follow for implementing current or last project	Correlation Coefficient	.304**	1.000
		Sig. (2-tailed)	.004	.
		N	86	86
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 6.49: Kendall's tau-b: Type of client and form of contracts

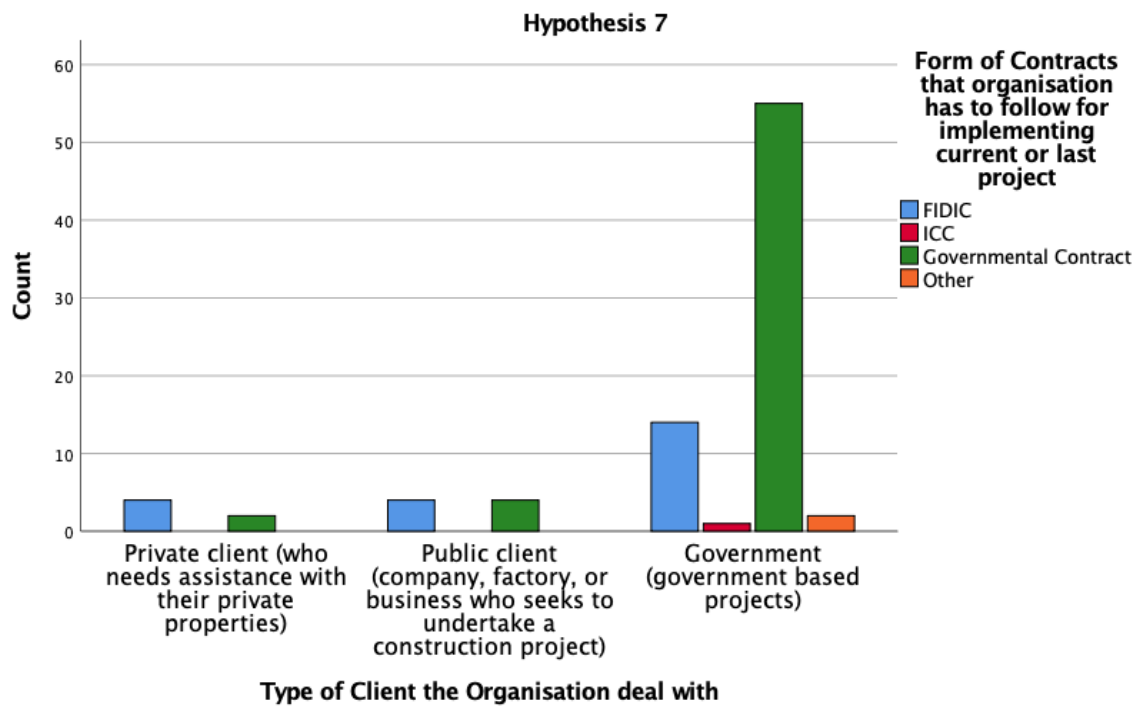


Figure 6.34: Type of client and form of contracts

Hypothesis 8: Seniority of respondents prefer to have fixed-price contracts rather than others.

In line with hypothesis 7 about the different types of project knowledge as discussed in section 4.2.4, one of the main types was the process and procedures knowledge, which is related to the execution of construction projects at different stages. For instance, this can include categories such as designing knowledge, planning knowledge, tendering knowledge, knowledge of contracts and techniques used, and the knowledge of maintenance or operation processes. Therefore, its hypothesis that Seniority of respondents prefer to have fixed-price contracts rather than others. It was therefore resolved to examine the relationship between a person’s position in the organisation and the type of contract they prefer, which was investigated using Kendall's tau-b correlation coefficient. The results for Kendall's tau-b correlation are shown in table 6.50. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86.

Secondly, to determine the direction of the relationship, the Spearman's rho correlation coefficient (-.066) is negative, indicating a negative correlation between the two variables,

which means the variables have a reciprocal relationship; as the seniority of respondents increases, the scores of the type of contract that employees prefer is decreased, as illustrated in figure 6.35. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables (Cohen, 1988). This means that changes in the position of employees are not correlated with changes in the type of contract. Kendall's tau-b was (-.066), which could indicate that the two variables were not strongly correlated. As a result, in this hypothesis, the p-value is less than 0.05, which means that it is possible to reject the null hypothesis and accept the alternative hypothesis.

Correlations			Position in the Organisation	Type of Contract that Employees prefer
Kendall's tau-b	Position in the Organisation	Correlation Coefficient	1.000	-.066
		Sig. (2-tailed)	.	.439
		N	86	86
	Type of Contract that Employees prefer	Correlation Coefficient	-.066	1.000
		Sig. (2-tailed)	.439	.
		N	86	86

Table 6.50: Kendall's tau-b: Position in the Organisation and Type of Contract that Employees prefer

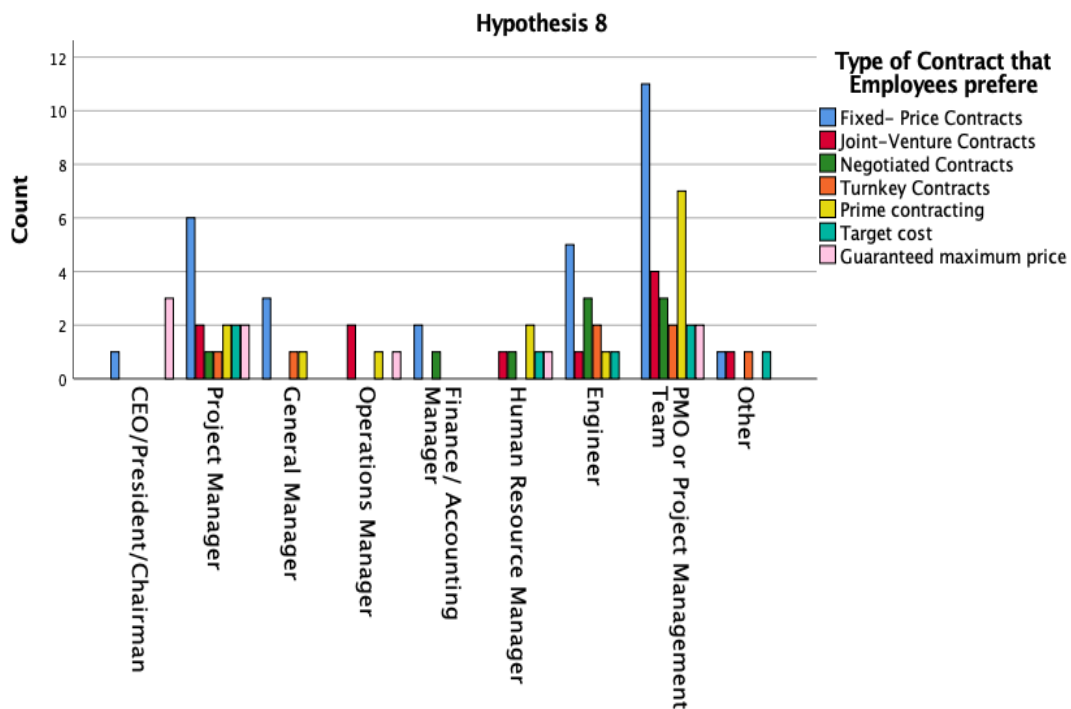


Figure 6.35: Position in the Organisation and Type of Contract that Employees prefer

Hypothesis 9: Organisations with the highest turnover are likely to have larger number of employees.

The literature review revealed that the complexity of today’s construction projects and the increasing competition between construction firms, as well as the larger involvement of multidisciplinary and multinational organisations within the construction industry, are convincing construction firms to be more innovative, project-oriented, and knowledge-driven. The management of construction projects requires the use of a large number of staff and the consumption of large quantities of materials and sources. It was therefore resolved to examine the relationship between the turnover of the organisation and the number of employees; this was investigated using Spearman's rho correlation coefficient.

The results for Spearman's rho correlation are shown in table 6.51. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86. Secondly, to determine the direction of the relationship, the Person correlation coefficient (.706) is positive, indicating a positive correlation between the two variables, which means the variables rise and fall together. Thirdly, for determining the strength of the relationship, there is a statistically strong relationship between the two (Cohens, 1988). This means that changes in the turnover of the organisation are correlated with changes in the number of employees. Pearson’s r was (.706), which suggests that the two variables were strongly correlated. As a result, in this hypothesis the p-value is more than 0.05, which means that is not possible to reject the null hypothesis. The direction of the variable relationship is difficult to predict on this study therefore showing a two tailed hypothesis.

Correlations		Turnover of the Organisation	Number of Employees work for the current employer	
Spearman's rho	Turnover of the Organisation	Correlation Coefficient	1.000	.706**
		Sig. (2-tailed)	.	.000
		N	86	86
	Number of Employees work for the current employer	Correlation Coefficient	.706**	1.000
		Sig. (2-tailed)	.000	.
		N	86	86
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 6.51: Spearman's rho correlation coefficient: Turnover of the organisation and the number of employees

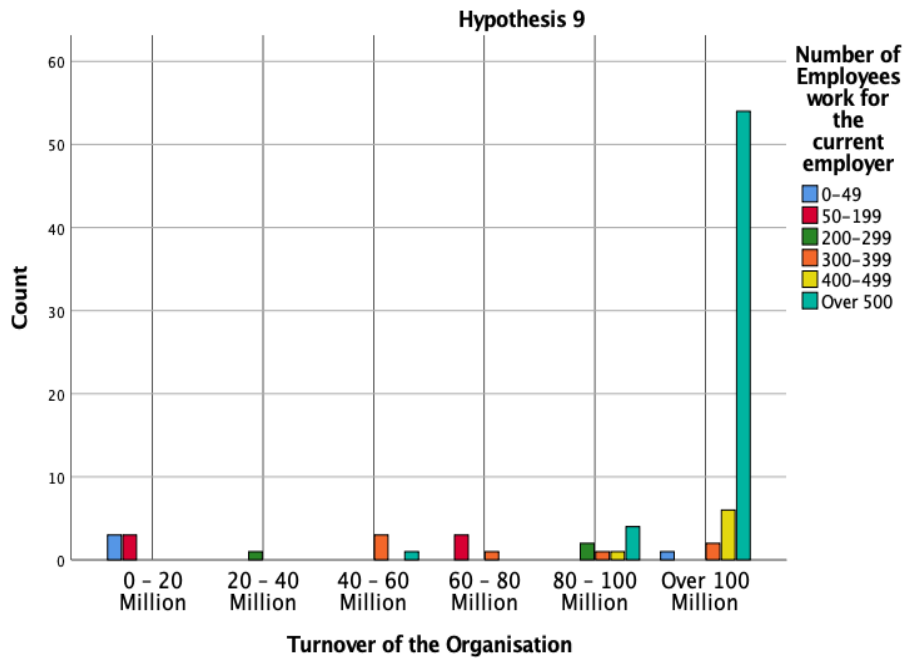


Figure 6.36: Turnover of the organisation and the number of employees

Hypothesis 10: Respondents who work at head office understand the roles of PMO more than respondents who work away on project sites.

Based on the results of the literature review, it can be concluded that the research into how to combine PMs into PMOs has been very successful for helping PMOs to become established and recognised in their value. The participation and sufficient understanding of PMs and project teams enables the fastest implementation of the PMO concept. The existence of PMO as a centralised office can manage the various standards, methodologies, and matrices towards different projects. The PMs in this case have more time to manage other practices such as the scope, quality, and cost of particular projects. Therefore, it is been suggested that employees who work in the head office and /or at the project’s site can support this approach by developing their knowledge. A null hypothesis was developed suggesting that respondents who work at head office understand the roles of PMO more than respondents who work away on project sites. It was therefore resolved to examine the relationship between respondent’s location of work and people's knowledge of the maturity levels of PMOs, which was investigated using Kendall's tau-b correlation coefficient.

The results for Kendall's tau-b correlation are shown in table 6.52. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86. Secondly, to determine the direction of the relationship, the Kendall's tau-b correlation

coefficient (.093) is positive, indicating a positive correlation between the two variables, which means the variables rise and fall together, as the respondent's location of work increase, people's knowledge of the maturity levels of the PMO increases, as illustrated in figure 6.37. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables by Following Cohen's recommendations on the interpretation of effect size for behavioral and psychological studies (1988, p. 25). This means that changes in the respondent's location of work are correlated with people's knowledge of the maturity levels of the PMO. Kendall's tau-b was (.093), which suggests that the two variables were correlated. This means the null hypothesis could be accepted asserting that the two variables are independent of each other. As a result, in this hypothesis the p-value is more than 0.05, which is not possible to reject the null hypothesis.

Correlations		Site (project) based or located in a regional or head office away from the project	People's knowledge of the maturity levels of PMO
Kendall's tau-b	Site (project) based or located in a regional or head office away from the project	Correlation Coefficient	1.000
		Sig. (2-tailed)	.
		N	86
	People's knowledge of the maturity levels of PMO	Correlation Coefficient	.093
		Sig. (2-tailed)	.352
		N	86

Table 6.52: Kendall's tau-b: Respondents location of work and People's knowledge of the maturity levels of PMO

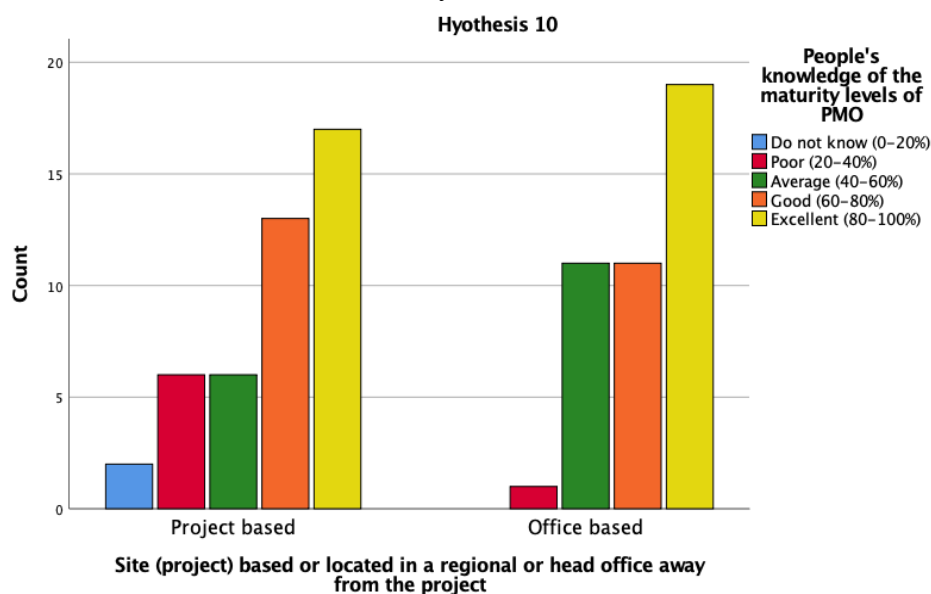


Figure 6.37: Respondents location of work and People's knowledge of the maturity levels of PMO

Hypothesis 11: Senior management has a higher propensity to see PMO as a very important.

Section 3.2.5.2 in the literature review emphasised the importance of involving top management and/or stakeholders in the development of the PMO. A particular weakness in implementing this concept can be seen as the failure to fully acknowledge the needs of senior management and/or the stakeholders. This will decrease the power of the PMO by failing to gain the necessary support. However, this research maintains that senior management and the stakeholders should be involved from the early stages and at each step of the process. Therefore, to examine if there is a relation between the position of respondents and their evaluation of the importance of PMO, the Pearson Chi-Square test was used as a statistical technique to compare groups. A null hypothesis was developed; senior management has a higher propensity to see PMO as very important. The results are shown in the Chi-Square tests table 6.53. The chi-square value was (49.454) and the result of *p* value (.002), which is significant as this value is less than the designated alpha value 0.05. This means the null hypothesis can be rejected asserting that the two variables are dependent on each other. To test the strength of association, Phi and Cramer's V were used, as shown in the Symmetric Measures table 6.54.

The value of Phi was (.758) and by Following Cohen's recommendations on the interpretation of effect size for behavioral and psychological studies (1988, p. 25). There is a large association between the position of respondents and their evaluation of the importance of the PMO. The clustered bar chart highlights the group categories and the frequency of counts in these groups. Participants who were working in the PMO or project management team rated the evolution of the PMO as most important (orange color). This means that changes in higher position are correlated with changes in their understanding and needs of PMO and could be concluded that the two variables were strongly correlated. As a result, in this hypothesis, the *p*-value is less than 0.05, and so the null hypothesis is rejected, and the alternative hypothesis is accepted.

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	49.454 ^a	24	.002
Likelihood Ratio	35.077	24	.067
Linear-by-Linear Association	1.798	1	.180
N of Valid Cases	86		

a. 32 cells (88.9%) have expected count less than 5. The minimum expected count is .03.

Table 6.54: Chi-Square Tests: Position of respondents and the importance of PMO

Symmetric Measures	Value	Approximate Significance
Nominal by Nominal	Phi	.758
	Cramer's V	.438
N of Valid Cases	86	

Table 6.55: Symmetric Measures: Position of respondents and the importance of PMO

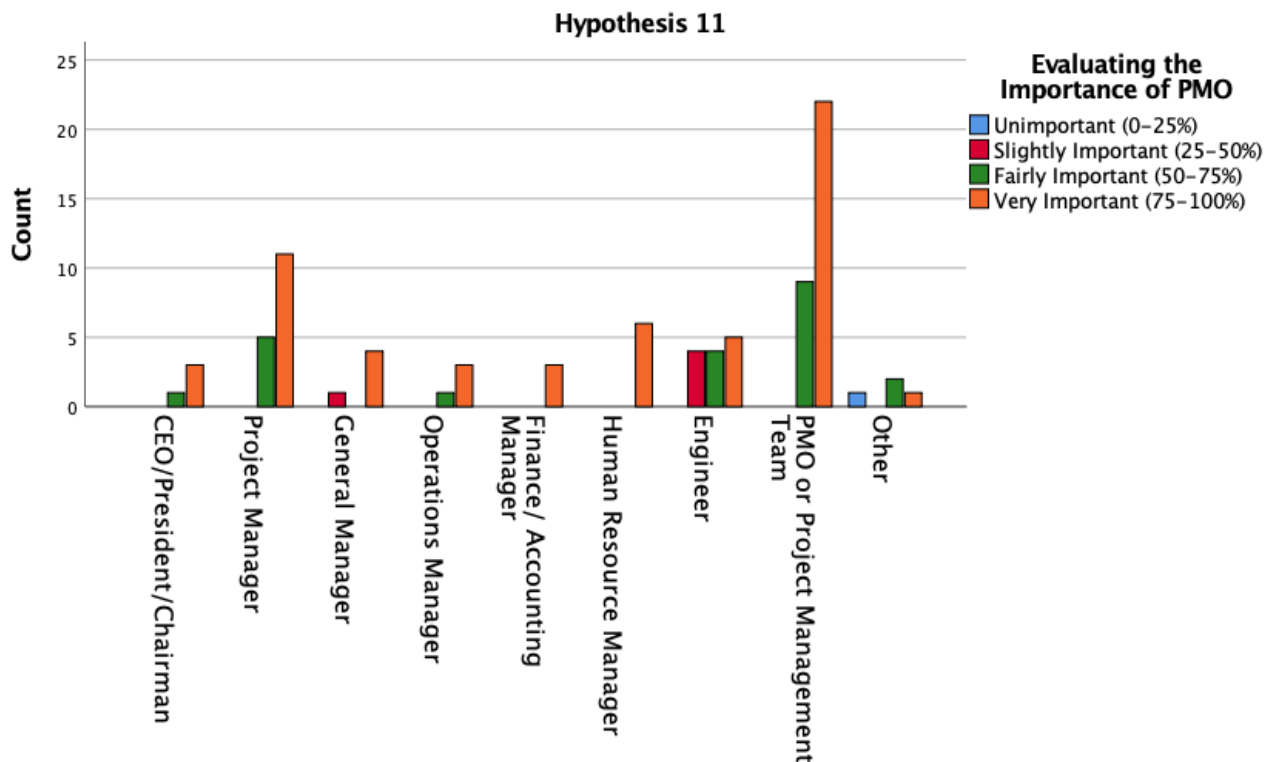


Figure 6.38: Position of respondents and the importance of PMO

Hypothesis 12: Respondents with highest age have lowest willingness to engage in KM processes.

The literature review in section 2.3.1.2 pointed out that KM content needs to constantly be updated. The efforts of KM cannot be effective if the work of other departments in the organisation are not working effectively. Investment in KM might not necessarily make huge profits; therefore, KM cannot be measured only in terms of financial gains. The effectiveness of the employees' participation can be a big challenge in how the organisation successfully implements KM. If employees can interact and understand their importance as a complementary aspect to KM, this challenge can be reduced. This hypothesis states that respondents with the highest age have the lowest willingness to engage in KM processes. The relationship between the age of participant and their willingness to engage with KM was investigated using Spearman's rho correlation coefficient. The results for Spearman's rho correlation are shown in table 6.56. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86.

Secondly, to determine the direction of the relationship, the Spearman's rho correlation coefficient (-.077) is negative, indicating a negative correlation between the two variables, which means the variables have a reciprocal relationship; as the respondents' age increases, their willingness to engage in KM processes decreases, as illustrated in figure 6.39. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables (Cohen, 1988). This means that changes in the ages of respondents are not correlated with changes in acquiring knowledge. Spearman's rho was (-.077), which suggests that the two variables were not strongly correlated. As a result, in this hypothesis, the p-value is less than 0.05, which means it is possible to reject the null hypothesis and accept the alternative hypothesis.

Correlations			Age of Participant	There is a set of processes in my organisation to acquire knowledge about our suppliers and customers
Spearman's rho	Age of Participant	Correlation Coefficient	1.000	-.077
		Sig. (2-tailed)	.	.480
		N	86	86
	There is a set of processes in my organisation to acquire knowledge about our suppliers and customers	Correlation Coefficient	-.077	1.000
		Sig. (2-tailed)	.480	.
		N	86	86

Table 6.56: Spearman's rho: Age of Participant * Acquiring knowledge

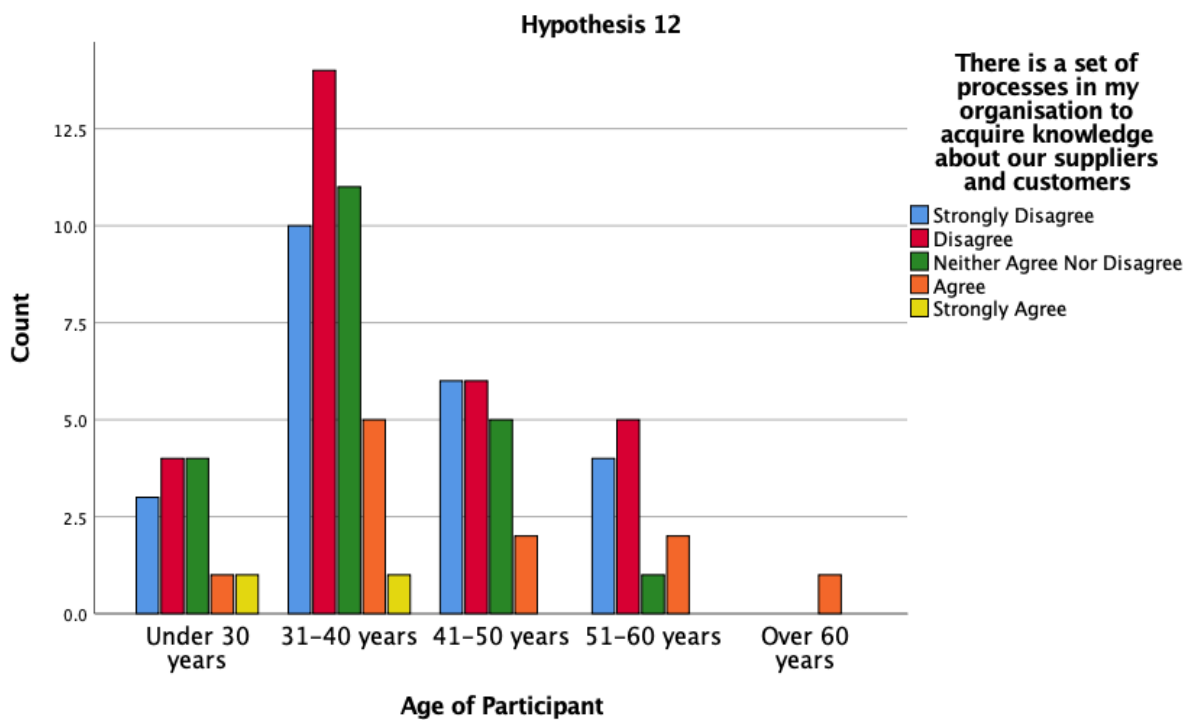


Figure 6.39: Age of Participant and Acquiring knowledge

Hypothesis 13: Respondents with highest experience are less likely to support the importance of knowledge components.

Similar to hypothesis 12, and as mentioned in section 2.3.1.1 of the literature review, using collaboration as a tool to bring individuals to work with other people or groups to achieve assigned tasks is useful to break down barriers between new employees with low experience in different locations and experiences to perform work simultaneously. Therefore, it is important that people with more experience support the existence of knowledge components. However, a null hypothesis indicated that respondents with the most experience are less likely to support the implementation of knowledge components. It was therefore resolved to examine the relationship between years of experience and how people in the organisation can perform and understand their own and other tasks, which was investigated using Spearman's rho correlation coefficient. The results for Spearman's rho correlation are shown in table 6.57. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86.

Secondly, to determine the direction of the relationship, the Spearman's rho correlation coefficient (.049) is positive, indicating a positive correlation between the two variables, which means the variables rise and fall together, as the years of experience increase, they disagree for the importance of knowledge components increases as illustrated in figure 6.40. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables by following Cohen's recommendations on the interpretation of effect size for behavioral and psychological studies (1988, p. 25). This means that changes in the experiences of respondents are correlated with changes in their opinions. Spearman's rho was (.049), which could suggest that the two variables were correlated. As a result, in this hypothesis, the p-value is less than 0.05, which means that it is possible to reject the null hypothesis and accept the alternative hypothesis.

Correlations			Years of Experience	People in my organisation can perform and understand their own and other's tasks
Spearman's rho	Years of Experience	Correlation Coefficient	1.000	.049
		Sig. (2-tailed)	.	.654
		N	86	86
	People in my organisation can perform and understand their own and other's tasks	Correlation Coefficient	.049	1.000
		Sig. (2-tailed)	.654	.
		N	86	86

Table 6.57: Spearman's rho: Years of experience and knowledge components

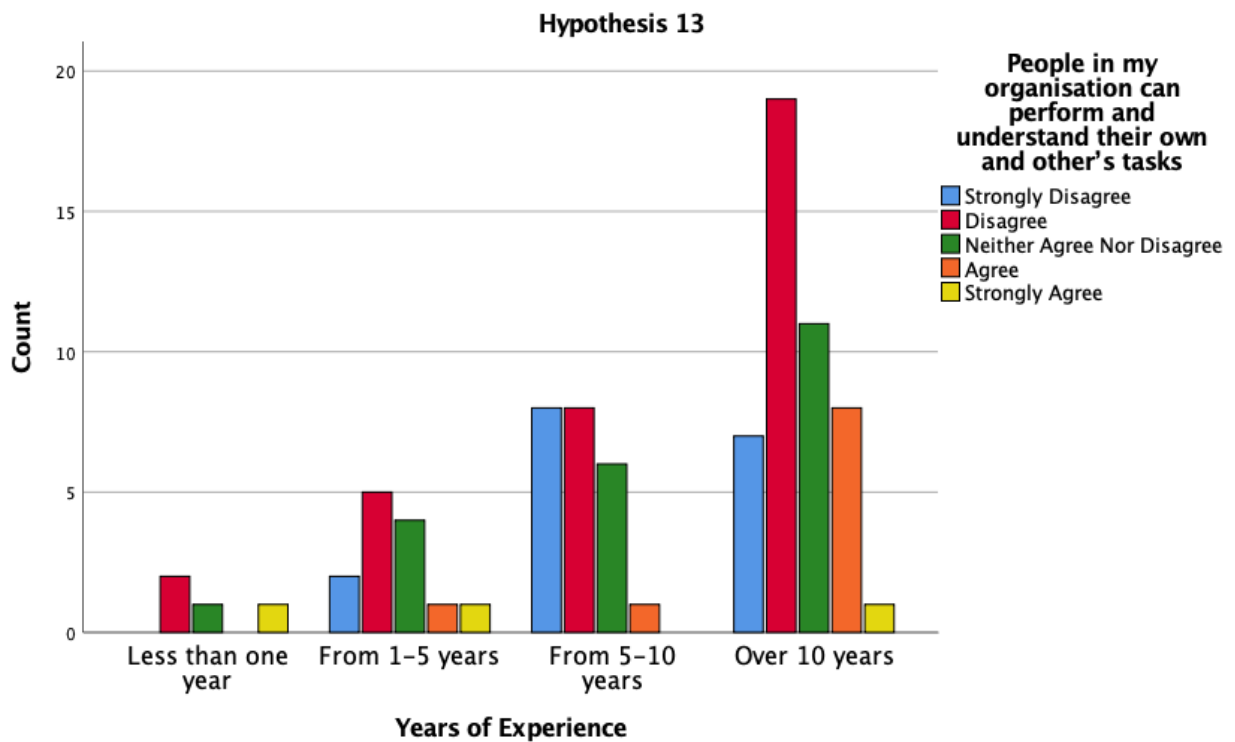


Figure 6.40: Years of experience and knowledge components

Hypothesis 14: Project-based respondents are less willing to see the importance of KM for improving organisational learning.

The result of the literature review has revealed that, as in section 2.3.7, competitive advantage seems to be one of the main benefits of gaining effective knowledge, which is based on intellectual assets rather than physical assets. When employees leave the organisation, their information, ideas, experiences, and insights will be lost if there is no clear attempt made to save the information. Knowledge sharing is a key activity of knowledge management. KM, in order to be utilised, needs to be transferred and stored in the company's memory; it needs to show its effective contribution to improving business performance. This hypothesis states that project-based respondents are less likely to recognise the importance of KM for improving organisational learning. It was therefore resolved to examine the relationship between location of work and views on the importance of KM, which was investigated using Spearman's rho correlation coefficient. The results for Spearman's rho correlation are shown in table 6.58. Firstly, by checking the information about the sample, the number of cases (N) is correct as represented by 86.

Secondly, to determine the direction of the relationship, the Spearman's rho correlation coefficient (-.022) is negative, which indicates a negative correlation between the two variables, suggesting that the variables have a reciprocal relationship. However, as the respondents who work in project-based increase, their willingness to see KM an important factor for organisational learning decreases, as illustrated in figure 6.41. Thirdly, for determining the strength of the relationship, there is a small correlation between the two variables by Following Cohen's recommendations on the interpretation of effect size for behavioral and psychological studies (1988, p. 25). This means that changes in the location of work are not correlated with changes in their opinions. Spearman's rho was (-.022), which could suggest that the two variables were not strongly correlated. As a result, in this hypothesis, the p-value is less than 0.05, which is possible to reject the null hypothesis, and accept the alternative hypothesis.

Correlations			Site (project) based or located in a regional or head office away from the project	My organisation often sends employees to different workshops, seminars, and conferences to acquire knowledge
Spearman's rho	Site (project) based or located in a regional or head office away from the project	Correlation Coefficient	1.000	-.022
		Sig. (2-tailed)	.	.843
		N	86	86
	My organisation often sends employees to different workshops, seminars, and conferences to acquire knowledge	Correlation Coefficient	-.022	1.000
		Sig. (2-tailed)	.843	.
		N	86	86

Table 6.58: Spearman's rho: Respondents work location and knowledge importance for organisational learning

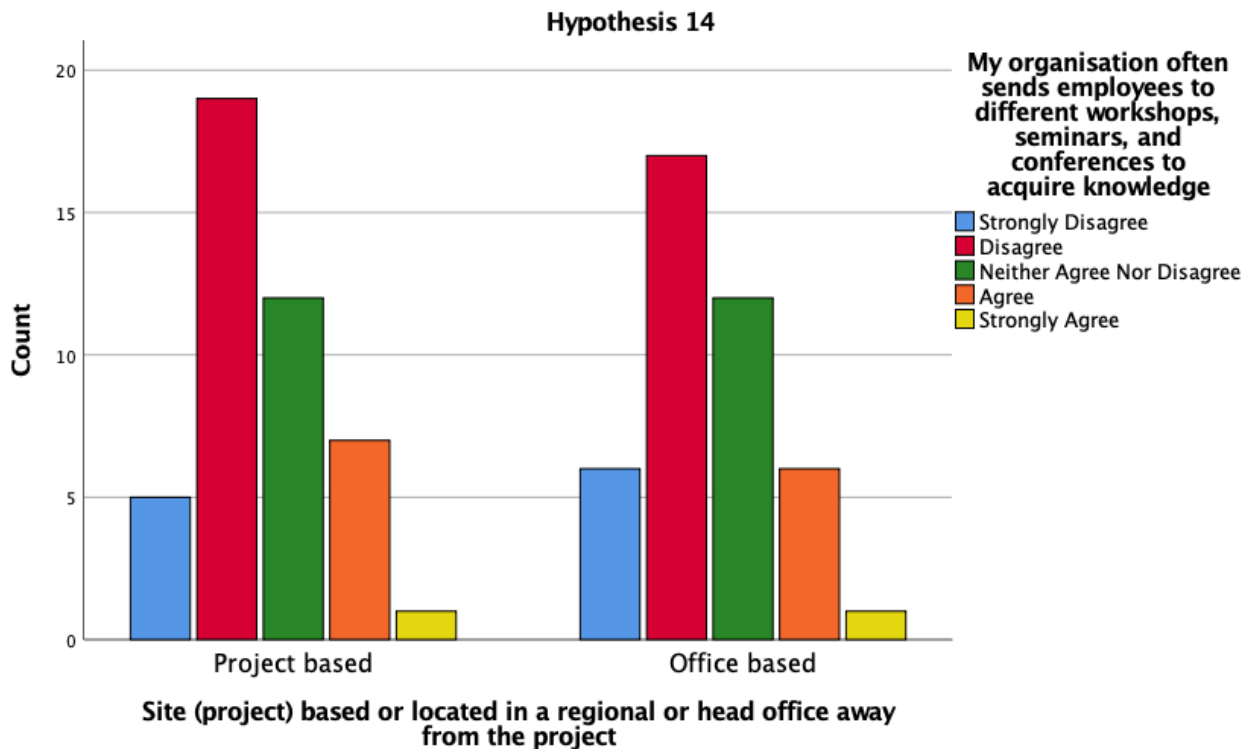


Figure 6.41: Respondents work location and knowledge importance for organisational learning

6.4 Concluding Chapter Seven

This chapter has analysed the collected data obtained from different organisations in the KSA to describe and explore what is happening in the KSA's construction market. The findings from this chapter have been divided into two main sections. Firstly, the chapter has offered a descriptive analysis is to provide simple descriptive tests that applied to generate a range of tables and charts. The descriptive analysis of the questionnaire method was divided into three sections. The first section was comprised of biographical questions to support the main analysis. The second section evaluated opinions about what is happening in the KSA construction market. The third section evaluated KM processes, components, and the necessary perspectives for its adoption. The second section of the chapter has offered an inferential analysis, highlighting the nature of relationships between variables and groups. This inferential analysis was used to draw a conclusion representing the wider population, by exploring the relationships among variables and comparison between the identified two groups.

A number of 14 hypotheses were established to make a judgment of the probability to evaluate the difference between the selected groups. To appraise the data's suitability, different tests were used to determine normality, including the Skewness test as a measure of the asymmetry for the distribution, the Shapiro-Wilk test, the Kolmogorov-Smirnov test, and the plot in the corresponding Q-Q-plots. Based on their outcomes, the non-parametric test was selected, and three different tests were used namely; Chi-Square Tests, Spearman's rho correlation coefficient, and Kendall's tau-b correlation coefficient. As proposed in chapter four, the data were collected randomly from medium to large organisations from multiple locations in the KSA. The survey questionnaires have been distributed equally to two groups namely; project-based groups and office-based groups. A number of 340 of questionnaires were distributed to employees from different positions under these two groups. The average response rate was 25.5% and a number of 86 were identified as a usable completed questionnaire. The BoS survey program, Microsoft Excel, and SPSS IBM software were used to distribute and analyse the data.

The main analysis of the findings illustrated that the large majority of respondents were men (95.3%), with far fewer women participating in this survey (4.7%). What is interesting in this survey is that almost 69% of participants were foreign labor and given the new immigration

policy if this questionnaire is representative, 19% of these positions would have to be reduced and go to local employees. This without doubt confirms the concerns mentioned earlier in literatures about the needs of capturing the valuable knowledge before people decide to leave the organisation due to the new immigration controls. Arab Citizens (Egyptian-Lebanon..etc.) category was at the highest level with almost 51% whereas the second category was going for the South Asian Citizens (Indian-Pakistani..etc.). However, European Citizens and East Asian Citizens (Chinese-Japanese..etc.) were the lowest groups who are working in KSA. It was surprising to find that more than half of the respondents identified that they were working in the KSA for the past 10 years (2007-2017). This result suggests strong evidence of the knowledge they might have and how they must be considered important for their organisations to keep them for such a long period of time.

55 respondents out of 86 had been with their employers for no more than 5 years. This may indicate that competition in the construction sector is high and the cost of maintaining professional staff seems also to be high. Therefore, this issue of employees moving from organisation to another requires the implementation of effective KM systems to prepare them for benefiting from employees' knowledge before they leave their current jobs. The majority of KSA's construction firms were working with "government projects" (83%) rather than working with private clients who need assistance with their private properties (7%) and public clients, companies, factories, or businesses who seeks to undertake a construction project (9%). This finding confirms the association between the orientation of KSA's government to invest in large numbers of projects and the chances by construction firms to benefit from these trends. This further indicates the importance of capturing knowledge and considering the needs of lesson learned as they will be dealing with the same client.

The construction of Public Building was the highest targeted of KSA's organisations with a percentage of 50%. However, 76.7% of respondents indicates that their firms undertook more of the large projects worth over 50 Million Saudi Riyal. The chosen sample area indicates that there is currently a boom in construction sector. Interestingly, most organisations took upon new types of projects with a percentage of 73.3%. This confirms that the KSA is a developing country, which is likely to invest more in new projects rather than refurbishment projects which only made up 4.7%. By asking respondents to evaluate the level of sub-contracting in current (most recent) projects, generally, there was a negative feeling from respondents about the

performance of sub-contractors. 61.6% of respondents measured the level of sub-contractor from minimal to low (0-40%), whereas 24 out of 86 respondents had the feeling that sub-contractors' levels were moderate. By asking respondents to evaluate the most-important and least-important practices in the management of construction projects in the KSA, it can be confirmed that by far the greatest demand is for communication and coordination among the various parties and projects, with a percentage around 36%. The second was the knowledge gained from previous projects (22%).

By asking respondents to indicate the most important function of the PMO, the greatest demand was by far for Knowledge Management, with a percentage of around 46%. The second was for Communication Management (21%) and a similar percentage identified the factor of Resource Management (18%). Those factors in section 6.2.2.1 that evaluated the difficulties and challenges of the KSA construction market can be compared with section 6.2.2.2 that evaluated the success factors of the PMO in improving business performance. As a result of analysing sections 6.2.2.4 and 6.2.2.4, it is possible to relate the establishment and evaluation processes of PMOs as road-map structures; the journey of the PMO should be step by step and the successful implementation of PMO does not mean it will be the answer to all an organisation's problems or take the place of the work of other departments. The establishment of the PMO needs to be followed by a successful evaluation process to increase its success and to protect this concept from failures. It can be confirmed that the Office-based group reported significantly more knowledge of the PMO than the Project-based group and that the Office-based group saw the PMO as more significant than the Project-based group.

The most interesting finding was that the application of KM processes needs to be supported by certain necessary perspectives to facilitate its implementation. Another important finding was that the components of knowledge are key factors in enabling its existence and achieving organisational learning based on knowledge captured. This finding also confirms the association between the literature review and those findings can be relatively close as there was no optimal use of KM processes and practices in the KSA. The findings further support the idea of using the proposed perspectives to facilitate KM adoption. It is therefore likely to suggest that such connections should exist between KM processes and perspectives to KM adoption via PMO can be an appropriate solution. This combination of findings provides support for the conceptual premise of this study.

Chapter Seven:

Analysis of Qualitative Data (Interviews)

7.1 Introduction

This chapter of the research will focus on analysing data in different ways, examining the information and details to achieve different research objectives. The first method analyses the data descriptively, considering the different maturity levels of the PMO. The second method is the cross analysis between the different maturity levels, with two main objectives. Firstly, an analysis of similarities and characteristics common among these levels. Secondly, an analysis and identification of factors of difference, which contributed to the existence of different maturity levels. The third method is to discuss the most important results in terms of the purpose of the study, which is divided into three main sections:

- Investigation of the PMO's value and its implementation
- Investigation of the need for KM and its implementation
- Investigation of the contribution of PMOs to both KM and PM practices

Finally, the purpose of these different methods of analysing personal interviews is to investigate what a mature model would look like? Which will later be linked with literature and quantitative data analysis in chapter eight.

7.1.1 Thematical analysis techniques

As discussed earlier in the methodology chapter, thematic analysis was used in this research. According to Braun and Clarke (2006), thematic analysis is a method to identify, analyse, and report themes to summarise the key findings of data. Within the data set, principle themes are highlighted. Thematic analysis was widely used in this study, but as there were no an agreed procedure for doing it. Therefore, the following chart 7.1 presents the analysis processes of the qualitative data, bases on Braun and Clarke (2006):

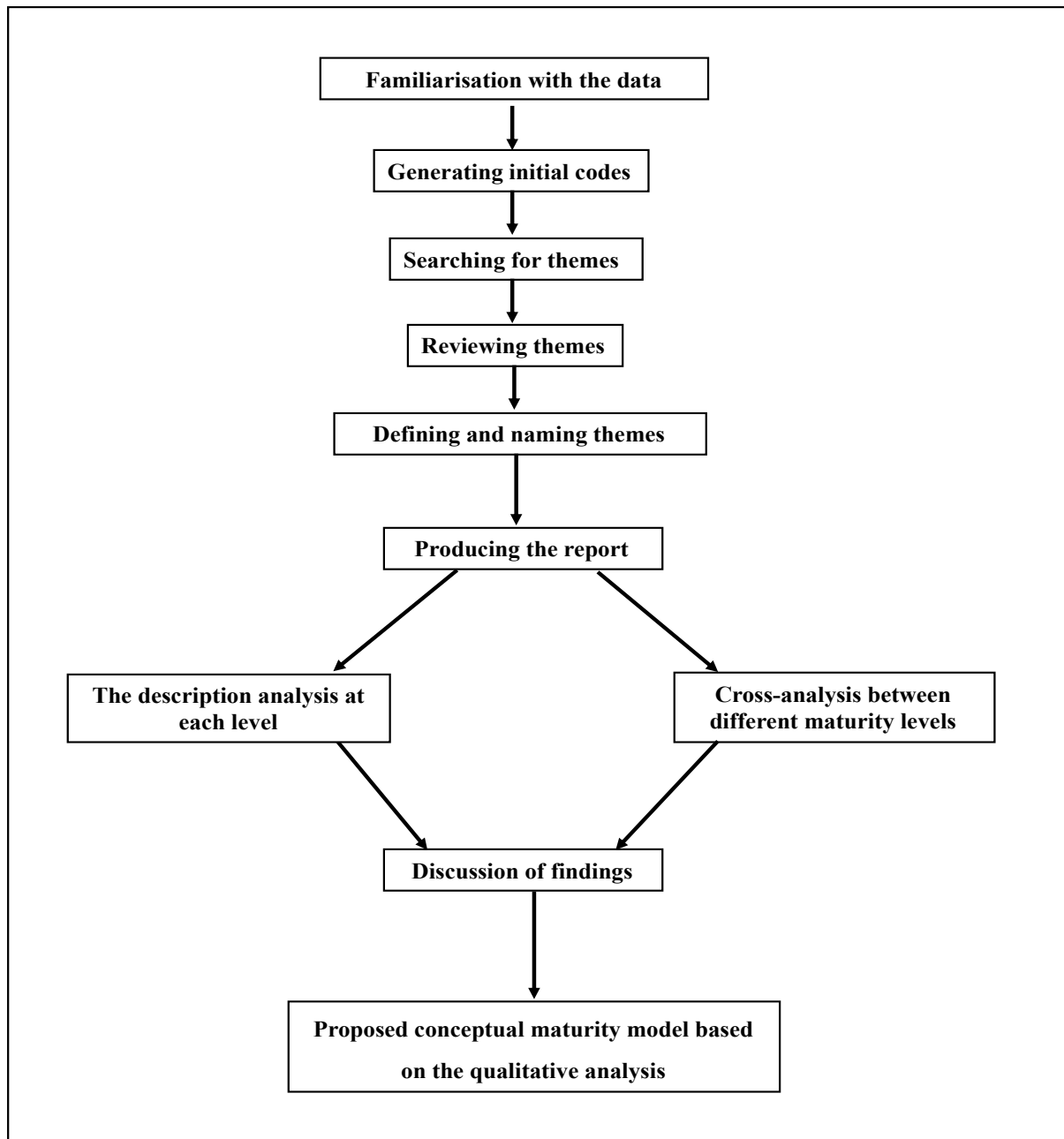


Figure 7.1: Flow chart of data analysis process adapted based on (Braun, 2006)

Braun and Clarke (2006) further comment on the advantages and disadvantages of thematic analysis. The advantages can be seen as its flexibility and accessibility to researchers with no need for extensive experience in analysing qualitative data. The disadvantages can be seen as poorly conducted analyses and/or inappropriate types of research questions. In this case the thematic map was used to identify the key themes and sub-themes in each level of the PMO. These maps were started by creating an initial thematic map with a large number of themes in each level and then these maps were developed over time and then followed by the final thematic maps to illustrate the final main themes and sub-themes of different maturity levels of the PMO.

7.1.2 Sample Selection for the Interviews

Using the whole population for every research study would be superlative. To include every subject of the population is not possible due to the population size and time constraints. However, convenience sampling is used in this research study to represent and reflect on the whole population. Battaglia (2008) and Cresswell and Clark (2011) define convenience sampling as a type of non-random or non-probability sampling technique. The target population of members is selected upon meeting certain practical criteria. Examples include: geographical proximity, accessibility, and willingness to participate. This research selected the interviewees based on three criteria:

- People who work in the PMO administration or deal directly with the office as PMs for no less than five years and have relevant information to the research.
- People who are able, accessible, and willing to give the level of information that is needed.
- The interviewees' organisations need to fall within the proposed criteria of each maturity levels of the PMO.

Sixteen personal interviews were conducted and distributed to four main levels that represented different maturity levels of the PMO. Four interviews were conducted at each level independently. These interviews were distributed to eight large size firms in the KSA construction sector according to the criteria previously defined at each level in terms of their PMO mechanism. In each of these firms, the interviews were divided into two main groups. The first groups included the PMO division with PMO leaders, teams, and the managers of different departments in senior management.

The second group was the various project managers who work away from the PMO in the execution of projects and the nature of whose work is related to the head office. By applying those procedures, the research was trying to achieve more accurate results, with the possibility of comparing them with a similar example at the same level to ensure the optimal selection of the sample of the study.

The figure 7.2 illustrates the convenience sample for conducting the interview methods in the KSA:

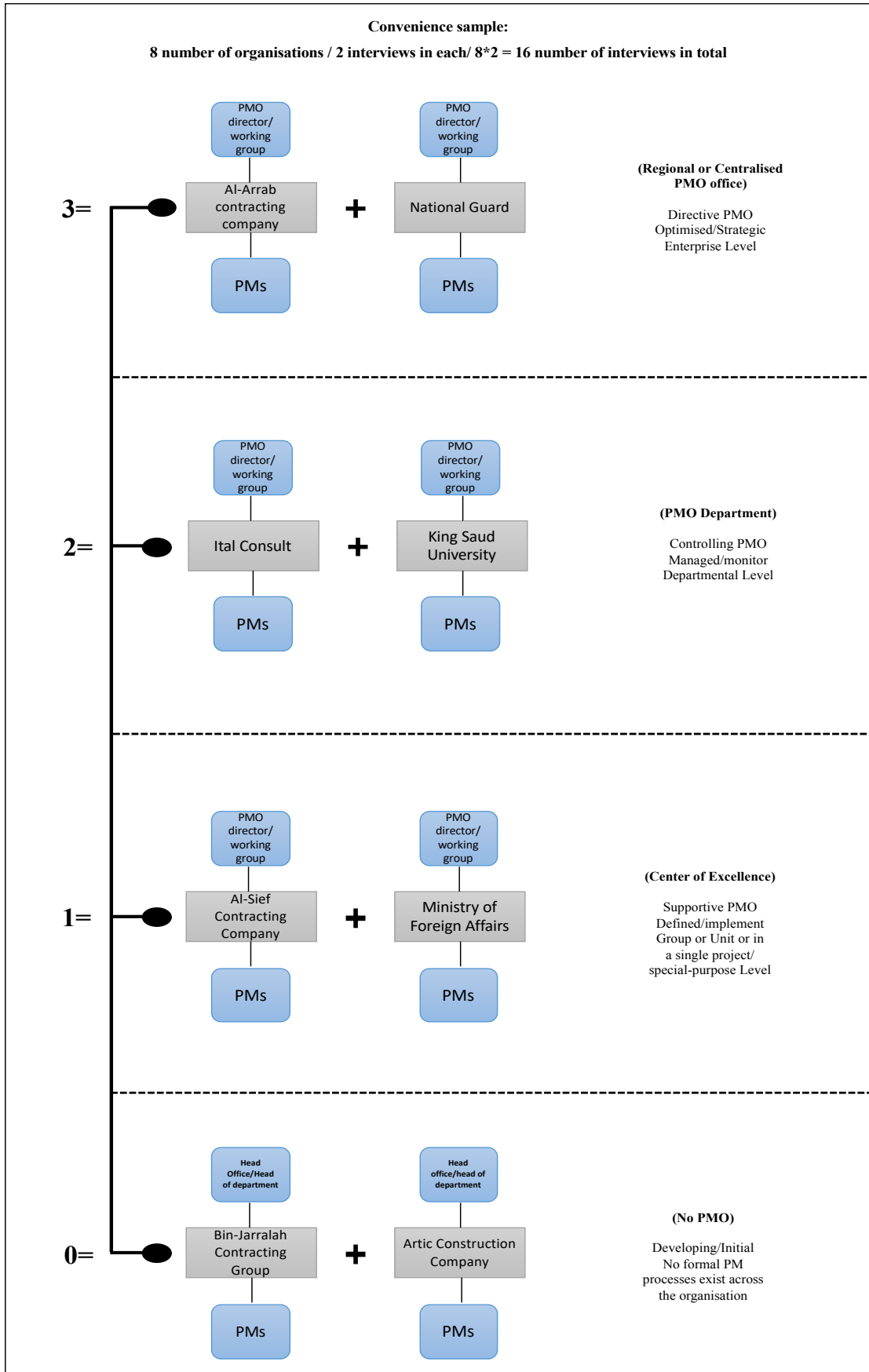


Figure 7.2: The convenience sample for conducting the interview methods

7.2 The description analysis at each level

This section will focus on the analysis of data collected from personal interviews in descriptive form. The first questions focused on asking respondents biographical information to support analysis such as age, qualifications, years of experiences, and their positions in the organisation. Secondly, to evaluate the firm's maturity levels, respondents were asked to evaluate the number of professional PM staff that they have and their utilisation of best practices of PM. Thirdly, questions were designed to measure how organisations deal with new changes, such as the cost of maintaining professional PM staff and dealing with new immigration control. The remaining questions are presented below:

- 1) Common problems/difficulties and dealing with new changes in KSA
- 2) PMO roles in increasing project success rates and improving business performance
- 3) Components and types of KM
- 4) KM and Organisational Learning (OL)
- 5) Organisational structure and the creation of knowledge via PMO offices
- 6) Competitive advantage and the capturing of knowledge via PMO offices
- 7) Organisational culture and the sharing of knowledge via PMO offices
- 8) Human Resources Management and the application of knowledge via PMO offices

Data collection took about three months in different locations of the KSA construction market due to the difficulty of having different levels of the PMO in one area. Therefore, this section has been divided into four different sub-sections and at the end of each section a thematical map has been provided, as follows:

- Level three (PMO office - Advanced level)
- Level two (PMO department - Moderate level)
- Level one (PMO group - Basic level)
- Levels zero (No PMO - Primitive level)

The interviews questions was placed at appendix D (see page 508).

7.2.1 Analysis of level three

To ensure that the selected persons and companies are matched to the criteria previously set out in the methodology chapter five, these questions were asked before the interviews were conducted, as shown in the table 7.1. Firstly, with regard to individuals, ages were ranged between (42-58) years. The number of years based on their respond is ranging from 12 to 25 years. In terms of positions, two people working in the central administration were selected at the PMO (R1 and R3). They also selected two people working away from the central office in the implementation of the projects (R2 and R4). Secondly, with regard to companies, two companies were selected with a PMO office operating in the Saudi construction market for a period of no less than five years. These questions were asked: What is the mechanism of the Office? What is its interest in achieving project management practices? As well as the rehabilitation of employees who working in the Office and how the PMO works to improve their performance? It is noticeable that many respondents felt positively that the Office offered them assistance and helped to achieve goals, either in the application of recent practices or the presence of training programs to develop the performance and increase the maturity of the companies they work on.

Nodes	Codes	Respondent 1	Respondent 2	Respondent 3	Respondent 4
Biographical questions to support analysis	Age	58 years	46 years	42 years	56 years
	Qualifications	Bachelor's Degree in Civil Engineering	Bachelor of Management	Certificate of architecture	Master's degree in Project Management
	Years of Experiences	25 years	15 years	12 years	22 years
	Positions	Coordinator in the project management office	Project Manager	Human Resource Management	Development of plans and strategies
Firms Maturity levels	Professional PM Staff	"Yes, we are qualified and have long experience in this field, especially some managers and engineers from America and different countries in Europe".	"PMO trains and qualifies employees in the project and can as a project manager request what I see suitable for qualifying our staff".	"We have many training programs and we are on a qualified scholarship to gain the required experience".	"Yes, we have a lot of professional certification in project management, whether American or British".
	Using best practice of PM	"Our PMO is divided into several independent departments to optimize the use of project management practices in line with the company's policies and capabilities such as contract management, IT, HR, design, quality and cost, which are under the PMO system". "These departments receive the various project applications and work to process them and send them for approval by the PMO team".	"I can say that our project management practices in the project are mainly linked to the PMO's central management departments. For example, our Procurement Department raises the request to the Central Procurement Department for approval and this helps our staff to focus more on project implementation and not to go too far in trying to find competitive prices or to ascertain the quality of service provided".	"The HR department provides appropriate support to all projects and meets the increasing needs in the concept of project management".	"We effectively manage communication, risk, quality, development, training and many more".

Table 7.1: Analysing biographical questions to support analysis of level 3

1) Common problems/difficulties and dealing with new changes in KSA:

There are approximately twenty factors that were discussed by the interviewers and that have a direct impact on project management and its implementation stages. It is noted that the interviewees focus on the factor of not benefiting from previous projects and their employment in overcoming current and future problems. For example, (R1) said: *“To not benefiting from their previous experiences or to highlight their competitors’ companies”*. To emphasize the importance of this factor (R3): *“In our organisations usually there is no effective database or reference to previous projects, both success and failure factors”*. The existence of a department concerned with collecting the factors of success and failure has a positive effect on the attempt not to fall into failing factors in the future, as well as helping to address them in the initial stages. Individually (R1) focused on *“Many decisions are taken individually based on the capabilities of project managers only”*. Random or unilateral decision-making has many negative effects on the validity and effectiveness of these decisions. (R3) focused on a staff-related factor which is *“The team or individuals are limited to carrying out their assigned tasks and do not have a full conception of the project or company objectives”*. This factor can be directly linked to employee satisfaction and loyalty to the company regardless of their knowledge of future policies and orientations. (R3) also addressed the apparent weakness in the optimal use of modern practices stating that: *“I see great weakness in the optimal use of modern management tools and practices such as project management and various practices as well as the weak qualification and lack of local competencies significantly”*. Similarly (R2) finds that *“The system of work is missing. I mean every project that works as an independent entity and an independent administration”*.

The nature of the projects seems to be working independently of each other, which helps to increase the overall costs and to not benefit from the distribution of resources as needed. (R1) emphasized this aspect in terms of: *“Neglecting the optimal investment in the work as an integrated system”*. (R4) focused on a new factor in terms of the negative impact on projects: *“Some project management team members are not qualified and have no theoretical or practical background for how to properly manage”*. (R3) also stressed the presence of the complexity and difficulty of managing construction projects: *“The construction sector is complex and constantly changing, and it is difficult to develop advance plans that cannot be changed according to environmental or environmental conditions”*.

By asking everyone about the impact of changes introduced in the Saudi market on their business, the study found some interesting results. (R1) stated that *“There is no doubt that the laws and reforms implemented by the Saudi government in recent times will have a significant impact on the company. High new visa fees such as entry and exit fees. Also begin to collect a monthly fee by a fixed amount, with the increase in the percentage in the coming years gradually linked to the ratio of local employment of Saudis to foreign workers”*. This gives an impression of how these factors affect the difficulty of retaining managerial competencies: *“This will make it more difficult to maintain employees from outside the country. The company has two options: first, to pay these new fees on behalf of the employees or to gradually increase their salaries to cover the deficit of these procedures”*. Otherwise, (R2) responded in the following way: *“As a leading company with a reputation in this field, we must have an integrated vision of the events that are happening around us. After knowing these new laws, we must find appropriate solutions to continue our activity properly”*. (R2) argued that it would be possible to develop local competencies: *“I see that there is no impediment to us to benefit more from the local competencies after training and qualified as required. Because I simply think that if these laws are intensified, many of the staff will leave”*.

(R3) referred to the launch of the Saudi Vision (2030) and the impact of this on the construction market in Saudi Arabia in the following way: *“We have a picture of the procedures of national transformation 2023, as well as vision 2030 Saudi Arabia through which periodic meetings were held between the PMO office and the shareholders of the company. I cannot give in detail the results of these meetings. But in general, there are voices that encourage the maximum use of existing staff and the training of a large number of Saudi employees to speed up their adaptation to these trends and new laws”*. He also stressed the high costs: *“Yes, the costs have become very high, but we will work to reduce them appropriately”*. Finally (R4) discussed the importance of these changes in the following way: *“The Secretariat's new laws by the government have great implications on our business course. We have clearly worked over the last few months to reduce staff numbers and duplicate tasks by the project team”*. (R4) focused on the possibility of Saudi companies to deal with these variables: *“There is dissatisfaction with the foreign staff, but we have worked very hard to renew their contracts with better features after PMO's approval. To reduce the monthly fees on the company we have recruited large numbers of local talent to increase the proportion of Saudis compared to foreigners”*.

2) PMO roles in increasing project success rates and improving business performance:

There are many tasks that PMOs work on, as noted in the interviewers' answers, but by focusing on similar and more frequent factors, the following can be seen: PMO is an important and key factor in assisting and supporting project managers: *“Effective PMO can provide project managers with the necessary support in terms of providing well-informed advice, such as financial balance, resource management and decision-making”* (R1). The Office is able to support project managers: *“In the event of a shortage of human resources or elements of the project, I can make a request to the office and be dealt with and respond satisfactorily”* (R4). However, sometimes the role of the Office tries to put limitations on the powers of project managers: *“I have specific powers that I cannot go beyond. From time to time, we receive new policies and practices from the Office that fully demonstrate how to deal with them”* (R4). In order to overcome the weakness of managerial competencies: *“I see that the project manager cannot alone or in the case of a working team has not qualified to run a giant project at different stages”* (R4).

Taking (R2) as an example, the role of the Office should not only support project managers but must also monitor the results of their work and ensure that they stay linked with the strategic plans of the company: *“The role of the office is to monitor the implementation of various projects that fall under the umbrella of the company”* (R3). In order to achieve the desired performance (R3) remarked that: *“I believe that understanding the roles and direct and indirect relationship between the office and project managers is reflected in achieving the company's aspirations. Simplifying the role of the Office is to reduce the many tasks of project managers, so that they can focus more on the stages of implementation correctly”* (R3). there was an agreement about the importance of the PMO office to limit the role of project managers: *“Focusing project managers only on the implementation of the project according to a specific time period”* (R3). This is due to the fact that project managers cannot do everything: *“Dealing with every small and large project is very difficult and impossible. A project manager in carrying all the project decisions on my own no longer exists”* (R4).

Otherwise, (R2) believes that the PMO with absolute powers can offer the: *“Selection of a suitable and qualified team for the potential of the project”*. This is done by assisting the Office in: *“know the priorities of the project and its linkage to the objectives of the strategic*

institution” (R2). Finally, through the information and data stored in the company's data basis, the PMs can “Take advantage of the company's method and methodology in project management by accessing to previous project documents” (R2).

There is agreement that the main office function is to support project management and apply best practices: *“The effective role of the Office improves project management practices and promotes knowledge and consistency among different task forces” (R1). To emphasize this (R3) says: “I think it is unreasonable to talk about the importance of project practices with the unclear picture of who will sponsor these initiatives and practices here, I mean the PMO”. (R2) therefore defined the role of the Office in supporting enterprise management practices, thus: “As for its role in achieving modern enterprise practices, it is the primary engine that is followed up and supported from time to time in accordance with the company's capabilities”. (R4) tries to simplify this concept in the following way: “PMO is a real tool to apply as much modern practice as possible”.*

To discuss the functions of the Office to develop business performance and increase success rates, note the following: (R1) focused on the role of the Office in supporting decisions: *“Based on the reports that we receive on a daily basis from different projects, this can give a clear picture of the state of progress in the work and the possibility of taking appropriate decisions”. (R1) also emphasises the effective role of the Office in the optimal distribution of all sources: “We can distribute resources to projects appropriately. If these resources are increased or decreased and we receive a request from one of these projects, we can provide these resources from our other projects or find a suitable budget for them”.*

(R2) discussed the importance of the Office in spreading the culture of the company in all projects and sections: *“Through our regular meetings with representatives of the office we give goals and plans that we must work to accomplish”. He stressed that the main purpose of the staff knowledge of the objectives of the company is: “Office directives can help increase transparency about company policies. New employees are transferred to the project by the office with a full description of the quality of their work and the tasks they are asked to do”. (R3) focused on the role of the Office in reducing costs: “It should be a major supporter of reducing costs and general expenses”. (R3) also commented that the PMO raises awareness of the importance of applying project management practices and decision making collectively:*

“Encouraging project management initiatives and practices in line with company policies. Setting specific terms of reference for project managers and making irresponsible decisions”.

Independently of the rest, the importance of the Office as a center of excellence was discussed by (R3) as enabling the company to: *“Develop, qualify and train employees by what the Office deems appropriate for the public interest. Inform staff of the mission's mission, mission and objectives”.* Finally, (R4) emphasized that the optimal investment in people will increase their motivation and loyalty: *“There is an urgent need to train the team members and develop their knowledge background in accordance with the rules and requirements of the work. Mistakes in implementation are sometimes fatal, as the return of some work or lack of consultants' approval increases project costs, delays delivery time and delivers the project”.*

3) Components and types of KM:

Through asking interviewees about the key components of KM, there was a strong agreement from all that people have a significant impact on the success or failure of knowledge. (R2) remarks that: *“I believe that people are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge”.* Moreover, (R4) remarked on the importance of people in contributing effective knowledge: *“Knowledge begins and ends with people. Educated organizations have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their education as key drivers in the development of the company”.*

However, (R1) added two more components of knowledge: *“The components of knowledge can be divided into three levels: processes, people and technology”.* The investment in implementing a unique system to activate and facilitate knowledge management was mentioned by (R2) in the following way: *“It also provides a clear system and reference for how to transfer and store information and experiences and how to reuse them later”.* (R3) remarked that: *“Technology sometimes plays an important role in documenting this knowledge. The existence of well-known administrative and policy systems through the Office helps to make it faster”.* (R1) described knowledge acquisition in the following way: *“There are two main components as a source of knowledge, mind and experience. Theoretical*

knowledge through the academic qualification or knowledge acquired through past experience and the working environment”.

Otherwise, to categories the different types of project knowledge, interviewees were asked to enumerate its types. All respondents agreed that knowledge in general can be classified into tacit and explicit knowledge. For example, (R1) remarked that: *“The type of knowledge can easily be divided into two groups: first explicit or virtual knowledge, which is characterized by external manifestations and can be expressed in writing and speaking and the possibility of conversion using simple technology. The second group is the implicit knowledge which is the most difficult and complex as it expresses the inner sense and the speed of intuition and good expectation of events. Is a subtle knowledge that describes the behavior and mentality of individuals and can only be transmitted through social interaction”.* In this line, (R3) asserted that: *“The implicit knowledge can represent 90% of the knowledge. Which is the most dangerous element of knowledge for its loss and the lack of optimal utilization of it”.*

This requires the organisation to find ways to invest more in the implicit knowledge, as it seems to be much difficult to implement. (R2) discusses knowledge in the following way: *“knowledge is generated on a daily and continuous basis and all successful or failed experiences can be obtained as knowledge, for example: implementation methods, use of new materials for construction at lower costs and faster completion, better handling of disputes and satisfactory resolution of all the parties”.* (R4) explains the main characteristics of tacit knowledge as: *“The type of knowledge can be sensual or tangible through periodic or non-sensory reports based on the culture, traditions and behavior of employees”.*

4) KM and Organisational Learning (OL):

To understand the relationship between both KM and OL, interviewees were asked to point out how KM can support OL and to comment on how the practices of OL work to facilitate knowledge. The following three themes were found. Firstly, the respondents largely discussed the effective roles of KM for OL. (R4) proposed that the increasing utilisation of KM will have a positive impact on the maturity of the organisation: *“Employees' knowledge of the company's short- and long-term policies and objectives has positive implications for the company becoming mature”.* (R3) clarified these relations in the following way: *“I can say that*

knowledge management focuses on content quality, while organizational education focuses on the quality of operations”.

However, (R3) argued that: *“knowledge management is one of the branches of organizational education and it expresses the effort and the company's attempt to find out what the company should know and how it can develop this knowledge and then maintain and use it effectively”.* Otherwise, (R1) confirmed (R4's) point of view that: *“Different knowledge management processes support the company to gain an increase in individual education, group learning, and collective decision making”.* (R1) further identified the benefits of KM for OL as: *“It also contributes to the development of the organization's behavior, quality of products, quality of services, organization of operations, and activation of good relations between different departments to develop the overall performance of the company. It also helps organizational education in the construction sector to meet the challenges of the economy, different building conditions and standards, and rapid response to environmental, climatic and administrative factors”.*

Secondly, respondents also gave more examples of the practices of OL. For instance, (R2) revealed that the ability of organisation to constantly change will indicate the organisation's learning level: *“In the implementation of projects there are many successful and unsuccessful experiences and the extent of the company's ability to learn to benefit from these experiences gives it an organizational learning feature. Is the ability of the company to constantly change and adopt effective policies and regulations in which all employees participate”.* In addition to this, (R4) strongly relates the practices of OL to KM: *“Applying the various processes of knowledge management correctly and knowing the components and types of knowledge as well as obtaining full support and knowledge of the importance of this knowledge gives the conclusion that the company has become an educated organization”.* In this case, (R3) identified the reason for this in the following way: *“many people believe that organizational education is complementary to knowledge management by confirming and supporting what has been learned and its reflection on the organization's behavior”.* However, he continued that it is also important to consider that: *“an educated company must disseminate the company's culture and strategy so that employees know well what objectives are to be achieved”.*

Thirdly, the interviewees revealed that the PMO can play many roles for encouraging KM processes. (R1) proposed the office to be the first call for addressing any project matters: *“The Office is considered the most important reference through which the employees are sent to many workshops and conferences, both internally and externally according to the needs of the work. The company is currently working on providing effective internal programs and courses offered by specialists in many fields”*. (R4) agreed with (R1) that: *“The amount of training programs and the extent of benefit from them is another factor. I cannot overlook that the office is a 100% shareholder but through periodic meetings with our office members we have good information that the next is better”*. However, (R3) argued that the PMO should be known as a center of excellence to enforce and encourage best practices: *“As far as I know about PMO, there are many researchers and practitioners in this field who have rated the office as a learning center where the company can achieve best practices, transfer experiences and provide full support”*. Finally, PMO roles, according to (R3), relate mainly to the organisation’s policies and strategies: *“The office is a major shareholder and I can say that it is currently the only one to provide the necessary support to our project managers and try to develop their abilities and skills and work on them to be used optimally in the management and development of the projects they are working on. I can also talk that a future plan has been put in place to increase the office's tasks and prepare it for ongoing training sessions. I also do not forget the attention of the Office in trying to find a suitable environment through which all members of the team and department managers can participate in achieving the objectives of the company and enforce the policies of the office”*.

5) Organisational structure and the creation of knowledge via PMO office:

Before analysing this important relation, interviewees were asked to illustrate PMO roles to create and activate knowledge. (R1) remarked that: *“The PMO roles must be more effective and applied properly. I know that the Office relies on four sub-processes to create knowledge, although many practices fall under each process”*. The first processes identified were collective processes: *“PMO office by documenting periodic meetings of the work and paying attention to the application of best practices are important factors for creating a suitable environment for knowledge”*. In addition, (R3) agreed that: *“There are also group operations that are utilized through periodic meetings, decision-making stages and action”*. The second set of processes were the external processes: *“External processes: The provision of training*

programs, workshops and the introduction of experts have a positive impact on knowledge creation” (R1). (R2) further described that: “Sometimes subcontractors who deal directly with PMO do not work as previously agreed. So, I see that more than the performance of project managers and team members or the reputation of these contractors can be learned by studying the market situation”.

The third set of processes were the internal processes: *“The work of permanent research, testing and examination of services are all practices that help to create knowledge as well as create new knowledge by drawing on current knowledge” (R1). (R3) agreed that the PMO can have more internal roles, suggesting that the: “PMO should work to document the usefulness of the end of the work, as well as try to reflect these experiences on the creation of new information to be applied in future work”.* The fourth set of processes were the social processes: *“official and informal events, recording the experiences and practices of competitors in the same field lead to the emergence of new knowledge” (R1). (R3) in this regard explained that: “It is possible to talk about periodic initiatives being launched, all aimed at creating the right knowledge at the right time and place”.* However, (R4) asserted that the main challenges of knowledge creation were that: *“All the information received from our project is sent daily to the office, so it is possible to get a better answer from the staff of the office. I do not see that it has great effects because the PMO is interested in this aspect and cannot ignore the importance of creating knowledge and benefiting from it in future projects”.* (R2) suggested limitations to the roles of the PMO: *“I cannot fully conclude that the Office contributes to the creation of knowledge in projects as it works effectively in central administration”.*

The relation between organisational structure and knowledge creation were largely discussed by (R1) and (R3). For example, (R1) argued that: *“Given the fact that knowledge can be generated at any stage of the project, it is very difficult to create knowledge if there is no effective organizational structure. I can say that the identification of knowledge management processes should be clearly explained in the organizational structure of the company and this makes it easy to exchange them correctly. There must be incentives and bonuses to motivate employees to create new knowledge”.* In addition to this, (R3) confirmed the importance of the availability of the organisational structure: *“Yes, we have an organizational structure that is updated from time to time and through the project completion process, I think it is effective. I*

cannot forget the importance of putting in good physical incentives or dividing our employees based on their contribution to creating new knowledge and developing the company's capabilities”.

However, there was an agreement by all respondents that the PMO structure can create and activate valuable knowledge. (R2) explained the difference between the organisation's structure and the PMO's structure as: *“In the project, we have a specific organizational structure of tasks and its relationship with other departments. PMO has a completely independent organizational structure. I suggest that there be an organizational structure that links the PMO to the structure of the project and explains how to create the knowledge and people concerned”.* (R1) confirmed that the PMO structure should accept or reject order internally, going through approval channels rather than relying on personal judgment: *“I see that the presence of the PMO office has become an absolute priority in creating many knowledges. Since PMO does not rely on one person or a specific department to implement and manage different tasks. The nature of the work of the office depends on its style that the process of making a particular decision must be taken by more than one person and here the creation of important knowledge will be high”.* Otherwise, (R3) argued that: *“The design of the organizational structure of the office gives it full powers and it is the direct vector of project implementation and policy enforcement. Creating the knowledge, I see is done by receiving periodic or monthly reports by project managers or by sending the assignees by the office to provide the necessary support”.* This might be done through standardising the reporting system to increase the changes of knowledge creation. (R4) proposed that if the project team and project managers fully understand their main tasks and responsibilities, they are likely to create knowledge for others: *“When can we answer yes? I see that by knowing if all employees and sections have full knowledge of everything that is required of them and built on them. As a project manager, I think that my team is well aware of his assignments and that he was given to him by the office in detail. The organizational structure of the project is independent but the PMO structure is tied to all the company's projects”.*

6) Competitive advantage and the capturing of knowledge via the PMO office:

Interviewees were asked to explain the roles of the PMO office in capturing and classifying knowledge. (R3) asserted that: *“Yes, Certainly the Office is a key and effective supporter of*

knowledge acquisition, I can mention some processes to acquire knowledge with a simple explanation of its most important practices”. Firstly, there is the classification of knowledge. (R4) believes that: “The classification of knowledge with the identification of knowledge sources as well as the selection of what suits and fits the direction of the company gives a positive impact to the acquisition of knowledge”. (R3) argues that: “By specifying the file management system from the identification of the sender and recipient and the type of knowledge as I explained earlier”. However, (R2) maintained that: “The acquisition of knowledge must be built on both internal and external factors to achieve maximum benefit”. = (R1) proposed for the organisation to have: “specific processes so that the company can know the identity and method of classification of knowledge”. Secondly, there is the identification of knowledge. This was discussed by (R4) in the following way: “I think that the functions of the Office here are how to best acquire the knowledge of qualified personnel before leaving the company walls”. In addition to this, (R3) mentioned that: “By specifying the file management system from the identification of the sender and recipient and the type of knowledge”. (R2) proposed that: “There must be specific procedures through which knowledge is secretly identified”.

Thirdly, there is the storage of knowledge: “By defining the system of controlling and arranging documents through official or informal events, as well as building an integrated database and reference through the Office” (R3). (R2) proposed that knowledge needs to be: “Stored to make it more difficult to transfer such practices to competitors”. (R1), in this regard, emphasised that: “The company must always have effective processes, policies and procedures to protect acquired knowledge and help prevent it from inappropriateness in the office or in the enterprise environment”. Fourthly, there is the selection of knowledge: “By defining the system of querying knowledge and repeating questions” (R3). (R4) argued that there is only one possible solution: “The best way here for the acquisition can be to activate the teamwork and the initiative of the Office to contribute to the development of staff awareness of its importance in developing their skills and achieving the desired goals. Activating the role of people in business leadership and keeping pace with development helps to acquire and discover their knowledge”. (R2) gave an example of how the PMO can deal with the selection of knowledge: “I believe that the role of the office is to try to bring or acquire foreign knowledge by other companies in the same field or by taking advantage of the company's

current knowledge and turn it into an added value through which the company can increase the success rates”.

(R1) mentioned that the main challenges of knowledge capturing was: *“First of all, we need to identify an important factor. Is both the company fully and the PMO office using a specific system or process known in knowledge management? I see that the extent to which both parties are keen to acquire knowledge in an organized way helps to achieve success”.* The need to analyse the relation between competitive advantage and knowledge capturing was emphasised by all. The interviewees agreed on the importance of this relation for increasing business performance. For example, (R1) argued that: *“Undoubtedly the company should invest in creating a good relationship of cooperation in both knowledge management and competitive advantage in order to support the enterprise strategies. I strongly agree that the relationship between them helps to increase the company's reputation”.* (R4) emphasised how this relation can have a positive impact on the company: *“The use of knowledge management to exploit external opportunities or reduce their negative impact is a competitive advantage”.* (R3) agreed with (R1) that: *“Knowledge management has a great impact on the competitive advantage by working to provide good and appropriate knowledge regarding the forces of competition. Each company has to maintain its traditional knowledge from acquisition by other companies by maintaining competent employees and not moving them to competitors or by taking advantage of their expertise before taking any other action”.* (R2) asserted that: *“Knowledge-based investment and the optimal utilization of knowledge, whether positive or negative, increases the competitive advantage of the company”.*

Moreover, the study asked respondents to evaluate the current practices of competitive advantage. (R4) defined competitive advantage as: *“the ability of the company to formulate and implement strategies that help it to generate profits and achieve success. Such as winning project tenders and entering into new projects”.* (R1) added that: *“The company's interest in expanding the scope of projects and spreading in different regions and using the latest elements of technology and the use of best practices in project management all give the company a great competitive advantage”.* Giving more details on the competition in construction and its difference to other industries, (R3) maintained that: *“With the development of the construction sector, each new project reflects a unique situation in itself, considering the variables of the local or international economy and the different laws and regulations of the work. Competitive*

advantage is a key requirement for companies to grow and compete with other companies in the markets”.

The contribution of the PMO to achieving competitive advantage by emphasised by all. For example, (R1) asserted that: *“The role of the office should be coordinated to confirm this relationship. The development of decision-making in PMO's knowledge-based office will contribute to the company's competitive advantage. The company must also work through the Office to have a modern knowledge management system and more complicated to the competition companies to imitate”.* (R2) proposed that the role of the PMO office in this sense was: *“to protect this knowledge from its transfer to externally competitive companies or from the loss of its internal acquisition. I believe that the work of the Office mainly to find and apply best practices in project management, create an organized work environment and benefit from investment in knowledge is a key component in achieving competitive advantage”.* (R4) evaluated the office roles to find opportunities as: *“to evaluate and develop the marketing efficiency of the company or to increase competitive advantages and to create knowledge that will contribute to reduce costs and increase product differentiation, shorten the time factor and distribute the facility effectively”.*

7) Organisational culture and the sharing of knowledge via the PMO office:

Sharing and transferring valuable knowledge represented the most significant issue identified by participants. For example, (R4) assumed that: *“It is very difficult to determine the extent to which PMOs have contributed to the promotion of knowledge as our work as project managers is limited to the delivery and fulfilment of the Office's requirements”.* In addition to this, (R2) believed that: *“The knowledge management infrastructure must be developed by the Office from time to time according to the needs of the company”.* The majority of those interviewed identified the main role of the PMO being to support the transferring and sharing of knowledge. Four themes were identified, as follows: Firstly, (R1) agreed that the PMO is instrument in achieving the: *“Dissemination and sharing of knowledge: This can be done through a comprehensive map of knowledge and the dissemination of its culture and its importance among all departments of management and projects”.* Organising and coordinating knowledge represented the second role. (R2) maintained that: *“I can say that the role of the Office should*

not only be to encourage the dissemination and transfer of knowledge but also to identify appropriate processes in organizing and coordinating knowledge priorities". (R4) proposed that: "There is a huge amount of information, many of which can be classified as valuable knowledge or excessive knowledge of the need of the organisation". Despite the transformation of knowledge types require some steps to convert tacit to explicit knowledge, respondents have been asked to point out this issue. (R3) suggested that: "The role of the Office should be limited to how knowledge is transferred between different aspects as follows: 1- The explicit knowledge: The Office shall transfer to individuals. For example, knowing the methods of administrative regulations, the Office is familiar with the new staff, or it is possible for the staff member to correspond to the departments of the office and to ask the question and wait for the response of the Office. 2- The implicit knowledge: the office must be transferred from individuals or the team to the company's system, for example, technical skills and effective solutions and constructive ideas. The Office records evaluates their applicability and dissemination to meet business needs". (R2) argued that: "It should also optimize the conversion of knowledge types into a specific way in which it is best to make the most of this knowledge". (R1) maintained that: "Transformation of both explicit and implicit knowledge into knowledge that the company can benefits from them in a simplified and clear way".

The third role is represented by the transfer and submission of knowledge. (R1) illustrated the important practices in the following way: "through the creation of channels of direct and indirect communication between projects. Identify a list of important knowledge. It is also possible for the office to register some public meetings or courses and then publish them using modern means of communication". In particular, (R2) argued that: "Personal knowledge or skills should not be neglected from being transferred to the Office, which in turn evaluates and maximizes their optimal use". Therefore, (R3) suggested that: "Through the Office's initiative to make periodic meetings could be a good support for knowledge transfer. As well as through daily / weekly / monthly or annual reporting".

A number of interviewees identified the importance of the relation between organisational culture and knowledge sharing: "I see organizational culture as one of the most important factors in the transmission of knowledge and its spread. Therefore, the organization must work to create all its procedures and policies and activate initiatives and stimulate sectors on the importance of knowledge rotation. This essentially guarantees the success of knowledge

management and the role of the Office in promoting and maximizing its use” (R1). (R4) noted that: “According to my earlier reading of PMI's project management book, there are similar and different roles between the Office and project managers. Therefore, I think that the joint contribution and knowledge of the role of each party helps to achieve the best results”.

This can be linked with the roles of senior management and project managers to spread knowledge culture: *“The role of senior management and project managers cannot be overlooked in the implementation and success of such practices. Project managers must cultivate among their work team the initiative to provide knowledge and transfer their expertise to their co-workers. Organizational culture must be built on teamwork and effective communication” (R1). Furthermore, “The knowledge management culture must be understood by employees because it helps to improve the performance of the organization and create a more effective and viable environment for achieving positive results” (R2). As a result, the knowledge culture can: “focus first of all on activating the role of project managers and their enthusiasm and confidence in the importance of transferring and disseminating knowledge. Project managers after their good knowledge can reverse that concept to the culture of the rest of the team” (R3).*

However, the interviews revealed a number of PMO roles that addressed organisational culture: *“The role of the work of the Office is an alternative to the concept of senior management in a more professional and effective and its focuses on the standardization of policies and various practices. That is, the Office is the one who communicates directly with project managers on a permanent and continuous basis. So, I can talk about the important role of project managers in the success of PMO's first roles and then talk about their role in the successful transfer of knowledge” (R3). (R2) maintains that: “The whole enterprise must function as one system bound to specific objectives. Projects should not operate independently of PMO's office or independent of other projects under the umbrella of the company”. One more negative feeling offered by (R4) was as follows: “My organization does not see its absolute support for organizational culture, since by taking the team's performance they cannot know the policies and cultures of the company. The incentives and rewards of knowledge transfer have been lost in the company's culture over the past years. It is currently possible to talk about a simple role for the Office in supporting this culture”.*

8) Human Resources Management and the application of knowledge via PMO office:

The main challenges of knowledge application and re-using processes have been discussed by (R3) and (R4). For example, (R3) observed that: *“I can point out an important point from the PMO that knowledge management now requires a radical change in how to lead others. Because the office policy considers leaders their role is more inclined to coordination, facilitation and training than to be described as presidents. The Office should work to build a common vision that reflects the company's overall direction. The role of the Office should not only work in the application of its knowledge based on the information received. Rather, it should be ensured that all information sent to individuals or department and project managers reflects true information and knowledge rather than personal conclusions or misinformation. The role of the office must be effective in bringing about continuous change and finding flexible, interactive and not fixed processes. Simply because the continuous change of procedures and policies reflects the amount of knowledge applied and used within the company. Also, the speed of response to difficulties and problems and increase the efficiency of the company must build on the sources of knowledge gained”*. In line with this (R4) proposed that: *“The support and contribution of the Office is to change management according to information and knowledge that reaches the office by project managers. That is to say, there are procedures and policies that arrive permanently to implement certain tasks or to discontinue certain actions and other actions”*.

Unsurprisingly the majority of respondents do not mention appropriate information about the roles of PMO to apply and/or re-use knowledge. However, (R1) argued that: *“Since the work of the Office focuses specifically on the development and standardization of procedures and policies in the institution based on the knowledge gained. As well as the role of the Office in linking this acquired knowledge to the problems and difficulties encountered in managing and implementing the business”*. (R1) also divided the roles of PMO into: *“Adoption and support of knowledge: This is done through the management of documents such as periodic reports. Application and activation of knowledge: through the development of effective systems to control and disseminate knowledge”*. However, (R2) focused more on the following aspects: *“I think that PMO should always tried to apply best practices, whether in project management or knowledge, and to encourage its use in accordance with business needs. Documenting and*

building a database through the office and a static reference helps to increase the success of this process”.

Respondents were asked to identify the main practices of Human Resources (HR) management within PMO office. Firstly, (R1) illustrated the relation between PMO and HR management in the following way: *“The optimal investment of knowledge must go up and reach people, because the origin of knowledge is based on people. The HR department is located within the PMO office and represents one of the largest and the main sections of the Office and is responsible for hiring cadres in different fields”.* (R2) discussed the role of HR departments before and after the adoption of the PMO: *“In the past, the role of human resources management has been limited to paying the salaries of the company's employees. At present, the roles of this department have varied completely. It has been responsible for many tasks, including but not limited to: evaluating the performance of employees, evaluating the company's need to fill positions and jobs, or resolving or increasing salaries”.* However, (R4) argued that: *“We do not have an integrated human resources management department in the project, but the project is fully linked to the Office”.*

It was suggested that this failure does not exist anymore because: *“Human resources management is one of the sections under the PMO structure. As it has sub-sections in different projects, the nature of its work directly linked with the main section of the office. In other words, the role of HR departments in projects is only operational according to the PMO directive. The main human resources section is lead, operational and development of other sub-divisions. For example, evaluation of the performance of project managers is carried out through the main human resources department, evaluation of the performance of engineers and project workers is carried out through sub-departments and project managers and then sent to the office to take the necessary action”.*

The interviews revealed a number of factors that can be provided by the PMO office to support HR management. (R1) argued that the office should focus on two key factors in the application and re-use of knowledge: *“1- Contribution of knowledge in developing the skills, expertise and capabilities of the members of the working group. 2- Contribution of knowledge in the development of human resources management work system, both within the PMO office or through its presence in the enterprise environment. The PMO concept not only relies on human*

resources management in knowledge management but relies on all other management departments as well as the knowledge gained from implementing different projects”. (R4) added that the office can eliminate the HR roles as: “Specialized staff are sent by the main administration to implement some necessary procedures. When I need the office, I, as the project manager, upload some applications to the office which are processed and resolved”. However, (R2) suggested that: “The PMO office can help to develop and expand the Human Resources Department, such as the creation of a training and development unit that is concerned with assessing the need for staff to develop their skills and capabilities. PMO is a representative of the Human Resources Department and is a key supporter of applying knowledge and confirming its work with high precision. And then reuse and make use of them after getting recommendations from either PMO's office manager or permanent members in project management or even in periodic meetings of department heads and project managers”.

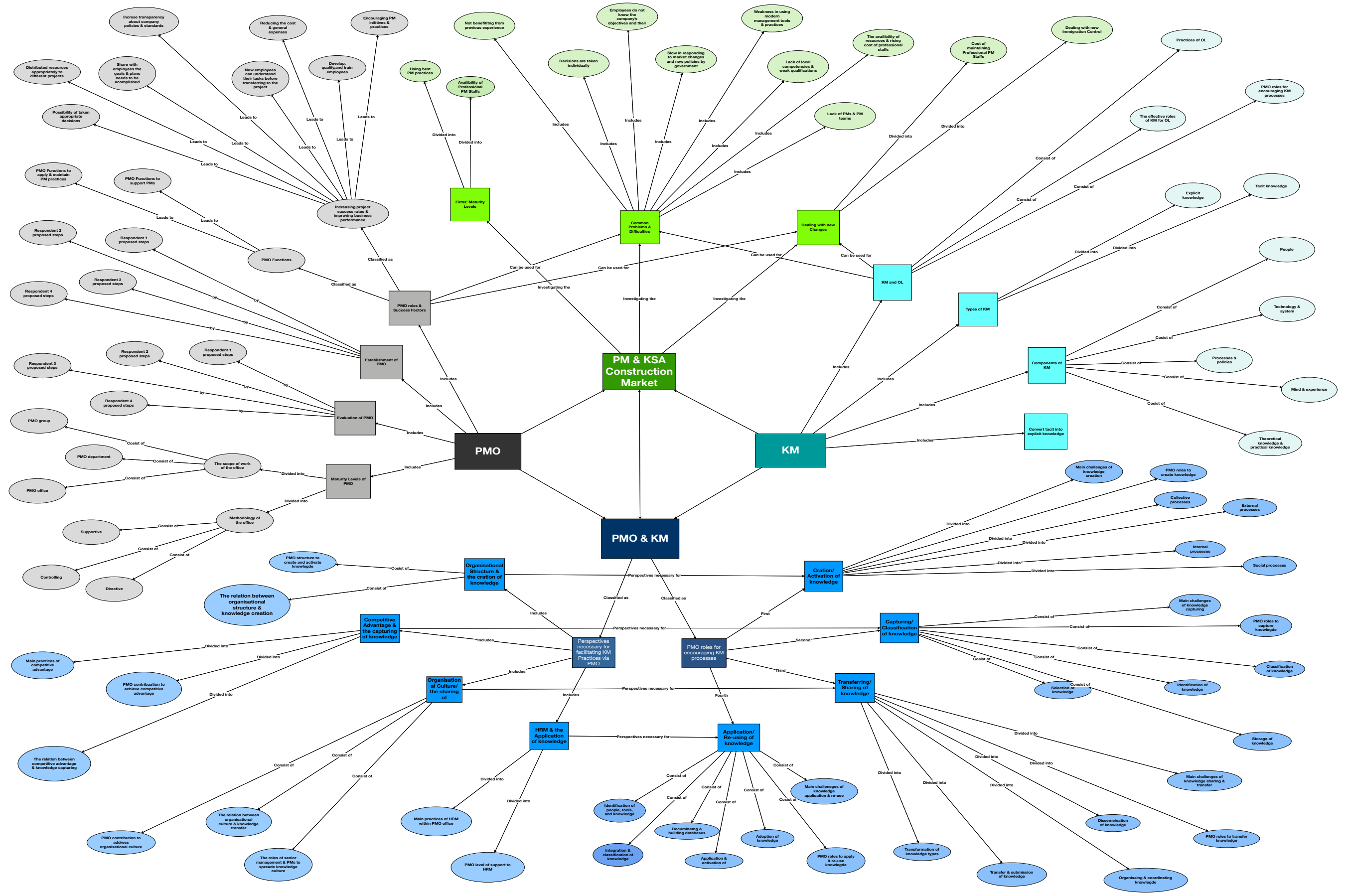


Figure 7.2A: Concept Map for Level 3

7.2.2 Analysis of level two

Table 7.2 illustrates the biographical questions to support analysis. The respondent's ages ranged between 43 and 51, and their average age was 47 years. In addition to this, the year of experiences respondent have been working in the charge of managing projects were ranged between 15 and 26 years. Therefore, the average years of experiences can be known as 20 years and 5 months. This might be useful for the research to find proper results. Two out of the four respondents were working as project managers and the another two were working in PMO department as Head of the PMO office and as a PMO analyst. The last thing to evaluate respondents' capabilities were their qualifications. Two of the interviewees had bachelor's in civil engineering and the others had master's degree in cost management and MBA. As a result, respondents had relevant qualifications, positions, and years of experiences that would suggest the suitability of their answers.

The second criteria to evaluate was the maturity levels of the organisation. The first factor was to evaluate the number of professional project management staff who currently working within their organisation. Respondents 6 was confirming their maturity as a company as: *"I can answer yes, as we have many qualified in this aspect and they have one or more of these professional certifications"*. Similar to this (R7): *"Yes, we have specialists in this aspect"*. Whereas (R5) argued that: *"I can assess the performance of our work to a medium degree"*. However, (R8) was unable to give an answer.

The third factor was to evaluate the availability of best practices of project management throughout the entire organisation. (R5) argued that: *"With PMO as a key advocate in creating an organized environment and achieving the required practices, we can now use the concepts defined by the American or British Project Management Institute"*. The difficulty of having a clear answer with this question was discussed by (R6), as: *"It is difficult to find a project management methodology that is clear or ready to be applied immediately, so companies should take advantage of a professional methodology that is appropriate to the size and activity of the company. Many construction companies in Saudi Arabia or arguably around the world benefit from the British PRINCE2 methodology or the PMBOK knowledge guide provided by the US PMI"*. (R8) linked the importance and availability of project management practices to the firm's strategies and objectives: *"I see that the project management practices were already*

known to us, but the main problem was known to us in advance, but the main problem was how to apply them and use them in accordance with the company's requirements as a system. I can emphasize that the role of the PMO section is 100% effective and should give greater powers". To benefit from recognised bodies in the best practice of project management, (R7) maintained that: "We adhere to the standards set by PMI, which has divided project management practices into 10 key departments".

Nodes	Codes	Respondent 5	Respondent 6	Respondent 7	Respondent 8
Biographical questions to support analysis	Age	45 years	48 years	51 years	43 years
	Qualifications	Bachelor's Degree in an architecture and master's Degree in Project Cost Management	Bachelor's degree in civil engineering	Bachelor's degree in civil engineering	Bachelor's degree in Management and master's degree MBA
	Years of Experiences	15 years	20 years	26 years	22 years
	Positions	Head of the PMO department	Project Manager	Working in the PMO department as an analyst and monitor for the performance	Project Manager
Firms Maturity levels	Professional PM Staff	"I can assess the performance of our work to a medium degree".	"I can answer yes, as we have many qualified in this aspect and they have one or more of these professional certifications".	"Yes, we have specialists in this aspect".	
	Using best practice of PM	"With PMO as a key advocate in creating an organized environment and achieving the required practices, we can now use the concepts defined by the American or British Project Management Institute".	"It is difficult to find a project management methodology that is clear or ready to be applied immediately, so companies should take advantage of a professional methodology that is appropriate to the size and activity of the company. Many construction companies in Saudi Arabia or arguably around the world benefit from the British PRINCE2 methodology or the PMBOK knowledge guide provided by the US PMI".	"We adhere to the standards set by PMI, which has divided project management practices into 10 key departments".	"I see that the project management practices were already known to us but the main problem was known to us in advance, but the main problem was how to apply them and use them in accordance with the company's requirements as a system. I can emphasize that the role of the PMO section is 100% effective and should give greater powers".

Table 7.2: Analysing biographical questions to support analysis of level 2

1) Common problems and difficulties:

A number of interviewees identified high variances in the common problems and difficulties that affected the completion of construction projects in the KSA. Dealing with new immigration control represented the most significant cause of delay: "The new laws developed by the Saudi government to keep up with the Saudi vision 2030 have had a significant impact on the proportion of our foreign employees. So many of them no longer see that Saudi Arabia is fulfilling its financial demands as before" (R8). This requires the majority of construction firms to: "Change its policy in this aspect to suit the current situation. When you do not have a choice, you have to accept the current situation and begin to make a quantum leap in this aspect" (R6). As well as to: "Develop a plan to replace national cadres. Take advantage of

foreign cadres before leaving. Yes, especially with increased visa costs and different immigration laws” (R7).

Five different respondents confirmed that: *“The situation has become more complex after the imposition of monthly fees on foreign labour”*. The cost of maintaining professional PM staff represented the second factor and can be related to the previous factor: *“The new economic changes will affect the enthusiasm of foreigners to work in Saudi Arabia and there will be a significant shortage of expatriate labour” (R7)*. Both of respondents 5 and 6 believed that: *“Retaining competent staff is very expensive. The company should co-exist with the situation as well as increase the Saudization rate as well as take advantage of the experiences of existing staff and document them effectively so as not to go into the wind”*. This means that: *“Competition in the construction sector is very difficult and retaining qualified staff is more difficult” (R8)*.

The impact of proper transparency represented more causes for the overrun costs: *“Lack of transparency and clarity in the knowledge of the strategies and objectives of the company in the current or future time. There is little interest in good planning. Lack of standards, methods of work, and accurate measurement indicators. The majority of the effort is focused only on the artwork and construction” (R6)*. In addition to this, respondent 8 also added that there was a: *“Lack of modern management methods in conducting business and achieving strategies”* and a tendency *“Not to study projects adequately and to enter projects larger than the capabilities of the company”*. Respondent 5 criticised the lack of coordination and communication: *“I believe that there is a complete absence of coordination among departments within the head office, in addition to the lack of satisfactory coordination between the company's various projects. Communication channels are virtually non-existent or ineffective. The Company's inability and ability to enter into large or complex projects in its implementation. Just think about the financial return and try to make the most of the structural explosion in the region without good planning”*. However, respondent 7 found it difficult to enter into new projects due to the cost of staff and materials: *“High costs of project implementation as a result of economic changes. The schedule changed due to lack of funding. Non-compliance of subcontractors with the technical specifications stipulated in the contracts. The weakness of the administrative organizations and the lack of knowledge of the work team planned plans and the next stages of business”*.

2) Roles and functions of the PMO department:

The interviews revealed a number of success factors that lead to increase project success rates and improved business performance. Respondent six suggested the PMO department as a complement to HR: *“PMO as an integrated work system must be responsible for filling the lack of human resources and distribution efficiently. Increase the efficiency of people and develop their skills. Overcoming the shortage of cash and delayed payments in projects. A key factor in overcoming administrative corruption and abuses in powers and decisions”*. This in turn would lead to best practices of project management: *“The ease of making decisions based on the strict control of the completion of projects and to inform the senior management of the latest developments of each stage. Optimal investment efficiency in the project management team and their knowledge of their role in the success of the project. Project management practices become clearer and easier and are documented correctly. Development and continuous training and knowledge of the company variables determined by the markets”* (R7). Respondent five considered the function of the PMO as follows: *“The functions of establishing a PMO department in an organization should be an effective supporter of the achievement of appropriate administrative regulations. Support the unification of policies, procedures and decision-making based on planned plans and meet the needs of work. PMO has also become a major support center for increasing staff efficiency and developing their capabilities through the development of appropriate programs. The idea of establishing a PMO is to eliminate the phenomenon of failure to follow-up and supervision of projects, which increases the time and cost of the project. The PMO is a founder to contribute to subjecting different projects to a unified work methodology”*.

Furthermore, it was suggested this approach often resulted in internal and external benefits: *“First, internally, it works to close the gap between the different departments of the administration and the projects that are implemented at the same time. Second: Externally works to create effective communication channels with stakeholders and clients and work on developing company strategies. PMO provides tangible and repeatable benefits to the company's long term. It also develops a methodology for achieving best practices in project management and defining standards that fit the company's brand”* (R8). It also became clear that the function of the PMO can be divided into different categories. Firstly, there is the function of supporting project managers: *“I think that the Office has become a good supporter in reducing the burden on project managers and reduce their functions outside the walls of*

projects. When a new contract is required with the subcontractors, PMO provides an appropriate profile of the previous work of these contractors. The office also supports the selection of the best prices by comparing them and negotiating on behalf of project managers to obtain a competitive and satisfactory price for all parties (R5).

All interviewees agreed on the importance of the PMO to reduce project manager's tasks, enabling them to focus on the execution of construction projects: *"We must know the difference between the role of PMO and the role of project manager. The project manager is only concerned with managing an independent project. PMO team members are responsible for managing all projects as a single block. The project manager only tries to obtain the specific resources that meet the project completion stages by itself"* (R7).

Therefore, both PMO and project managers depend upon each other and the success of managing projects can be built upon their successful relations. A successful relationship between PMOs and PMs can: *"Provide more accurate information and more details about staff and performance. Provide qualified trainers and consultants to develop the capabilities of team members. Evaluate the performance of the project and always align it with the company's objectives, which enables project managers to know the project's success trends in advance"* (R8). The PMO can act on behalf of project managers to select the right team for different organisational projects: *"A project manager in addition to training so that the department is concerned with providing trainers and training materials. Assist in selecting team members"* (R6).

Secondly, there is the function of the PMO to achieve best practices of project management: *"The PMO department I expect its main roles to be effective in advising and monitoring in supporting project quality and ensuring best practices"* (R6). The PMO department is also interested in ensuring that: *"All projects operate according to the company's strategies. The sources are distributed according to the public interest"* (R7). However, respondent eight suggested that the PMO department should: *"Develop a methodology for achieving best practices in project management and defining standards that fit the company's brand"*.

3) Components and types of KM:

When asked to point out the critical components of KM, both respondent 5 and 6 suggested that: *“Sources of knowledge can be summarized in two main sources: 1- Internal sources of knowledge: They can be acquired through implicit knowledge. Such as individuals working in the field. 2- External sources: It can be gained by taking advantage of the recruitment of experts from outside the institution or follow the competition companies and assess their areas of strength and weakness”* (R5). Furthermore, *“Sources of knowledge can be divided into internal knowledge such as processes, procedures and internal activities of the company. External knowledge such as research, studies and previous experiences of competitors”* (R6). It also became clear that the components of knowledge can be divided into different categories: *“The classification of knowledge is divided into many viewpoints, but it is possible to talk about one another: cognitive knowledge, causal knowledge, knowledge of purpose, knowledge of the administrator. Components of knowledge are human processes and how to develop appropriate mechanisms”* (R7). In addition to this, respondent 8 believed that: *“Components of knowledge are known to three factors: people, technology, modus operandi or practices used to achieve them”*.

The majority of those interviewed classified the types of project knowledge into implicit and explicit knowledge. Knowledge is also divided into two parts: *“the implicit knowledge that exists in the experiences, practices and values of the persons. The explicit knowledge is that which we can obtain in the documents and database and which can be easily transferred”* (R8). Both respondents 6 and 7 suggested that: *“The type of knowledge is either explicit or implicit”*.

4) Knowledge management and organisational learning:

A number of interviewees agreed that the PMO roles are effective for encouraging and facilitating the various processes of KM: *“PMO works to link knowledge management to a specific system that helps them create and validate knowledge assets. The PMO is the main engine of various knowledge management processes which aims at the end of the road to achieve an educated organization”* (R7). Respondent 5 pointed out the importance of the PMO department to provide programs and coaching for project teams: *“In response to your question about the programs offered by the PMO department, we have a plan to send our employees to*

gain knowledge and experience, as well as our work during the previous period to provide developmental and cultural programs to share experiences. The focus of the department on developing staff skills and investing optimally in creating an appropriate working environment, has positive implications for understanding and understanding the company's strategic objectives” (R5).

The contribution of the PMO is to develop an effective KM system that not only involves the use of technology factors but also links the employees of the organisation and connects them with experts in the same field: *“The contribution of PMO is to develop an effective knowledge management system that not only involves the use of technology factors but also links the employees of the organization and connects them with experts in the same field. PMO's contribution is to rely on human activity to generate more knowledge than to rely on computer usage and communication links may not be effective. The above factors can be achieved only through PMO's role in providing appropriate training programs” (R6).* It was also confirmed the availability of the PMO department can: *“Maximize knowledge management and disseminate its culture in the institution and to find effective programs such as PMO” (R8).*

The relation between KM and organisational learning reflects on the maturity of the organisation: *“The importance of the relationship between knowledge management and organizational learning can be clarified. Organizational learning is the primary goal of knowledge management. Also, organizational learning focuses on processes, while knowledge management focuses on the content of acquired knowledge, organizational learning helps to achieve sustainable development in the optimal use of knowledge” (R6).* Respondent 7 also illustrated the importance of KM for the maturity of the organisation: *“Knowledge Management contains many processes, methods and techniques that are used in the company to achieve organizational education”.* As a result of this relation, organisations would deal with this as: *“Otherwise, knowledge management is the process of transforming individual knowledge into organizational knowledge in order to be accessible to all. The concept of knowledge management and organizational learning is concerned with developing, linking and empowering employees and ensuring the company's access to its learning” (R8).*

The approach of organisational learning can be seen in different practices: *“Behavior change based on the outcome of past experience and different practices, it focuses primarily on the*

amount of knowledge acquired. I can say that the organization learns as human learns and through this educational process, the employee at first acquires many concepts and practices and thus becomes the competence and merit on which the organization depends” (R5). Specifically, in the construction sector, the organisational learning is: “A conscious effort by companies to improve productivity, efficiency and innovation. To meet the current economic and technological conditions. The difficulty and complexity of the stages of implementation in construction projects increase the uncertainty and the greater the uncertainty the greater the need to learn. Learning increases responsiveness and effectiveness in the face of hazards and failure factors” (R8).

5) Organisational structure and the creation of knowledge via PMO departments:

A number of interviewees identified the PMO department as a real contribution to the process of knowledge creation: “Creating knowledge management initiatives should be conducted by the PMO to verify the importance of the presence of this department” (R6). Respondent 5 argued that the PMO department: “Must be supportive in order to contribute to the creation of knowledge throughout the company”. Respondent 8 said: “I can talk about the importance of the presence of the auxiliary factors that the PMO should work on to create knowledge”. The following three factors were suggested: “Internalization: The explicit knowledge here is created through the use of implicit knowledge and then shared with all. The company is trying to learn to offer training programs to its employees. The PMO must help to find quality programs that help to assimilate tacit knowledge and try to create new knowledge. Socialization: Knowledge is created through the use of certain practices such as business monitoring, discussion of activities, analysis of results, or by spending time together because that is a good factor in sharing common experiences. It is also possible to talk about external factors that help us acquire new knowledge in projects such as interaction with customers, suppliers and stakeholders. Mix: Here the conversion of explicit knowledge into explicit knowledge such as the work of annual reports is based on knowing the monthly or periodic reports” (R8).

The Socialisation process can be represented as one of the most known roles that can be adopted by the PMO department: “Activation of knowledge I believe that it is motivated by people to take part in the sharing of important knowledge and experience and that job evaluation is

linked to the employee's contribution to the creation of new knowledge” (R5). Respondent 6 added that: “New knowledge lies on the human effort and the role of PMO should be effective in achieving the necessary support. Knowledge creation is built on innovation, invention, initiative and loyalty by employees to create new knowledge that helps develop the system. You need to know the steps needed to transform the types of knowledge between them”. Other goals were discussed by respondent 7: “The PMO should focus on creating knowledge through practice, teamwork, communication and education. The role of PMO must work to achieve these goals”.

It was also clear that the Internalisation and Externalisation processes can be covered by the presence of the PMO department: *“The department also develops performance standards to evaluate and document all knowledge processes” (R5). Despite the difficulty of creating knowledge it was suggested that: “To create knowledge, you must focus on knowing what / why / how / from. Creating knowledge can be built on prior knowledge, here lies the department's role in developing and addressing it” (R7). Otherwise, the Externalisation process was described by respondent 7 in the following way: “This process focuses on linking implicit and explicit knowledge. The creation of knowledge takes place through the extraterritorial realization of implicit knowledge to become collective knowledge”. The creation of knowledge also can be accessed through: “The department's role in stimulating research and development, learning lessons and creative thinking” (R6).*

PMO roles to transform different types of knowledge were discussed again by respondent 7 in the following way: *“Knowledge creation is done by transforming knowledge into practices and activities that can be used to maximize the spread of knowledge”.* Respondents identified that many companies apply Nonaka’s model (SECI): *“Knowledge creation initiatives have been designed through the implementation of the SECI concept, which reflects processes and practices within and outside the company, as well as assessment of teamwork and knowledge of community coordination and outreach” (R5).*

The relationship between organisational structure and the creation of knowledge has been discussed by all respondents. This relation can be seen as: *“The backbone of the organisation and reflects its success from its failure” (R6).* The debate as to how organisational structure deals with knowledge creation can be divided into formal and informal: *“The official is the one*

that is presented as a map of the different sections of the company and determines the general relationship between them. Informal is the way people work with each other to evaluate the performance of the company and to benefit from different knowledge and experience” (R7).

Furthermore, it was suggested that the PMO structure creates and activates knowledge: *“The PMO Division falls under the Senior Management structure as a supporting section. This department works in relation to all the different sections of the company. The department has an independent organizational structure of 8 persons who are constantly present in the central administration. The Center has correspondents in many projects to achieve the goals of the pre-set. I see the extent to which the department is able to unify and share the company's strategic objectives with knowledge management, which is the main focus of the effectiveness of the structure of this department” (R5).* Respondent 6 proposed many roles of this relation: *“The role of PMO is in controlling the identification of relationships. Application of scope of supervision, delegation of authority, distribution of work and responsibilities. The role of PMO has helped define the functional description of each cell in the structure and thus help to activate the appropriate knowledge”.*

However, respondent 7 disagreed, arguing that the PMO department can be more suitable to deal with the creation of knowledge when there is a centre of excellence run by the PMO group: *“Here I see the role of the PMO work structure to create and activate the role of knowledge by creating Center of Excellence department, I'm sure it will do the job more effectively”.* A coordination structure created by the PMO department was proposed by respondent 8, who argued that it should work smoothly within general structure of the organisation: *“We have a general organizational structure of the company, we have organizational structure of the project, we have organizational structure in each department of central management. I believe that PMO's role is to create a coordination structure that improves the relationship of these structures and links them together to achieve company strategies. PMO's work to design a good and effective organizational structure will have a significant impact on the creation of knowledge and its orderly life rules”.*

6) Competitive advantage and the capturing of knowledge via the PMO department:

The relation between competitive advantage and the capturing of knowledge have positive aspects on the nature of their works and on the improvement of organisations: *“Managing*

knowledge effectively and correctly is a competitive advantage of the company” (R7). It was suggested that a (SOWT) analysis theory as discussed by Sharm et al (2014) divided into Strengths and Weaknesses, which seems to internal factors, whereas the remaining two factors are Opportunities and Threats that related more to external factors, could maximise this relation as: “Use of competitive advantage is to know the areas of force and work to confirm and knowledge of areas of weakness and work to address and knowledge of areas of power and work on the exploitation and knowledge and risk reduction” (R5). It also became clear that the practices of competitive advantage could improve business performance: “Competitive advantage is to achieve a sustainable advantage and different from competitors, so the optimal acquisition of many knowledges, such as regulatory knowledge, technological, market, and competitive advantage. If the companies can control over these factors and its knowledge greatly, they can increase the company's position in the market” (R6).

Competitive advantage is based on rapid response to market changes, financial crisis, climate unsustainably, and the faster reaction of construction firms than their competitors. Therefore, respondent 8 suggested: *“Acquiring and dealing well with knowledge and not allowing competitors to take advantage of the success factors of the company are those who help to maximize the role and continuity of competition. Considering the lack of excessive competition among team members has a positive role in acquiring knowledge and allowing the company to compete well”*. PMO departments could contribute to achieving competitive advantage by: *“Categorizing the knowledge correctly by PMO and determining its type has a key role in activating the cultural advantage of the company and increasing its position in the market” (R5)*. Respondent 7 agreed: *“Three main steps must be taken by the PMO department to acquire knowledge by acquiring the appropriate knowledge, information and experience and providing it to relevant people and departments in a timely manner. The ease, speed, and relevance of different knowledge management processes by PMO are those who determine their use as a competitive advantage”*.

The majority of those interviewed identified PMO roles to capture knowledge: *“To acquire knowledge, it is necessary to know what sources of knowledge in the projects can be classified as follows: First, knowledge of trade: procurement and sales, resource management and strategic plan. Second, knowledge of techniques: the importance of bringing tools and devices and processes that increase productivity and reduce the effort, time and cost. Third, product*

knowledge: product quality, customer satisfaction and price competition. Fourth, project management knowledge: Key processes in project management, time management, costs and resources. Fifth, knowledge of administrative organizations: the role of communication, coordination and cooperation in the acquisition of knowledge” (R7). This illustrated the different types of knowledge and the presence of the PMO can contribute to their classification: “Knowledge acquisition must be made after defining and classifying the type of knowledge. For example; knowledge about the type of customers, the labour market, the project environment, nationality of employees, procedures and policies” (R8).

In addition to this, respondent 6 believed that: *“The organizational process of PMO in the organization and classification of knowledge is an important factor. The acquisition of knowledge results in many important and non-important knowledges, so a good classification of knowledge helps to retain each other and to delete some parts that are incompatible with the general content of knowledge”*. Only one respondent mentioned feedback as an important aspect of the PMO department: *“There are after ways that help to acquire knowledge such as setting up a suggestions box, listening to views, stifling the role of people, developing good motivators” (R8)*. Another respondent had different point of view, arguing that the PMO department should consider the identification process of KM: *“To have a good background on the company's strategies and the extent to which projects are completed, which can help to choose and identify the appropriate knowledge and how to share them with owners” (R5)*. The selection of knowledge was identified by respondents 5 and 6 as being important: *“The processes of selecting the right knowledge that I consider to be a direct responsibility of the department so that members of PMO” (R5); “The role of PMO in increasing knowledge readiness for each time and place helps to optimize acquisition of knowledge” (R6)*.

7) Organisational culture and the transformation/ sharing of knowledge via PMO departments:

The sharing of knowledge represents the most important process of knowledge transfer, which can be related to the level of organisational culture: *“A deep understanding by all departments and projects of the culture of the organisation and markets has a good reflection in the transfer of knowledge. Mixing different cultures together makes it easier to transfer knowledge” (R7)*. This deep understanding can in return spread the culture of knowledge: *“Organizational*

culture is what distinguishes group members from others. Sometimes some companies describe their culture as open or closed. Open culture is the most organized and helps to ease the transfer of knowledge” (R6). Respondent 5 agreed that: “Before attempting to disseminate a culture of knowledge management and its importance, focus on ensuring that the culture of the PMO concept is well known. Because the role of the PMO department cannot be done if we neglect to spread the culture and importance of this concept”.

However, PMO roles must also address organisational culture: *“In the past, work was closer to random and did not benefit from the exchange of experiences and teamwork. The role of the department is now positive in supporting the work as one system working according to specific plans” (R5). Therefore, everyone should know how KM affects the overall performance of the organisation: “The PMO can take on the role of senior management in promoting teamwork to share valuable knowledge” (R6). Working on the appropriate environment of projects and trying to overcome poor competition among the members of the team was suggested by respondent 7 as ways of improving KM: “There is a significant impact between organizational culture and knowledge transfer, so PMO should increase awareness and educate the staff on the importance of sharing knowledge and linking it to reward programs”. If this is not working properly, there is a good chance that the spread of knowledge can be reduced. Respondent 8 believed their roles in the management of projects were: “Purely practical, but when we need to know and solve some of the problems that face us, we communicate directly with the PMO, which in turn sends us specialists in this field. The role of PMO in creating an integrated organizational culture has a positive impact on achieving the company's overall objectives. The role of senior management is ineffective in this regard”.*

PMO roles to transfer and support the sharing of knowledge represented the most recommended roles: *“I believe that the PMO department through the reports and documents it receives daily achieves a good transfer and proper knowledge of understanding the most important factors facing the implementation of projects” (R8). Representative 5 added that: “PMO presence is an important factor in increasing the growth and maximization of knowledge”. Four main roles and success factors by the PMO department were identified. Firstly, the communication channels were discussed by all interviewees. To investigate whether human knowledge or technology was more important, it was suggested that: “The use of technology cannot be ignored but it should not be the only thing to focus on, and the optimal*

utilization of direct processes and broad participation with people should be avoided” (R5). Respondent linked the importance of PMO department to the sharing of knowledge: “The presence of such knowledge when needed or in future uses determines the role and importance of the PMO's performance in the company”.

The main practices of PMO were explained by respondent 6 in the following way: *“PMO presence is an important factor in increasing the growth and maximization of knowledge by sharing, communication, exchange of ideas, skills and experiences are positive factors in the spread of knowledge”.* The construction firms need to offer: *“Effective communication between departments and easy access to the valuable knowledge has a positive impact in knowledge transfer” (R8).* Secondly, the content of knowledge is significant in knowing which type of knowledge is valuable or not: *“PMO's role in knowledge transfer should focus on several practices, including: finding an appropriate means to transfer knowledge, whether people or tools. There is an incentive to carry out knowledge transfer. Demonstrate knowledge content” (R6).* Timing is critical in knowledge transfer: *“The Department's work on the transfer of knowledge in a timely manner at the appropriate place helps to spread knowledge and increase its importance” (R5).*

It was confirmed that the components of knowledge can be divided into different groups: *“Transferring knowledge can be done by one of the components of knowledge - people, technology or processes” (R7).* Respondent 8 argued: *“Knowledge transfer can be done informally about the way people interact daily in work environments”.* Thirdly, the transformation of knowledge represented one of the main issues affecting the knowledge: *“Overcoming the obstacles that limit the transfer of knowledge, especially in the enterprise environment, the competition is greater and therefore there is difficulty in transferring knowledge” (R6).* Respondent 5 suggested: *“PMO's role in knowledge transfer should focus on several practices, including: finding an appropriate means to transfer knowledge, whether people or tools. There is an incentive to carry out knowledge transfer. Demonstrate knowledge content”.* Respondent 8 argued that: *“The role of PMO in the control of administrative regulations and projects can transfer important knowledge to stakeholders and senior management”.* However, only one respondent believed that the rewards programs can have a big impact on the encouragement of employees to share their knowledge: *“Factors contributing to knowledge transfer can be summarized in: Making knowledge formal, training*

and continuous development, using effective systems, stimulating the role of consulting, creating opportunities and linking them with bonuses and rewards” (R7).

8) Human Resources management and the application/ re-using of knowledge via PMO departments:

With the introduction of PMO’s concepts nowadays, there is a confusion between the PMO and HR management: *“The operation of the PMO concept as a head office or as a sub-section that defines the mechanism of human resources management. The mechanism of PMO department is to keep pace with advances in technology, keeping pace with temporal and spatial variables and optimizing the use of the latest practices. As it has become very difficult especially in large companies to increase the burden and burdens on human resources management in the evaluation of the performance of employees and determine the salary scale and exchange dates in addition to knowledge management and assistance in development and training. PMO is currently a key player in supporting human resources management and reducing tasks” (R6).* This explains in depth the similarities and differences between these departments. Respondent 5, when asked about the PMO level of support to HR management, suggested: *“Good question, PMO levels and types are those who define the HR department. Specifically, if PMO acts as a separate department of senior management, its role is independent of human resources and relations between them are based on knowledge of similar and different roles among them”.* In addition to this, respondent 8 identified that: *“The presence of PMO helps in supporting human resources and focuses its work on monitoring the employees of the company”.*

Therefore, with the creation of the PMO, there is an overlap of responsibilities and functions with HR management. Respondent 7 believed that the: *“PMO is beginning to take the lion's share in the application, storage and reuse of knowledge. Periodic reports that reach the office carry a lot of knowledge and experience, the role of PMO must be documented and the development of an appropriate mechanism for reuse either in training programs or activate the role of project managers in the transfer of new knowledge”.* The interviews revealed a number of practices of HR management for the application and re-use of knowledge: *“The role of human resources is fully competent financial matters for staff and the registration of attendance and absence and the work of employment procedures after obtaining prior*

permission from the PMO section” (R8). It was clear that the current focus of HR management within the existence of PMO department has changed: “The Human Resources Department has become more meaningful in terms of staff performance, attendance and absence” (R7). Respondent 5 argued the following: “To clarify the idea of Knowledge management processes in the case of the presence of the PMO section within this section and the role of the Human Resources Department is not concerned with training and development and the coordination and application of different knowledge”.

The roles of PMO departments to support the application and re-use of knowledge were discussed and can be summarised in the following way: *“I see through the work of PMO on the adoption and the creation of methodologies, policies and activities unified that it works to apply a comprehensive knowledge of the entity of the company” (R8). All respondents agreed that the quality of knowledge management facilitated by the PMO is one of its most significant roles: “Urgent solutions to enterprise problems as well as low reliance on experts in the implementation of business, and easy access to accurate information and increase the contribution of people to know the importance of knowledge gives good impressions on the optimal use of knowledge” (R7). Whereas respondent 6 was struggling to not clearly identify that: “Knowledge cannot be applied or used to solve problems or that do not help to grow and adapt factors is costly and redundant knowledge about the company's need”. Therefore, it was suggested that: “The role of PMO in applying knowledge should be concerned with these processes: First, optimal use. Second, reuse when needed or in new project. Third, maximize the use of content” (R7).*

However, respondent 5 argued that: *“The department should know the extent to which this knowledge can affect the company's problems”*. In addition to this, respondent 8 added the following: *“PMO's knowledge of the company's corporate objectives, strategies and outlook and its knowledge of current business performance and strengths and weaknesses in the company, through which it can identify what knowledge can be reused and what knowledge is not needed in their application”*. Life-cycle of knowledge was proposed by three respondents. Firstly, respondent 5 believed that: *“Application and reuse of knowledge must be given to us as members of the PMO Section. Our PMO department should be the main reference for applying the knowledge and confirming its role and then documenting it in the section for subsequent reuse. I see that the knowledge map should be started by the section and ends at*

the PMO section doors". Secondly, respondent 7 identified that the factors of: *"Time and cost factors are of great importance in the organization, storage, application and reuse of knowledge. Develop appropriate budget, specific tools, documented actions and activities that will help to transfer the effective knowledge"*. Finally, respondent 6 asserted that the PMO should: *"Stimulate good knowledge implementation, linking the knowledge management strategy with the corporate strategy as a whole"*. The availability of knowledge was suggested by respondent 7 as: *"The readiness and ease of use of knowledge is what determines the success of knowledge management"*.

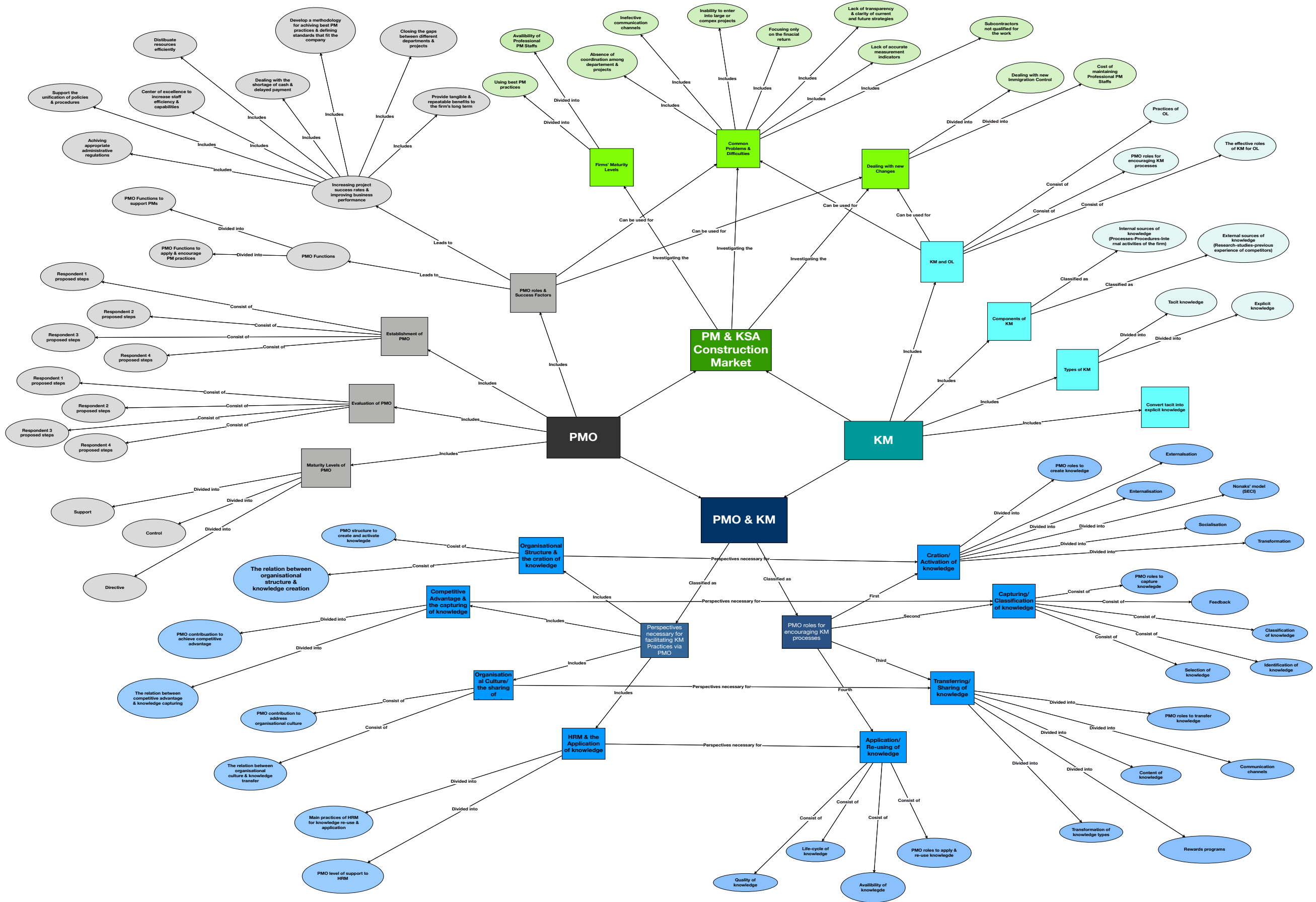


Figure 7.2B: Concept Map for Level 2

7.2.3 Analysis of level one

The interviews revealed a number of factors accomplished by the PMO group. These factors led to increasing project success rates and improved business performance. A number of interviewees identified the main roles of the PMO group throughout the organisation. For instance, (R10) explained the best practice of PM in the following way: *“Our establishment of the PMO Group gives a good impression of our future direction and our absolute knowledge of the importance of obtaining best practices in project management. I can say that once we have reached the comprehensive concept of the PMO system and attract high-level talent in this field, we have achieved what we want and work according to the requirements of the modern era”*. However, the rest did not feel completely satisfied with the maturity level of the organisation: *“We do not have specialists or qualified people in the field of project management significantly, but we will work on it in the near future. The weakness we have seen in the use of best practices in the management of projects, in addition to our need to create a more organizational and dynamic environment”* (R9).

Respondent 12 added that: *“I think we still have a lot to achieve best practices and administrative regulations. But we must not speed up this transformation that we are seeking to implement now in order to create an iron grip on projects by developing our PMO concept”*. Respondent 11 asked respondents to evaluate their firm’s maturity: *“I can say that we are at the beginning of the road and will leave the leadership of the PMO Group to determine the future priorities of the company and to make a qualitative shift in increasing the awareness and maturity of the company's employees. Do PMO tasks so that we can determine the level of our business development”*.

By analysing the biographical questions as shown in table 7.3, the following can be seen: First, the respondents ages were examined, which ranges from 44 to 52 years. This can be linked with their years of experiences as it ranges from 15 to 20 years. This fell under the research criteria to find experienced participants, who are likely to have more information and to be able to answer questions more accurately. Secondly, the participant’s positions in this level were a PMO analyst, two project managers, and a manager in the PMO group. This suggests the relevance of these respondents to the research questions being asked. Finally, the qualification of interviewees was various: Bachelor of Architecture, Business and Engineering. This helps

to establish their familiarity with project management approaches and the construction sector.

Nodes	Codes	Respondent 9	Respondent 10	Respondent 11	Respondent 12
Biographical questions to support analysis	Age	48 years	44 years	49 years	52 years
	Qualifications	Bachelor of Architecture	Bachelor of Business Administration and Master of Economics	Bachelor's degree in civil engineering	Bachelor of Structural Engineering
	Years of Experiences	15 years	18 years	15 years	20 years
	Positions	PMO Analyst	Project Manager	Manager in PMO Group	Project Manager
Firms Maturity levels	Using best practice of PM	<p>"We do not have specialists or qualified in the field of project management significantly, but we will work on it in the near future".</p> <p>"The weakness we have seen in the use of best practices in the management of projects, in addition to our need to create a more organizational and dynamic environment".</p>	<p>"Our establishment of the PMO Group gives a good impression of our future direction and our absolute knowledge of the importance of obtaining best practices in project management".</p> <p>"I can say that once we have reached the comprehensive concept of the PMO system and attract high-level talent in this field, we have achieved what we want and work according to the requirements of the modern era".</p>	<p>"We are at the beginning of the road and will leave the leadership of the PMO Group to determine the future priorities of the company and to make a qualitative shift in increasing the awareness and maturity of the company's employees".</p> <p>"Do PMO tasks so that we can determine the level of our business development? "</p>	<p>"I think we still have a lot to achieve best practices and administrative regulations. But we must not speed up this transformation that we are seeking to implement now in order to create an iron grip on projects by developing our PMO concept".</p>

Table 7.3: Analysing biographical questions to support analysis of level 1

1) Common problems and difficulties affecting the management of construction projects:

The majority of those interviewed identified common factors that might delay or lead to abandoned construction projects. For instance, Respondent 9 mentioned the following factors: *"Project failure can be divided into: (A) Internal factors such as weak administrative capacity, lack of competence and efficiency of administrative organizations, imbalance of experience and maturity levels, negligence in project monitoring and the presence of complete solutions; failure to have a project control team linked to the organization's objectives. (B) External factors such as increased taxes, inflation rates, local unemployment, the attempt to settle certain occupations, the imposition of recommendations on firms, government rules, the presence of more powerful and opportunistic competitors, lack of information on the status of the domestic market.* It also became clear that problems experienced during the execution of projects were exacerbated by weak understanding and planning of such projects: *"We have a weak planning and lack of support and lack of appropriate competencies and random administrative organizations"* (R12). This resulting in a situation whereby: *"Do not allow*

enough time to complete the different works. Unforeseen the occurrence of problems or risks that may affect the work system. Try to execute a number of projects in a single time. Difficulty managing and distributing resources between projects. Lack of good use of previous experiences or of others' experiences. The presence of project managers is not fully qualified” (R11).

Giving rise to the execution of a number of projects at the same time will increase the pressure of organisations to engage in these properly: *“Limitations in the study of the nature of the project and focus on the financial analysis of bids without interest in technical analysis. Increase the number of projects on the potential of contractors, which cause randomization in the organization and coordination. Weak understanding of all terms and contractual formulas between the Contracting Parties” (R10).* Although dealing with new control changes and the cost of maintaining professional project management staff were not as apparent before the introducing of Saudi 2030 vision, respondent 9 argued that: *“The resettlement of many professions and disciplines, the imposition of monthly fees on foreign labour increase. The prices of visas and the cost of living certainly have a significant impact on the maintenance of expatriate labour”.* This has convinced the KSA’s construction firms to take actions: *“Therefore, we must prepare our business activity for what is coming and make the best use of our experts before leaving the Saudi market if necessary” (R9).*

However, this lack of economic stability also translated into rising the cost of maintaining professional project management staff: *“These factors will affect the retention of our managerial competencies. Therefore, their expertise and knowledge must be transferred correctly before losing what the company has done for many years” (R10).* Respondent 10 further remarks that: *“Economic reforms will have a positive impact on achieving the Saudi vision 2030. We must follow this development. Changes in expatriate fees and increased Emiratization” (R10).* These challenges need to be addressed: *“A plan and strategy should be devised to take advantage of specialized personnel in many areas before considering the layoffs in order to minimize the consequences of leaving the company” (R11).* New laws and large changes in construction mean that the management of projects need to keep abreast with these events. Respondent 12 agreed that: *“Yes, it will certainly be difficult to maintain foreign competencies, so we will work to benefit from their experience and communicate with them”;* *“We will try to train appropriate national talent”.*

2) PMO roles and functions:

A number of interviewees identified a number of roles and functions of the PMO group throughout the entire organisation. Respondents agreed that PMO roles can increase project success rates because they can: *“Develop appropriate standards, methodologies and policies for the performance of the company, and impose them on projects for the purpose of achieving sustainability and unified administrative organization. Training and PMO as a center of excellence and a consulting and development destination for positive change in the direction of the company. Distribution of various resources equally on projects, and then management and communication with projects when needed. Develop specific and consistent operations in the management of company information, with a view to achieving knowledge management and organizational learning”* (R9). Respondent 10 argued that the PMO group is able: *“To further strengthen cooperation among the different departments in the central administration and to link them with projects currently implemented by the company. Project support and guidance to the management teams of these projects. To find a unified methodology in project management and thus facilitate the tasks of the work of project managers. Provide effective training and development programs after examining the needs of employees. Create a link between the staff and their administrative references in order to provide continuous counselling and guidance, especially for the new team members. To benefit from the development and application of practices and software and policies to follow up and manage projects. A good information store containing all the data and details of the current and previous projects with the identification of easy and safe ways to access them when needed. Reduce expenditure, manage project portfolio and allocate adequate resources for each project”*.

However, (R12) believed that the PMO can offer some other roles as: *“Follow-up, supervision, support, consultation, standardization of practices, use of best methodologies in project management. Work as a single working system that shares resources and risks. It is a good store for knowledge, experience and studying the factors surrounding the business”*. Coordination and communication factors were mentioned by (R11): *“PMO provides tangible and repeatable benefits in the short and long term of the company. Works to achieve the organizational culture of the company and adapts to the strategic shifts. Integrates important data and information from projects and supports Balanced Scorecard. Helps to manage the*

sharing of resources, methodologies, tools and techniques for the success of projects according to priority. Provides supervision, training, guidance and development of management methodology for project managers and employees in various departments”.

The main functions of the PMO can be divided into different categories. Firstly, the function of the PMO to support project managers, is discussed by (R11) in the following way: *“Providing financial liquidity, supporting training and development programs, documenting the work and ensuring how they can be reused. Distribution of resources by priority. Identify project objectives and relate them to company strategy”.* Secondly, the function of the PMO group is to encourage, apply, run, and use best project management practices. All respondents suggested the usefulness of the PMO becoming a centre of excellence to achieve best practices: *“PMO’s mechanism to provide unified systems and processes that give more time for project managers to carry out their necessary work. The planning, reporting, documentation, dispute resolution and selection of subcontractors should also be the responsibility of the PMO team members”* (R10). In line with this argument, (R9) suggested the following criteria of success can be adopted by the PMO group: *“Lead the project schedule and budget. Dealing with the issues facing the project, especially in the delivery of works. Finding appropriate tools needed by the project. Good storage of project documents and information. Support the management of project team members, in terms of providing and preparing training programs. Standardization of standards, methodologies and processes, which helps project managers to focus well on the implementation of their work”.*

However, it was suggested that the PMO group can have more of an influence in the sharing of knowledge, resources, and experiences to increase the maturity of the organisation: *“The sharing of resources among all projects can be managed by the PMO. Guidance, training, education and supervision. Develop and manage project activities and other common documents. Achieving best practices, methodologies and standards in project management. Developing expertise, knowledge, abilities and management skills”* (R12). Respondent 11 out of the other three interviewees in this level was arguing that the PMO should be in charge of addressing disputes: *“Good handling of disputes, difficulties and obstacles faced by project managers”.*

3) Components and types of KM:

Respondents were suggesting that the most significant component of knowledge is based on the interaction and participation of people: *“People and how to manage processes are the main sources of knowledge”* (R9). In regard to this argument, (R10) also suggested that: *“Components of knowledge through the interaction of people among themselves or through the management of processes or the creation of effective technology factors and practices to acquire knowledge”*. However, (R12) considered that: *“Knowledge is produced at any time and place and is not constrained by factors of failure or success”*. Interviewees accepted that human, system, and processes are key components of knowledge: *“The basic sources of knowledge based on the human being is interacting with its types and achieve its objectives. The existence of effective knowledge management systems is very important but the difficulty of obtaining implicit knowledge is a barrier to the success of its work”* (R11).

Based on the respondents' views in this level, Knowledge can be divided into two different types tacit or explicit knowledge: *“Types of knowledge are either explicit and can be transferred in periodic reports, documents, contracts, etc. Implicit knowledge exists in the thinking and logic of people, which requires the planting of initiatives and the presence of a good desire to transfer them”* (R9). Respondent 10 argued that: *“In an enterprise environment, more explicit knowledge can be documented in documents. In the senior management of the company, knowledge is implicit, because of the large number of experts”*. In addition to this (R12) observed that: *“Types of knowledge are either clear, observable, and documented such as report management, delivery and receipt phases, or the study of tenders and contracts. Type II implicit knowledge in the human mind is very difficult to obtain if it is not obtained in one way or another”*.

4) Knowledge management and organisational learning:

Unsurprisingly the majority of respondents alluded to one of the roles of the PMO as creating a Centre of Excellence: *“The role of PMO in managing knowledge processes ultimately gives an educated organization based on a large database. It is possible to activate the role of the Center of Excellence through PMO in providing training courses. Contributing to raising awareness among people of the importance of the existence of this concept and that if*

implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general. It is possible to speak here about the effective role of PMO as a center of excellence. The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company” (R9). Further to this (R10), added that the PMO is able to: “Build organizational memory. The good concept PMO contributes to the development of skills in individuals. Increase the outcome of creativity. The dissemination of useful ideas. Facilitate more effective cooperative processes”. This perspective was reinforced by (R11) who observed that: “PMO's knowledge management processes ensure continued knowledge acquisition and organizational learning. To maximize the role of PMO, there must be appropriate programs to develop capabilities and capabilities”. However, (R12) did not see the PMO group as particularly effective: “The role of PMO is not noticeable in providing great support in providing training programs and sending administrative competencies to develop them or to attract qualified competencies”.

It also became clear that effective relations between KM and organisational learning experienced during the management of construction projects contributed to increasing the overall performance of the organisation: *“The contribution of effective knowledge management helps to transform into an educated organization. The interest of organizations in the ability to learn and adapt to internal and external variables and the possibility of forming future alternatives, has a positive role in the application of the concepts of the Organization. Knowledge serves as a great asset for any organization, success and achievement of the goals upon which it builds” (R10). Respondent 12 also argued that knowledge should be captured as it contributes to improve the strategies of the organisations: “There is also a clear lack of knowledge of all the objectives and strategies of the company and what projects are trying to win the company in the Saudi market or externally”.*

It was suggested that the success of the organisation in applying various practices of organisational learning builds up the maturity of the organisation: *“Continued improvement in the performance of the company and change strategies for the better and the creation of success factors. It gives an indication that the organization has become educated. Knowledge management is part of this system” (R11). (R12) defined the KM practices as: “It is the learning organization that builds its policies and stages of development on the knowledge gained”.*

5) Organisational structure and the creation of knowledge via the PMO group:

Organisational structure represented the most significant factor for creating knowledge. The relation between organisational structure and the creation of knowledge can support initiatives and practices to create new knowledge: *“The role of the organizational structure is very important in creating and activating knowledge for the following reasons: The organizational structure must be more appropriate to knowledge management processes in terms of autonomy in decision-making and help to increase initiatives in teamwork. The organizational structure should provide high flexibility in the implementation of knowledge management strategies and plans. The organizational structure could include four main contents: human elements, management, processes, technology”* (R11). Respondent 12 argued that: *“Good structure gives a concrete impression of the relationship between the different sections. In addition to the easy transfer of information from one department to another and how to work together and increase organizational culture of the company to create knowledge, the appropriate organisational structure is needed”*. (R11) suggested that: *“Therefore, there is a real possibility to redesign the company structure to help activate knowledge and manage its operations correctly”*. However, there was disagreement from (R9) about this relation of organisational structure and the creation of knowledge: *“I do not think that is effective, since there must be an infrastructure, even if it is simple, that supports knowledge management”*.

The interviews revealed that the PMO structure can support the creation of knowledge: *“The PMO group should have a detailed structure for the performance of the work of the knowledge management process and who are the people concerned and what means will be used and what is the importance of managing this knowledge to the people and the interest of the company as an entity”* (R12). Respondent 9 said that: *“The concept of PMO works to turn the life of the demand from one hand to another and then resubmit the application with approval or rejection with the appropriate recommendations. A large number of knowledges are created and organisation needs to have a mechanism or a detailed structure of knowledge rotation”* (R9). Respondent 10 defined the PMO structure in the following way: *“The PMO Group in the structure of our company are supportive and advisory, which working to restructure the company in line with the information and knowledge of the internal and external activities. By knowing the structure of the company, there are relationships among many departments, since the PMO has the authority to make recommendations to senior management and company*

owners”. However, one concern was noticed by (R10) that the: *“PMO's role is to create an organizational structure that promotes knowledge exchange among different units and that knowledge is not created in places and is blocked elsewhere”*.

It also became clear that the roles of the PMO group and knowledge creation can be divided into three main themes as proposed by the interviewees. All agreed that Internal processes should be the first process to create knowledge: *“Creating knowledge must receive the absolute support of the PMO group and can be done through internal processes such as market research and knowledge of previous experiences or by learning the experiences of others in the same field. Supporting the initiative with proposals and recommendations and presenting views and experiences that are important in the development of the organization's environment”* (R9). (R10) described the maturity level of the PMO to work as a Centre of Excellence as increasing skills and competencies: *“The role of PMO team members in recruiting talent or retaining managerial competencies helps to create new knowledge and activate existing knowledge”*. Respondent 12 believed that it is important to make good use of old knowledge: *“The role of PMO should consider previous knowledge and use it to help acquire new”*. (R11) remarked on the following benefits: *“The role of PMO contributes to the creation of a set of approved measures that can be directed to decisions, procedures and practices to increase the future success of the company. PMO group contributes to supporting knowledge management objectives and documenting individual and group activities”*.

Two interviewees identified external processes as equally important as internal processes: *“The external processes is important for developing the competency and skills of the staff and the request of experts and specialists and the organisation of meetings and workshops to maximize the creation of knowledge and activate its role”* (R9). The external process as also seeks to provide: *“PMO group seeks to provide the necessary capabilities and capabilities to activate the efficiency of knowledge”* (R11). The practices of knowledge creation in the management of construction projects were discussed in the following way: *“Creating knowledge is interested in research aspects and study recent developments. Also, through the presence of clear and informed processes on how to initiate innovation and the importance of generating creative ideas”* (R12). It was suggested that: *“The selection of alternatives, the identification of opportunities, the standardization of models and the optimal utilization of available human, natural and artistic resources, with the aim of creating new knowledge and bringing about the*

desired change directly related to knowledge management” (R11). Respondent 9 agreed that knowledge must be managed and supported properly to maximise its benefits: “There must be an internal process that supports the creation of knowledge and should be known by everyone”. Respondent 10 did not see the existence of PMO group as supporting the creation of knowledge if there was no identified structure to follow: “Suppose that the PMO is professional enough or working towards an integrated concept. Knowledge creation is done through the participation of different working methods in identifying problems and trying to find appropriate solutions to them in an innovative and continuous manner”.

6) Competitive advantage and the capturing of knowledge via PMO group:

The majority of those interviewed identified competitive advantage and knowledge capturing as strongly related: *“The acquisition of good knowledge both internally and externally and to add this knowledge correctly contributes to the achievement of competitive advantage, such as: providing competitive prices based on knowledge of competitors and the provision of good products through knowledge of the local market” (R11). Respondent 10 suggested some practices to achieve competitive advantage and mentioned the capturing of knowledge: “The company’s ability to continue winning tenders, retaining professionals, attracting qualified people, activating training and development programs, increasing cultural awareness, spreading knowledge, standardizing operations, and helping employees to know the future directions of the company are factors that achieve the competitive advantage”.*

In addition to this (R12) argued that: *“The advantage is determined by the percentage of completion of our projects. How to deal with many of the activities and processes we face daily professionally. Firm’s ability to get the best cadres and competencies in the market to gain their valuable knowledge. Our use of modern means and mechanisms. The difficulty of acquiring our knowledge that we have by others in the same field”.* (R9) believed that: *“Managing knowledge processes is a competitive advantage if exploited quickly and rationally”.* It also became clear that the investment in establishing the PMO group had a positive impact on competitive advantage, bringing the following advantages: *“Speed in doing business by taking advantage of previous experiences and knowledge. The provision of appropriate means and the distribution of resources based on good knowledge in terms of the need for different organisation’s projects” (R11). Therefore, it was suggested that the: “PMO*

should act quickly to acquire knowledge from current staff and knowledge from competitors in the field. To monitor business on a continuous basis and not to allow competitors to benefit from hiring employees and transfer their valuable knowledge” (R9). Similarly, as previously discussed in the analysis of knowledge creation, the respondents identified two main themes of PMO group for the capturing of knowledge internal and external processes. All respondents proposed the internal processes as: “The PMO members should have the authority to obtain any information about the status of the projects or to know what risks are likely to occur” (R12). (R11) suggested PMO group as: A key to managing knowledge and defining the form of operations and their plan of action. Acquiring knowledge is through the PMO Group by raising awareness, providing means and clarifying the way to obtain information and knowledge”. However, (R9) argued that the rehabilitation of people should go first: “To determine the mechanism of acquisition of knowledge and who are the people concerned to take this responsibility, the rehabilitation of people and the identification of practices”. Respondent 10 strongly agreed about the importance of capturing knowledge: “PMO group should be responsible for the classification of knowledge types within the organization: for example, the knowledge of customers, the state of the market, the work carried out and then work to determine their importance to the organisation. Acquire knowledge from different sources, internally such as repositories of knowledge, discussion and communication between departments and projects”.

Unsurprisingly the external processes not discussed as the internal process but (R10) mentioned some examples: *“PMO group should be responsible for encouraging the participation of conferences and workshops, attracting qualified staff and qualifying existing staff by providing suitable training courses and coaching sessions”*. When asked what the practices of knowledge capturing were, (R10) suggested that the: *“PMO group should coordinate the acquisition of knowledge, which can take place in the administrative systems or the periodic procedures or through their presence in the heads of employees. Knowledge classification must identify and compare existing knowledge assets and required knowledge assets. A general framework for value added for knowledge management should also be developed”*. Respondent 12 observed that: *“The acquisition of PMO projects periodically can be converted into knowledge”*. Respondent 9 responded in the following way: *“Let me ask you who is responsible for taking advantage of knowledge management before entering PMO. no one. Therefore, PMO must take responsibility and absolute authority to manage all knowledge processes”*.

7) Organisational culture and the sharing of knowledge via the PMO group:

A number of interviewees identified that the sharing of knowledge is dependent on the culture of organisation: *“The presence of innovative and effective systems to encourage the members of the project team to keep pace with knowledge management procedures. There must be a clear vision of the tasks of the people in order to increase the Organization's culture of knowledge dissemination. Knowledge management practices both in senior management and in projects must be integrated with the company's overall levels”* (R9). In addition to this (R11) proposed that: *“Managing knowledge transfer and dissemination processes requires an encouraging and stimulating organizational culture, is a set of values, behavior, beliefs and intuitions within the scope of work that occur naturally between the interaction of individuals with each other and the expectations of officials for the way others work and the return of their actions”*. Respondent 10 suggested that: *“Organizational culture is a healthy competitive environment, a good mechanism for knowledge transfer, effective means to obtain knowledge in a simple way”*. (R12) struggled with the effectiveness of senior management in this regard: *“Senior management is ineffective. We as project managers are short on this aspect. Because we have a lot of daily tasks. Time factor is important in supporting organizational culture. The culture of work varies according to the different nationalities. PMO group should find appropriate ways for better integration of nationalities to increase cooperation and provide a healthy working environment”*.

The importance of the PMO for spreading knowledge culture throughout the organisation was observed by the majority of respondents. It is important to *“Understand the importance of the role of PMO team members in supporting best practices and promoting teamwork and collaboration. Understand the importance of knowledge sharing and how it can help to develop the maturity of the company and to reflect about the individuals tasks and the possibility to develop their skills and achieve their goals”*. (R9) mentioned that: *“PMO team members and project managers should be aware of their role in promoting knowledge transfer”*. Respondent 11 proposed the role of the PMO in the following way *“The role of PMO should consider 3 fundamentals in achieving organizational culture: values - standards - practices. The role of PMO helps to spread a single regulatory framework, which reduces the resort to always more severe measures”*.

When asked to indicate the main roles of PMO to transfer knowledge, (R9) suggested that the: *“PMO should identify formal channels of communication and knowledge sharing. There should be a high speed in the transfer of knowledge, especially between projects and senior management, in order to maintain the safe transfer of knowledge. Members of the PMO team must be qualified to transfer knowledge and create practices to participate as well as develop effective systems from time to time to keep abreast of the pace of transformation in the construction sector”*. Respondent 12 proposed two main factors: *“Increasing awareness among people of the importance of sharing knowledge can maximise its important and success. The spread of knowledge can be through developing appropriate rewards and incentives by PMO center of excellence”*. The effectiveness of PMOs to encourage knowledge transfer was suggested by (R11): *“The role of PMO must be effective in ensuring that knowledge is provided and accessible when needed as well as to ensure that such knowledge reaches as many people as possible”*.

(R10) argued that the transfer of tacit into explicit knowledge can be a big challenge for the PMO group: *“The role of PMO in the transfer of implicit and explicit knowledge efficiently generates an important return for the company. Knowledge distribution channels are either formal such as training sessions, inter-departmental communication, projects and communication between the staff. Or be informal such as initiatives, debates and periodic meetings”*. A number of respondents identified different practices of knowledge transfer: *“Knowledge transfer must be done quickly from the enterprise environment to the company's stores. Because there is a lot of knowledge that is generated daily”* (R12). Who to deliver the knowledge to was mentioned by (R11): *“Transfer of knowledge should be concerned with the delivery of important information to stakeholders or beneficiaries in time, form and cost appropriate”*. Respondent 10 added that the: *“Dissemination of knowledge helps to increase the abilities and skills of project managers and project teams and needs to be classified to access the right people and objective”*.

8) Human resources management and the application of knowledge via the PMO group:

The PMO roles for assisting Human Resources management to apply knowledge was discussed by all interviewees: *“The PMO team should support human resources management and guide them on the quality of training programs that the company really needs. Informing leading employees to maximize the role of knowledge and loyalty of employees in the development of company strategies. PMO's role in prioritizing the company in acquiring business that meets the stakeholders' orientations. Clarify what processes and practices should be changed or developed according to the market situation”* (R9). The definition of the PMO role can encourage its importance: *“Roles and responsibilities must be defined with the presence of the PMO concept. Responsibilities are given by senior management. Sometimes PMO's limited role is limited to making recommendations for human resources management”* (R12). Respondent 11 illustrated the main roles of the group as: *“To educate, motivate and equip employees to take advantage of technology in acquired knowledge or through a good knowledge of practices”*. (R10) mentioned some similarities between the PMO and HR management and suggested that their respective roles need to be clarified: *“This group is concerned with the management of knowledge operations and trying to make the most of them, which fulfils the aspirations of the company. There is a direct relationship to the role of human resources and PMO, but the responsibilities of each party must be determined so that there is no duplication or overlapping of powers”*.

The relation between HR management and the application of knowledge were discussed by (R10) and (R11). For example, (R10) identified the common factors between them as: *“Human resources management is not involved in knowledge management with the presence of PMO group in the company”*. (R11) identified the challenges that might affect the application of knowledge as: *“Here we can talk about technological challenges. Some believe that technology is the only key factor in knowledge management. This is an incorrect belief, employing technology to be the only catalyst for different knowledge management processes and practices has a positive impact on viability and continuity in competition. The role of human resources is to provide the means to achieve these goals”*.

A number of interviewees emphasised the role of the PMO group for applying and re-using knowledge: *“The role and contribution of PMO in applying some of the knowledge learned to*

increase the enthusiasm of staff that their expertise and information will be applied as a priority” (R9). In addition to this, (R12) added that: “The knowledge application is increasing the validity of the PMO. If there are no absolute powers or overlap of responsibilities, there is difficulty in applying knowledge”. It was also suggested that there are some common practices of knowledge re-use that can be accessed: “To ensure the reuse of knowledge, the performance of decision making and the amount of changes that have occurred in administrative regulations must be assessed. Link knowledge application with financial incentive systems and employee performance assessment. Increasing the employees' awareness of the importance of their role in the application of knowledge” (R9). (R10) offered several examples to support this argument, observing that the: “Application of knowledge is through the work and activities and practices and how to teach others because knowledge requires access to quality education and determine the mechanism to explain. Learning occurs through attempts, opportunities and completion of business which is reflected in improving the level of knowledge. Knowledge is a force if applied even with errors. An efficient knowledge system must understand errors and constantly review them”. However, (R11) argued that: “Knowledge is applied through the transformation of knowledge into operational processes. There is great importance in storing knowledge, using effective practices or using modern technology factors to make research and knowledge access easy”. Figure 7.3 illustrate the concept map for this level and summarise the key findings; as follows:

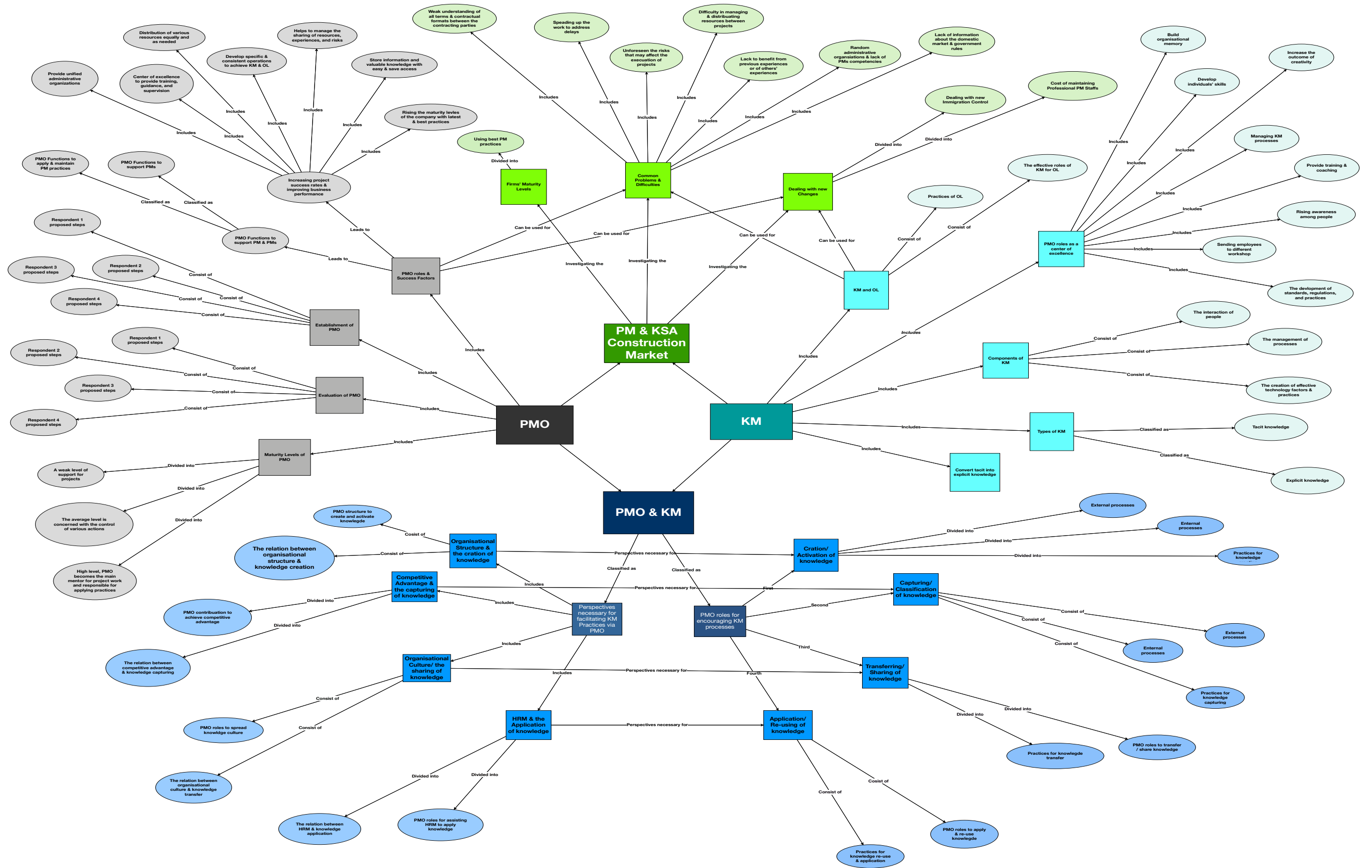


Figure 7.3: Concept Map for Level 1

7.2.4 Analysis of level zero

The biographical questions to support the analysis is highlighted in table 7.4. First of all, the ages of the interviewees ranged between 45 and 55 years, with an average age of 50 years. Years of experiences in this level ranged from 18 to 25 years of experience working within the construction industry with an average of 21 years. Respondent’s qualifications were variable, but the lowest degree was Bachelor and two out of the respondents had master’s degree. Two respondents were working as project managers and the other working as CEO and Head of HR department. However, the majority of respondents in this level do not have any types of PMO, but their responds illustrated that they were ready to move forward and starting to implement the approach: *“I think it is time to find a radical change in the administrative regulations and work on developing competencies”* (R14).

Respondent 15 observed that it was difficult to measure the firm’s level of expertise as there were not real and effective procedures to follow: *“There is no real and effective tool to assess the performance of the company's business. Many things are not transparent and clear. The company's guidance and plans are not only known to the decision-makers, and we often face financial difficulties and we do not know the actual performance of the company's budget”*. Respondent 13 suggested that construction firms needs to evaluate their number and size of projects they executed and then to take action for investing in new programs or methodology to cop with the new changes: *“We have a qualified team with great practical and scientific expertise. It is difficult to define a certain level, but as a company with enormous potential and ability to compete to win different projects”*.

Nodes	Codes	Respondent 13	Respondent 14	Respondent 15	Respondent 16
Biographical questions to support analysis	Age	54 years	55 years	45 years	52 years
	Qualifications	Bachelor's and master's degree in engineering	Bachelor of Engineering	BA in Business Administration and Master of Financial Management	Bachelor of Architecture and Master of Planning
	Years of Experiences	25 years	22 years	18 years	20 years
	Positions	CEO	Project Manager	Head of HR department	Project Manager
Firms' level of expertise	Using best practice of PM and having Professional PM Staff	<i>“We have a qualified team with great practical and scientific expertise”.</i> <i>“It is difficult to define a certain level, but as a company with enormous potential and ability to compete to win different projects”.</i>	<i>“I think it is time to find a radical change in the administrative regulations and work on developing competencies”.</i>	<i>“There is no real and effective tool to assess the performance of the company's business”.</i> <i>Many things are not transparent and clear”.</i> <i>“The company's guidance and plans are not only known to the decision-makers, and we often face financial difficulties and we do not know the actual performance of the company's budget”.</i>	<i>“Simply, according to the efficiency of project managers and responsiveness of senior management with the need for projects”.</i>

Table 7.4: Analysing biographical questions to support analysis of level 0

1) Common problems and difficulties:

The interviews at this particular level revealed a number of common problems and difficulties which led to project delays and overrun costs. Respondent 13 observed that: *“We have not benefited from our previous experience in an ideal and informed way. The difficulty of communication and coordination between our central administration and the various projects, especially outside the city of Riyadh. We do not have unified management regulations that are applied in the majority of projects, but we rely directly on the possibilities of our project managers”*. It was also suggested there were no obvious standards and policies that could be added between different projects within the same organisation: *“Operations, activities and policies always vary from project to project. The existence of regulatory bases and specific laws we do not have. Sometimes the company's possibilities do not allow it to enter into new projects”* (R15).

This resulted in dealing with every project as a new experience and not benefiting from the knowledge acquired from previous projects: *“Our evolution is very slow, we must follow the modern age, we must give opportunity for change. I can mention the names of our previous projects, but I cannot find out what practices, activities and risks we faced in their implementation. There is independence in the implementation of projects and the language of communication is nil. The communication language between projects and management is not working properly”* (R14). Respondent 16 noted some other difficulties of the KSA’s construction market as: *“Communication with the consultant or clients. Provide cash payments for works delivered. Distribution of resources by business priority. Efficiency of project managers and team members”*. Respondent 15 noted how the new immigration controls had a negative impact on construction firms: *“Compliance with the decisions, considering the costs of fees for foreign labour on the salary scale in the company”* (R15).

Respondent 16 illustrated how the introduction of the Saudi’s 2030 vision was increasing the pressure on firms to properly deal with these changes: *“The country here has become in a race against time and the changes have become very large. A good study of the situation of the market and not neglecting to take advantage of the transfer of the craft to the national hands correctly”*. The difficulty of maintaining professional project management staff has increased: *“We have a great majority of staff who have many years of working with us. The imposition of*

new duties and taxes on foreign labour has made the majority of them think of leaving the company” (R13). Respondent 14 was agreed on this matter: “Yes Certainly, if we want to stay in competition strongly we must believe in local competencies, and seek to integrate them with our foreign competencies, in order to acquire knowledge and achieve the strategic objectives of the company”. However, respondent 15 was the only one who was not disappointed with these changes, he advocated that companies should: “Try to take advantage of our competencies no matter what the cost will be needed”.

2) Expected benefits of investing in PMOs:

As discussed early, all of the respondents were confirming that PMOs not existed in their organisations. However, respondents have been asked specifically in this level to identify the expected benefits of the investment in PMOs: *“Working on monitoring the main factors of projects, cost, time, expenses, and others. The audacity to make decisions based on accurate database. Identify project priorities and implement common strategies and methodologies” (R13). It also became clear that the PMO was getting attention from different industries around the globe in order to: “Support the application and promotion of project management practices. PMO works to attract experts in the field of project management and thus act as a center of excellence for all activities and processes related to project management and provide the required training and modern methods” (R15). Respondent 16 suggested that the PMO could assist in gathering information and identifying the data needed for project management in the company; the PMO can “Create databases, processes and various workflow tasks. Provide appropriate support for different projects according to the company's priorities and strategies”.*

Furthermore, respondent 16 suggested four main functions that the organisation can get from the investment in this approach: *“Reporting: responsible for all reports received from various projects. Support for training: It can work alongside human resources and development management by making recommendations on the quality and relevance of training programs. Management of communication and coordination between the projects of the Organization and how to link them. Develop methodology and processes for project management”.* However, as a project manager, respondent 15 explained their needs to the PMO as it can serve the organisation by: *“I need coordination and good communication with the decision makers as*

well to help provide urgent solutions and deal perfectly with the trends and difficulties that limit the completion of the work. Making decisions personally presents me with problems with senior management". It was also suggested the establishment of PMO can be: "A great regulatory tool, an observation point that has many positive and reform aspects in companies. PMO has become involved in reporting on the problems facing the project implementation stages and providing the ideal tools and solutions. Keeping and organizing the documents of the management in a professional manner that facilitates the process of retrieval and utilization" (R14). Respondent 14 also added the roles of PMO as a Centre of Excellence can provide the following aspects: "Identifying the training and development needs of senior management and project staff. Coordination with relevant organizational units is also supported to meet these needs. Provide periodic reports on the status of projects and support proposals for their development and utilization".

3) Components and types of knowledge:

The majority of those interviewed were unsatisfied with the level of project management and knowledge management practices they currently face. However, the researcher decided to modify the questions format in this level to obtain the key factors rather than evaluating its performance. Types of project knowledge were mainly divided into tacit and explicit knowledge: "Explicit knowledge: Which can be described by external and concrete manifestations and expressed by talking, discussion and writing and allows technology and practices conversion. Tacit knowledge: It exists in the minds and behavior of individuals and can be described by the internal sense of speed and clarity and intuition and expressed by experience and responsiveness" (R16). Respondent 15 explained the differentiation between these in the following way: "Know what - why - how - to who, which is divided into two main sections are: Tacit knowledge: the remaining part of the head of the individual in terms of experience, previous information, visions and personal ideas. Explicit knowledge: which can be obtained clearly through documents, periodic reports and others". Respondent 13 argued that: "Every action, activity, decision or even accurate details of projects is knowledge. The types of knowledge are numerous but are summarized in implicit and explicit knowledge".

Respondent 14 divided the components of KM into three different perspectives: "Knowledge management can be viewed from several perspectives: First, from a technical perspective.

Second, from the perspective of organizational culture. Third, from a financial perspective. The main component of knowledge is human power because it is the foundation that is conveyed through individual knowledge to organizational knowledge". People represented the most important component of KM: "People are the primary drivers of knowledge, so effective processes must be identified to achieve the management objectives of this knowledge" (R13).

4) KM and organisational learning:

Respondents identified four themes relating KM and organisational learning. Firstly, they remarked upon the development of KM to support the development of organisational learning: *"To achieve the standards of the educated organization must be constantly focused on the development of knowledge management processes, especially to ensure the mechanism of work and the importance of the company" (R15).* The greater the interest in knowledge management processes, the more mature the organisation becomes: *"Knowledge management by working to benefit from the previous experiences and knowledge gained and different information can contribute to increase the level of learning and the maturity of the company" (R16).*

It also became clear that the development of the KM systems supported the development of organisational learning: *"Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time" (R13).* Secondly, the KM achievement for organisational learning can be seen in: *"Increased transparency, availability and accessibility of information, teamwork and continuous communication are all positive impacts that contribute to organizational education" (R15).* In addition to this, respondent 16 suggested that: *"The constant change and stay in the competition reflect learning styles, as well as lessons learned to facilitate the implementation of future projects and meet challenges".* Thirdly, learning is based on acquiring knowledge: *"Learning is based on acquiring knowledge and developing appropriate processes to maximize their utilization. Knowledge management is a good factor to gain the best lessons and experiences" (R14).* Fourthly, people's knowledge is important for organisational learning: *"Knowledge management helps to care for people and their role is effective in increasing the maturity of the company" (R14).*

5) Organisational structure and the creation of knowledge:

The interviews revealed the failure of construction firms to link organisational structure with the knowledge life-cycle: *“I believe that a responsible entity should be identified for the knowledge lifecycle, both in the projects being implemented and in the administrative work of the head office”* (R15). Respondent 13 believed this failure was due to the presence of ineffective organisational structure: *“I believe that the division or activation of the role of senior management should be defined in promoting the creation of knowledge”*. However, respondent 16 argued that: *“My role as project manager is to motivate team members to share experiences, maximize knowledge and have beneficial returns for everyone”*. The current level of organisational structure to support the creation of knowledge was almost missed: *“There is a governance structure that illustrates the different sections but the structure's contribution to defining the life cycle of knowledge is almost missing”* (R13). Respondent 14 disagreed with the current effectiveness of their organisational structure to encourage knowledge: *“No, because if you ask me which department is responsible for managing or collecting best practices I cannot answer or identifying one”*. Respondent 15 observed that: *“We have a structure of the company distributed in different sections. But a clear structure to create knowledge does not exist”*. However, respondent 16 suggested that: *“There must be an independent structure to manage knowledge processes and different stages. Our project structure is not supportive of knowledge creation”*.

A number of interviewees suggested a number of steps to create knowledge properly: *“Knowledge creation must be built on clear foundations and processes, such as what are the sources of knowledge? Including those concerned with the management, coordination and monitoring of their work? Determine how knowledge types are converted? What knowledge does the organization really need to be activated?”* (R16). This approach will require the involvement of senior management: *“Senior management must consider the importance of creating knowledge. There must be a formal system or people involved in managing knowledge management”* (R13). It was also suggested that: *“We do not have clear policies and processes to create knowledge. To continue to compete, knowledge must be created using modern practices and processes to manage them clearly”* (R15). Similarly, to this argument, respondent 14 added: *“There are no major processes and practices currently can meet the needs of the company. There is no supporting body involved in managing knowledge management. Respondents thought that not having adequate means of knowledge retention*

would have a negative impact on the entire organisation: *“Awareness and attention are missing for the importance of capturing knowledge. There is a lack of interest by people in the importance of transferring their experiences to others”* (R14). Whilst respondent 15 represented other impacts as: *“The contribution of the creation of wrong decisions. Do not take advantage of previous knowledge. Weak qualification of the company”*.

6) Competitive advantage and the capturing of knowledge:

Competitive advantage is one of the most exciting debates by interviewees such as: *“I see the company has good competitive advantages through its reputation in the Saudi market. The availability of financial liquidity, the ability to implement a number of projects simultaneously, have good information about subcontractors, good relations with a number of customers have been built”* (R13). Respondent 16 defined this approach as: *“A company's distinction from the other is how to successfully manage internal and external operations. The long-term survival of the employees with the company, this gave an indication that the company's environment is valid and that it remains committed to the rules of competition”*. The main practices of current competitive advantage were extensively discussed by respondent 15: *“Competitive advantage is based on the presence of strong governance in the company, which enabling the organisation to know the relationships and tasks between the departments and projects”*. Interviewees identified a number of steps to capture knowledge: *“Providing training and qualification programs for employees on how to acquire important knowledge”* (R15).

However, respondent 16 suggested that it was important to activate certain roles: *“There are roles that must be activated such as the role of senior management to identify an appropriate mechanism and qualifying project managers to encourage other team members to the importance of acquiring different knowledge”*. In addition to this, respondent 14 suggested that: *“senior management should encourage their employees to recognize the importance of acquiring knowledge. Senior management should believe in the importance of acquiring different sources of knowledge. In order to acquire knowledge, there must be specific and informed processes”*. It also became clear that: *“The concept of knowledge management must be a clear concept for different departments in order to optimize knowledge acquisition. Good knowledge acquisition can be developed through business documentation and effective systems”* (R13). By contrast, respondents 15 and 16 emphasised some of the difficulties

associated with capturing knowledge: *“Much knowledge we have not acquired correctly. We had specialists in many areas of American and European countries and when they left we encountered great difficulties”* (R15); a *“There are no specific initiatives to acquire daily knowledge and then classify it to make it difficult to imitate by competitors”* (R16). Unsurprisingly, the majority of respondents mentioned the importance of saving valuable knowledge: *“In the past, there were no real competitors. Currently competition is more difficult to quickly acquire knowledge and best practices and generally there are two factors: First, attracting competencies. Second, provide training programs and support the rehabilitation of current employees”* (R14). Respondent 13 responded in the following way: *“I think as knowledge should be classified for optimal acquisition”*. Respondent 14 noted that *“Effective modern systems, processes and practices must be in place to help make it difficult to transport them outside the company”*. Respondent 16 added that: *“The optimal acquisition of knowledge is the acquisition of competencies”*.

7) Organisational culture and the sharing of knowledge:

The analysis showed different aspects of organisational culture, including common language, communication, coordination, different nationalities, and people’s awareness. Organisational culture and the sharing of knowledge are often interconnected and are hard to accomplish when the previous factors are not properly considered. Therefore, the consideration of common language was considered important by both respondent 13 and 14: *“The majority of staff in construction have different language of communication according to their nationalities and cultures”*(R13); *“The entrepreneurial environment is full of different cultures such as language acquisition”* (R14). Two other aspects were also suggested by respondent 13: *“I believe that the presence of a unified methodology or effective management of communication and coordination has a positive impact”*; *“There are different nationalities with different cultures”*. Respondent 14 asserted that: *“I cannot say for sure, and many of the employees in the project are not developing their performance and activating their role and importance in the constructive cooperation that serves the entire of the company”*.

However, steps to transfer knowledge is equally important as the previous processes: *“I believe that activating the role of cooperative interactions. Creating appropriate communication channels will contribute to the transfer of knowledge”* (R14). Participants mentioned that

environment and culture play major roles in the sharing of knowledge: *“The transfer of knowledge is done by creating the company's culture of cooperation and linking the different entities of the company to effective communicators”* (R15). Knowledge transfer is done through the contribution of individuals: *“It is necessary to provide the appropriate means, find common formulas, and training in continuous development and linking them to promotions”* (R16). It was suggested that the: *“Transfer of knowledge must be done from anywhere in the company and be used to transfer all experiences, either failed, or successful”* (R13). The majority of those who interviewed represented the expected impact of not disseminating knowledge as: *“There are no specific mechanisms, practices or means for everyone to transfer knowledge from one side to another”* (R16). Some noted that the speeds of knowledge transfer was ineffective: *“Transfer of knowledge is only when needed as it requires more time to find the people concerned and then transferred to the beneficiary”* (R15). The absence of incentives programs was mentioned by respondent 14 who noted: *“the lack of incentives and initiatives to transfer knowledge”*. It also became clear that there are no good databases: *“Much of the knowledge is published only by personal judgment or not properly conveyed to decision makers in the company”* (R13).

8) Human resource management and the application of knowledge:

When respondents were asked to evaluate the current level of HR management, there was general disagreement about its level of support for KM processes: *“The communication between projects and management of human resources is missing, except in the case of deductions in salaries or the identification of contracts, we go to the central administration to implement the necessary procedures. The large number of responsibilities and the lack of support for human resources management limit the appropriate sharing of valuable knowledge”* (R16). Respondent 13 struggled to find any practices of KM in the organisation: *“Without a clear presence of a department or group to support knowledge management, human resources management should be involved and must be able to make use of knowledge”*.

This argument can be supported by respondent 15's point that *“Availability, empowerment, time factor, people's ability, awareness, loyalty and dedication to work are of paramount importance in defining the role of human resources management in the application and reuse of valuable knowledge, information and experiences”*. Respondent 14 highlighted the absence

of support for KM: *“Initiatives are not documented, unorganized or unsupported”*. The proposed steps to re-use and/or apply knowledge were discussed by respondent 14 in the following way: *“Application of knowledge is linked to the level of change that should be acquired in the company. By configuring that the company beginning to apply best practices. The culture of people is important for change. View the successes of others before decision makers in the company”*. Respondent 16 observed that: *“the application of knowledge is achieved by activating the role of previous operations. The existence of a body that can ascertain what knowledge is important to the company and then reformulate it to suit the company's general strategies”*. The concept map of this level is shown as in figure 7.4:

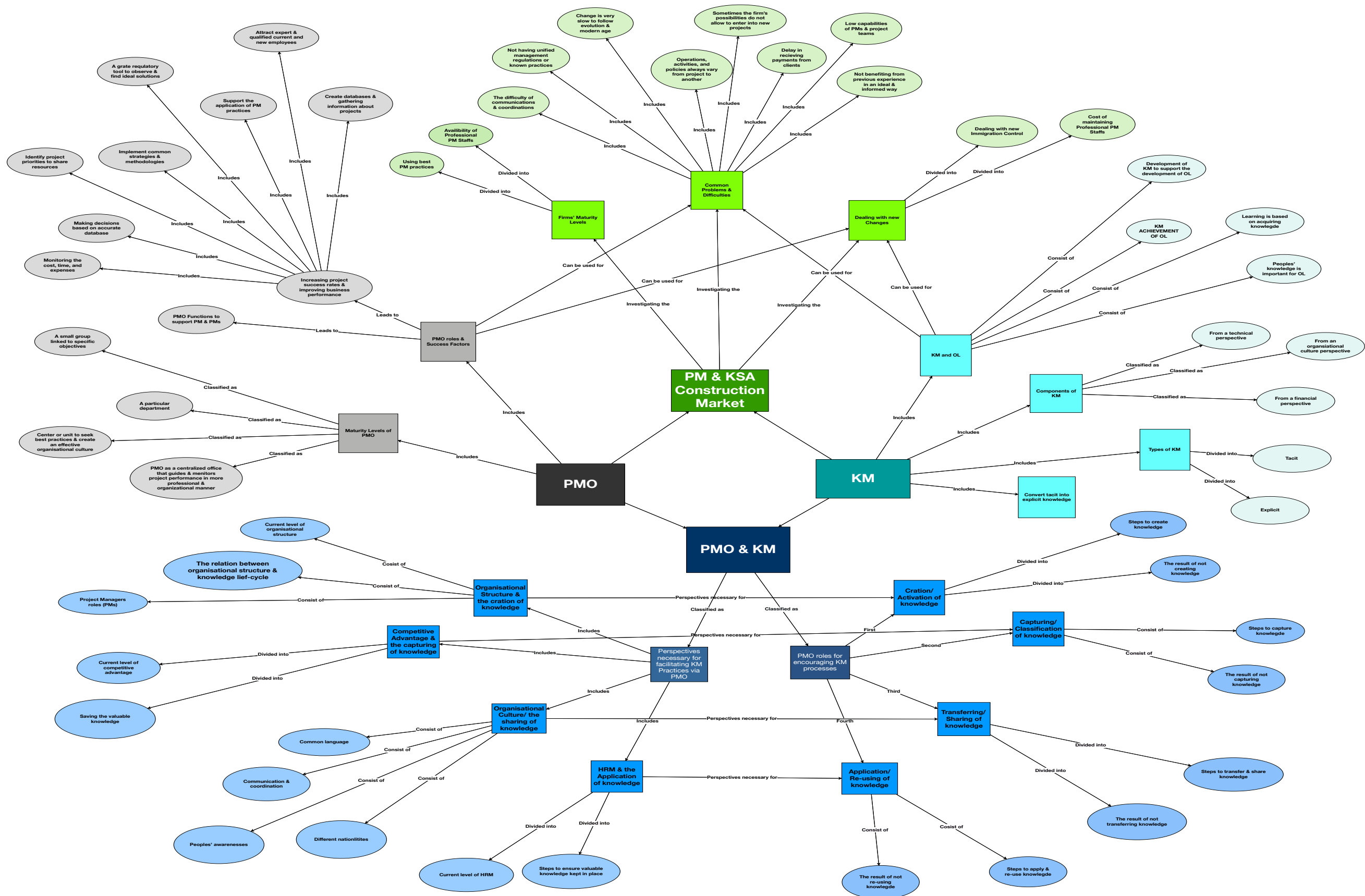


Figure 7.4: Concept Map for Level 0

7.3 Cross-analysis between different maturity levels

The literature review revealed that few efforts have been reported on using appropriate PMO maturity models to assess the needs of organisations and to maximise the benefits of applying this concept. This gap of knowledge is clearly identified by conducting the qualitative analysis as different construction firms had different maturity levels of PMOs and their functionality was accordingly different. Therefore, in order to link the description analysis at each level with the objectives of the research, cross-analysis between different maturity levels is provided. The first part of the analysis will examine the similarities and characteristics that common to all maturity levels. Specifically, it will analyse the concept of the PMO, the concept of KM, and ways to convert tacit into explicit knowledge. The second part will consider the differences that differentiate levels of maturity. In particular, it will explore PMOs maturity levels, steps and procedures to establish PMOs, and steps and procedures to evaluate/update PMOs. Figure 7.5 illustrates that the utilisation of NVivo program can shows the most repeated terminologies based on the qualitative analysis; as follows:



Figure 7.5: Using NVivo program to show the most repeated terminologies based on the qualitative analysis

7.3.1 Similarities and characteristics common to all

Many similarities and characteristics common to all were identified based on the analysis of each maturity levels of PMOs. This means that certain factors are applicable to different maturity levels. Analysing the respondents understanding of the PMO concept and analysing the respondents understanding of the KM concept reveal some important similarities such as the desire to improve business performance and increase the maturity levels of organisations. Although, analysing the respondent's views of the ways to convert tacit into explicit knowledge were representing common steps and procedures, which can be implemented no matter what PMO levels does exist.

7.3.1.1 The concept of the PMO

Various definitions of the PMO and its concept have been presented by all of the interviewees. The respondents classified the PMO in different ways as follows. Firstly, ten out of the sixteen interviewees defined the PMO as a Centre of Excellence that could increase the maturity of the organisation: *"The role of PMO is the supervision of the life cycle of the project from start to finish. PMO can be characterized by central project support such as management organization, logistical support, and management development of knowledge, reporting, risk and communications. A center of excellence such as developing methods, standards, processes and tools, as well as its role in training and directing staff"* (R8). It was suggested that this centre should be: *"an internal or external group of the company, whose work is based on developing and ensuring project management standards. Also maintain best practices and evaluate project performance and guidance when needed, it can be known as a center of excellence"* (R11). In addition to this, respondent 12 said that the: *"PMO is an administrative structure that consolidates the various processes of projects and provides the possibility of sharing resources, methods, tools and methodologies"*.

The flexibility of the PMO's centre is: *"To provide models, information, technical support and training to the project team without imposing any control over their projects or activities"* (R9). This centre can be used as: *"A tool and methodology for achieving project management objectives which depend on the procedures for starting, planning, implementing, adjusting and closing work according to meet specific objectives and standards at a pre-agreed time"* (R10).

However, respondent 13 described the position of the PMO in the following way: *“The central administration to facilitate the provision of tools, applications, and resources for distribution in a way that meets the needs of projects”*. This is can be useful for the PMO’s centre of excellence to be the initial call when needed: *“PMO’s department is to control these projects and manage them when needed. It is considered the initial call and reference when there is a need to provide some resources or to address some problems”* (R6). The nature of this centre was proposed by respondent 12 in the following way: *“PMO is an organizational unit, group or center of excellence composed of a group of project management experts”*. It also became clear that the PMO centre can: *“Optimize the potential and resources of the organization and sharing projects with each other to reduce costs and increase knowledge and maturity”* (R2).

Secondly, other respondents related its importance to the role it plays in developing organisational project management maturity. Respondent 10 noted that the *“PMO has contributed to the evaluation, standardization and re-introduction of refined practices and processes in the implementation of future projects. It the backbone of the application and management of modern project management methodologies, which is reflected in the interest of the organization”* (R10). Respondent 14 saw the PMO as: *“A department responsible for planning and monitoring the implementation of all projects. PMO is the main thinker to use best practices in project management. PMO can be the main link between senior management and projects implemented by the company”*. Respondent 15 referred to the PMO as a governance: *“It is the governance of project management, monitoring its performance and training, conducting research and studies on the needs of project management in companies”*.

Thirdly, as the number and complexity of projects throughout the world has increased, the PMO enables the standardization of practices, policies, and procedures: *“To manage the activities and events of the joint projects by linking them as one working system through PMO”* (R2). Respondent 6 pointed out that the *“PMO works to unify efforts and organize different business processes in accordance with unified systems and policies that achieve best practices in project management”*. This in turn would lead to an increase in the level of transparency: *“A tool and a system of work to help increase transparency and take decisions in the interest of the company as a whole entity”* (R11).

Fourthly, the popularity and expansion of PMOs among organisations appears to be related to its function as a centre of knowledge and documentation of various projects: *“The PMO concept is the main engine that aims to apply knowledge, techniques and skills in various project activities according to company strategies”* (R6). The responsibility of the PMO can focus on the internal and external factors of the organisation: *“Internally, PMO works to bridge knowledge bridges and bridge gaps between different departments and projects. Externally PMO works on good communication with shareholders and stakeholders and selecting strategies that achieve the company's success”* (R7). Respondent 3 observed that the PMO is a good storage of information: *“The PMO is a good store of information through which all data and details of the implementation of current and past projects will be collected and utilized in the future”* (R3).

Fifthly, the PMO enables the development of common standards and methodologies to contribute to improved business performance: *“There are two main reasons for the establishment of the Office: the first concerns the application of standardized project management standards and the second is to try to increase the success rates of projects and reduce the factors of failure”* (R4). The role of the PMO can be related directly to its maturity: *“PMO's role in business leadership can be such as a course in the development of organizational, cultural and educational structures, standardization of processes and governance, and support for decision-making”* (R8). Respondent 13 added the following: *“It is an organizational entity within the structure of the company. It monitors projects, examines them, verifies their operations and policies, and then compares them to the standards, bases and strategies of the company”*.

Sixthly, the PMO can assist senior management with the progress of various projects and support the project managers: *“PMO's idea emerged to relieve pressure on senior management and help regulate and control the environment of different enterprises”* (R3); *“PMO message to us as project managers that the planning, organization, direction and monitoring processes should be communicated to the PMO for approval to start implementation”* (R2). Respondent 4 observed that: *“As a project manager, I can say that PMO is a real assistant in implementing a lot of responsibilities that take me a great time to prepare and request”*. Respondent 7 confirmed the importance of the PMO to project managers: *“PMO is the right hand of project managers, the center of control over knowledge areas and project management practices”*.

Finally, other respondents defined the PMO in the following ways: *“PMO I think it is the main engine of the projects. I can compare it to the traffic vehicle. It monitors the performance of our various projects on a daily basis. I can compare it to the ambulance, as it helps the troubled projects improve their performance and try not to fall into these mistakes in the future”* (R1). Respondent 5 emphasised that there are different types of PMOs and the organisation should choose the appropriate type to address their needs: *“When there are two or three projects the company is working on, it is possible to control them and find appropriate solutions. But when a company has a large number of projects or a very large project, PMO department management distributes tasks by priority. Some small enterprises also consume a very large proportion of the enterprise's resources and are supposed to be available for large projects. We have established a PMO department to address these challenges and address them in the public interest”*. Respondent 9 followed the PMI's definition: *“PMO is a group of specialists and experts in a number of fields, concerned with making a quantum leap in the company”*. Finally, respondent 1 suggested the strategic role of the PMO: *“It is an effective control and operational system to achieve the strategic objectives of the company according to plans organized”*.

Respondents	Definitions of PMOs
(R1)	<p><i>“PMO I think it is the main engine of the projects. I can compare it to the traffic vehicle. It monitors the performance of our various projects on a daily basis”.</i></p> <p><i>“I can compare it to the ambulance, as it helps the troubled projects improve their performance and try not to fall into these mistakes in the future”.</i></p> <p><i>“It is an effective control and operational system to achieve the strategic objectives of the company according to plans organized”.</i></p>
(R2)	<p><i>“To manage the activities and events of the joint projects by linking them as one working system through PMO”.</i></p> <p><i>“PMO letter to us as project managers that the planning, organization, direction and monitoring processes should be communicated to the PMO for approval to start implementation”.</i></p> <p><i>“Optimizing the potential and resources of the organization and sharing projects with each other to reduce costs and increase knowledge and maturity”.</i></p>
(R3)	<p><i>“PMO's idea emerged to relieve pressure on senior management and help regulate and control the environment of different enterprises”.</i></p> <p><i>“The idea of PMO has evolved into a center of knowledge and documentation of various projects. Which includes preserving the historical information of previous projects in order to take advantage of them not to fall into the common risks and issues”.</i></p> <p><i>“PMO is also an important factor in resource management and the creation of common methodologies and policies”.</i></p>
(R4)	<p><i>“As a project manager, I can say that PMO is a real assistant in implementing a lot of responsibilities that take me a great time to prepare and request”.</i></p> <p><i>“There are two main reasons for the establishment of the Office: the first concerns the application of standardized project management standards and the second is to try to increase the success rates of projects and reduce the factors of failure”.</i></p> <p><i>“The PMO is a good store of information through which all data and details of the implementation of current and past projects will be collected and utilized in the future”.</i></p>
(R5)	<p><i>“When there are two or three projects the company is working on, it is possible to control them and find appropriate solutions. But when a company has a large number of projects or a very large project, PMO department management distributes tasks by priority. Some small enterprises also consume a very large proportion of the enterprise's resources and are supposed to be available for large projects. We have established a PMO department to address these challenges and address them in the public interest”.</i></p>
(R6)	<p><i>“PMO's department is to control these projects and manage them when needed. It is considered the initial call and reference when there is a need to provide some resources or to address some problems”.</i></p> <p><i>“The PMO concept is the main engine that aims to apply knowledge, techniques and skills in various project activities according to company strategies”.</i></p> <p><i>“PMO works to unify efforts and organize different business processes in accordance with unified systems and policies that achieve best practices in project management”.</i></p>
(R7)	<p><i>“PMO is the right hand of project managers, the center of control over knowledge areas and project management practices.</i></p> <p><i>“PMO cares about the internal and external aspects of the company. Internally, PMO works to bridge knowledge bridges and bridge gaps between different departments and projects. Externally PMO works on good communication with</i></p>

	<i>shareholders and stakeholders and selecting strategies that achieve the company's success”.</i>
(R8)	<i>“The role of PMO is the supervision of the life cycle of the project from start to finish. PMO can be characterized by central project support such as management organization, logistical support, and management development of knowledge, reporting, risk and communications. A center of excellence such as developing methods, standards, processes and tools, as well as its role in training and directing staff. PMO's role in business leadership can be such as a course in the development of organizational, cultural and educational structures, standardization of processes and governance, and support for decision-making”.</i>
(R9)	<i>“PMO is a group of specialists and experts in a number of fields, concerned with making a quantum leap in the company. PMO Group provides models, information, technical support and training to the project team without imposing any control over their projects or activities”.</i>
(R10)	<i>“It is a tool and methodology for achieving project management objectives which depend on the procedures for starting, planning, implementing, adjusting and closing work according to meet specific objectives and standards at a pre-agreed time”. “PMO has contributed to the evaluation, standardization and re-introduction of refined practices and processes in the implementation of future projects”. “It the backbone of the application and management of modern project management methodologies, which is reflected in the interest of the organization”.</i>
(R11)	<i>“PMO is an internal or external group of the company, whose work is based on developing and ensuring project management standards. Also maintain best practices and evaluate project performance and guidance when needed, it can be known as a center of excellence”. “A tool and a system of work to help increase transparency and take decisions in the interest of the company as a whole entity”.</i>
(R12)	<i>“PMO is an administrative structure that consolidates the various processes of projects and provides the possibility of sharing resources, methods, tools and methodologies”.</i>
(R13)	<i>“It is an organizational entity within the structure of the company. It monitors projects, examines them, verifies their operations and policies, and then compares them to the standards, bases and strategies of the company”. “PMO is the central administration to facilitate the provision of tools, applications, and resources for distribution in a way that meets the needs of projects”.</i>
(R14)	<i>“A department responsible for planning and monitoring the implementation of all projects”. “PMO is the main thinker to use best practices in project management. PMO can be the main link between senior management and projects implemented by the company”.</i>
(R15)	<i>“It is the governance of project management, monitoring its performance and training, conducting research and studies on the needs of project management in companies”.</i>
(R16)	<i>“PMO is an organizational unit, group or center of excellence composed of a group of project management experts”.</i>

Table 7.5: Analysing the respondents understanding of the PMO’s concept

7.3.1.2 The concept of KM

Interviewees classified KM in different ways, some of them related its functions to the logical processes and practices to manage and protect appropriate knowledge (R1, R5, R9 .. etc). Others attributed its importance to achieving organisational learning and improving business performance (R4, R6, R8 .. etc). This research, based on the interviews, identifies six themes of the KM concept. Firstly, to identify different processes to manage the appropriate knowledge: *“Knowledge management is the creation of appropriate knowledge through which the scope and needs of the project are identified and knowledge of appropriate strategies such as processes, skills, knowledge, tools, techniques which are ultimately aimed at delivering the project correctly”* (R1). Respondent 9 defined KM as: *“A systematic management aimed at managing knowledge assets to meet tactical and supervisory requirements. It is a combination of key and subsidiary initiatives, strategies and processes that support the creation, acquisition, transfer and reuse of knowledge efficiently and effectively”*. Similar processes were suggested by respondent 13: *“Assistive processes through which organizations can generate, test, organize, use and disseminate knowledge”*. Respondent 16 added the importance of sharing knowledge to the previous processes of KM: *“A set of strategies, policies and regulations that maximize and increase intellectual and informational resources by identifying processes and practices that benefit the entity of the company”*.

Secondly, KM achieves organisational learning based on lessons learned: *“KM is the process through which knowledge and experience resources are shared and shared with individuals and the organization in order to raise awareness and achieve the required learning for the organization. It is the process of motivating and encouraging individual or collective initiatives that increase knowledge acquisition and best use by companies”* (R4). The importance of lessons learned was identified by respondent 11: *“Knowledge management is essentially a map that determines the flow of information and the management of its operations so that the company can accomplish its duties and tasks and increase the success of its projects”*. However, respondent 14 and 15 proposed that the implementation of KM is to gain best practices. KM is *“A set of processes and behaviors that are co-drafted by the beneficiaries within the organization in order to acquire knowledge, to contribute to the application of best practices and to increase long-term competitiveness”* (R14); *“Information, skills, capabilities,*

and experiences, whether implicit or clear, that exist with the employees of the company” (R15).

Thirdly, KM creates a healthy environment and organisational culture to facilitate the adoption of knowledge: *“Knowledge management is the ability of the institution to achieve unity and work as one entity that meets different needs”* (R7). In addition to this, respondent 10 mentioned that both environmental and organisational culture or structure could affect the effectiveness of knowledge: *“Directing the management of intellectual capital as well as intellectual assets in the workforce. Manage different work environments and allow employees to get the right ideas and solutions to address their problems. Increased organization, networking and effective communication between internal and external individuals”*.

Fourthly, KM applies knowledge for decision-making and problem solving to support the management of projects: *“Knowledge management: is the main engine to extract the information, skills and experience available both in the sources of technology or the human mind and then converted, published and stored and linked to decision-making and problem-solving”* (R6).

Fifthly, KM enables the extraction of information, skills, and experience to improve business performance and prevent knowledge from being lost or copied by other competitors: *“The process of improving the effectiveness and efficiency of individuals and the organization in order to create more expertise and information that will help to prevent this knowledge from being lost as people leave the company”* (R2). Respondent 8 agreed that a proper KM system can: *“Maximize the company's benefit from the generation of intellectual assets and existing knowledge. It is also a collection of key and subsidiary processes and practices that organizations use to develop the organization's performance”*. It was also suggested that the implementation of KM would increase an individual's skills and knowledge as well as contributing to the development of the organisation's maturity: *“The process of extracting information and knowledge from individuals and how it is managed in terms of analysis and development to printed or electronic documents or practices that have been applied”* (R12).

Sixthly, KM creates practices that are able to increase knowledge contents and its types: *“Knowledge management is based on both science and knowledge, whether implicit or*

apparent knowledge” (R5). It became clear that KM is: “A concept that seeks to: Try to create practices to enable increased knowledge content to facilitate and manage people's experiences throughout the organization in order to achieve innovation and organizational learning” (R10). Respondent 11 added that: “Information and knowledge are based on procedures, documents, resources and workers' skills”. Respondent 2 saw KM as “A set of technical, technological and engineering strategies and policies aimed at creating, collecting, sharing and re-utilizing the knowledge gained”. Respondent 1 referred to KM in the following way “Knowledge management is the logical practice to improve project management performance by developing well thought out processes through which these activities and experiences are managed by project teams and members”. Respondent 3 saw KM as: “Finding suitable processes through which knowledge is acquired and transferred and then processed and utilized in various administrative activities, for example in decision making, strategic planning, problem solving, risk management and learning”.

Respondents	Definitions of KM
(R1)	<p><i>“Knowledge management is the logical practice to improve project management performance by developing well thought out processes through which these activities and experiences are managed by project teams and members”.</i></p> <p><i>“Knowledge management is the creation of appropriate knowledge through which the scope and needs of the project are identified and knowledge of appropriate strategies such as processes, skills, knowledge, tools, techniques which are ultimately aimed at delivering the project correctly”.</i></p>
(R2)	<p><i>“A set of technical, technological and engineering strategies and policies aimed at creating, collecting, sharing and re-utilizing the knowledge gained”.</i></p> <p><i>“The process of improving the effectiveness and efficiency of individuals and the organization in order to create more expertise and information that will help to prevent this knowledge from being lost as people leave the company”.</i></p>
(R3)	<p><i>“Finding suitable processes through which knowledge is acquired and transferred and then processed and utilized in various administrative activities, for example in decision making, strategic planning, problem solving, risk management and learning”.</i></p>
(R4)	<p><i>“KM is the process through which knowledge and experience resources are shared and shared with individuals and the organization in order to raise awareness and achieve the required learning for the organization.</i></p> <p><i>“It is the process of motivating and encouraging individual or collective initiatives that increase knowledge acquisition and best use by companies”.</i></p>
(R5)	<p><i>“Knowledge management is based on both science and knowledge, whether implicit or apparent knowledge”.</i></p>
(R6)	<p><i>“Knowledge management: is the main engine to extract the information, skills and experience available both in the sources of technology or the human mind and then converted, published and stored and linked to decision-making and problem-solving”.</i></p>
(R7)	<p><i>“Knowledge management is the ability of the institution to achieve unity and work as one entity that meets different needs”.</i></p>
(R8)	<p><i>“Knowledge management is to maximize the company's benefit from the generation of intellectual assets and existing knowledge. It is also a collection of key and subsidiary processes and practices that organizations use to develop the organization's performance”.</i></p>

(R9)	<p><i>“A systematic management aimed at managing knowledge assets to meet tactical and supervisory requirements”.</i></p> <p><i>“It is a combination of key and subsidiary initiatives, strategies and processes that support the creation, acquisition, transfer and reuse of knowledge efficiently and effectively”.</i></p>
(R10)	<p><i>“A concept that seeks to: Try to create practices to enable increased knowledge content to facilitate and manage people's experiences throughout the organization in order to achieve innovation and organizational learning”.</i></p> <p><i>“Directing the management of intellectual capital as well as intellectual assets in the workforce. Manage different work environments and allow employees to get the right ideas and solutions to address their problems. Increased organization, networking and effective communication between internal and external individuals”.</i></p>
(R11)	<p><i>“Information and knowledge are based on procedures, documents, resources and workers' skills”.</i></p> <p><i>“Knowledge management is essentially a map that determines the flow of information and the management of its operations so that the company can accomplish its duties and tasks and increase the success of its projects”.</i></p>
(R12)	<p><i>“The process of extracting information and knowledge from individuals and how it is managed in terms of analysis and development to printed or electronic documents or practices that have been applied”.</i></p>
(R13)	<p><i>“Assistive processes through which organizations can generate, test, organize, use and disseminate knowledge”.</i></p>
(R14)	<p><i>“A set of processes and behaviors that are co-drafted by the beneficiaries within the organization in order to acquire knowledge, to contribute to the application of best practices and to increase long-term competitiveness”.</i></p>
(R15)	<p><i>“Information, skills, capabilities, and experiences, whether implicit or clear, that exist with the employees of the company”.</i></p>
(R16)	<p><i>“A set of strategies, policies and regulations that maximize and increase intellectual and informational resources by identifying processes and practices that benefit the entity of the company”.</i></p>

Table 7.6: Analysing the respondents understanding of the KM's concept

7.3.1.3 Ways to convert tacit into explicit knowledge

Many interviewees defined the major ways of converting tacit knowledge into explicit knowledge. Six main themes have been identified as a result of the interviews. Firstly, it is important to develop effective strategies, policies, and processes: *“Knowledge can be transformed by developing effective strategies and policies to observe and store its practices in the Office's databases to be used for future needs”* (R1). Respondent 13 in this regard argued that: *“To identify a party to follow this transformation, create the environment of the company to be supportive of this transformation.*

Develop specific processes and document transition phases. Develop various programs and incentives”.

Secondly, it is vital to activate appropriate system of incentives and rewards: *“Activate the role of the Office to be a key catalyst to encourage the transfer of this knowledge and share with others. I believe that the activation of the system of incentives and rewards has a big role in this aspect”* (R1). Respondent 7 also agreed on the needs of incentives and rewards to motivate people to share their experiences and increase their loyalty to the organisation: *“The implicit knowledge cannot be easily predicted or accessed by the mechanism of action if there are no initiatives and willingness to participate. But can be accessed by querying, maximizing teamwork, developing incentives and creating a sound competitive environment”*. Similarly, respondent 9 argued that knowledge could be retained: *“Through the creation of incentives, initiatives and interest from people and stakeholders”*.

Thirdly, the PMO can raise awareness and qualifying people via the Centre of Excellence: *“I believe that the work of the Office as a center of excellence and a qualitative shift of the institution through the process of training and continuous development has a significant role in the exchange of official and non-official information. The role of the Office in documenting reports and meetings can contribute to the transformation of implicit knowledge into explicit”* (R2). In addition to this, respondent 4 added: *“One of the basic items included in the description of the job of each employee sent to us by the Office is to be fully prepared to provide the necessary knowledge to others and contribute to the development role of the company. If there is a need to enter into training programs or courses offered by the Office, you must be committed to attendance and participation. Also, participate actively in periodic workshops”*.

Respondent 6 agreed that it was important to activate the role of the PMO as a Centre of Excellence: *“Since implicit knowledge is more complex and liable to be lost, the PMO must act to enforce knowledge extraction policies or provide optimal incentives to acquire such knowledge”*. Increasing teamwork could have a positive impact on the flounces of knowledge; it could *“Encourage individuals to work collectively and cooperatively. Raising awareness and maturity of the company on the importance of transforming implicit knowledge into explicit”* (R13). Respondent 15 added the PMO could help *“By identifying and monitoring the work of technical, engineering and technological procedures produced by individuals in the organization”* (R15).

Fourthly, it is important to document various project activities and periodic meetings: *“The importance of periodic meetings cannot be ignored, but the nature of their work must be positive and not only as a constant and durable process”* (R5). Respondent 6 also observed the importance of this: *“Attention to periodic meetings, activating teamwork and documentation of various activities have positive roles in obtaining implicit knowledge”*. Since explicit knowledge is readily accessible, respondent 7 suggested that: *“the process of documentation and optimization should be organized”*. Respondent 10 similarly observed that: *“Through the establishment of periodic meetings and documentation of all work and benefit from all successful and unsuccessful experiences and stimulate initiatives and innovations and the development of workshops and providing programs to increase the importance of knowledge transfer”*. Respondent 11 argued that the presence of initiative and incentives is not enough and recommended that: *“The best way is through good documentation of all information and knowledge”*.

Fifthly, it is vital to encourage the culture of innovations, cooperation, and trust: *“By increasing attention to the main characteristics and features of the Organization, such as the interest in the culture of innovation and the culture of cooperation among the members of the Working Group”* (R8). Respondent 11 noted that it is important to *“Share the concept of honest competition and public interest and love for others and the importance of transferring this knowledge to the development of many related areas within the walls of the company”* (R9). Respondent 11 suggested that: *“In addition to direct cooperation, I mean face-to-face by encouraging teamwork or by having regular meetings”* (R11). It also became clear that: *“The process of conversion is through the promotion of teamwork and cooperation and to increase*

the honest competition and be away from selfishness or lack of love for others. Trust, honesty and allegiance also have important meanings in transforming implicit knowledge” (R12). Respondent 14 offered some examples: “Through the ability to innovate and develop ideas and solutions and use them as added values tacit knowledge can be transformed into explicit through collaborative methods such as dialogue or training programs”. This factor represented the most important factor by considering the number of interviewees were appointed the same argument: “Improving efficiency, cooperation and individual effectiveness contributes to the transfer of implicit knowledge and increased creativity and initiative” (R15). Respondent 16 observed that knowledge “Can be transformed by social and cooperative interaction. In other words, joint work should be done among members of a single working group with a view to exchanging experiences. And make better decisions in consultation” (R16).

Sixthly, it is important to create communication channels, teamwork, and initiatives: *“There are many steps that help to transform implicit knowledge into explicit knowledge that can be: Developing good systems of participation, creating channels of discussion on thorny topics, optimizing investment in transforming people's ideas into electronic forms so that they can be easily accessed and used when needed. I also believe that knowledge is generally built on the Secretariat and can be activated by appropriate communication processes” (R5). Respondent 8 added that it is important to pay: “Attention to the characteristics of the initiative such as supporting senior management of the knowledge management system, linking incentives with quality building as well as coordination of communication and effective communication on the achievement of knowledge management processes”.*

Respondents	Ways to convert tacit into explicit knowledge
(R1)	<p><i>“Can be transformed by developing effective strategies and policies to observe and store practices in the Office's databases to be used as future information”.</i></p> <p><i>“Activate the role of the Office to be a key catalyst to encourage the transfer of this knowledge and share with others. I believe that the activation of the system of incentives and rewards has a big role in this aspect”.</i></p>
(R2)	<p><i>“I believe that the work of the Office as a center of excellence and a qualitative shift of the institution through the process of training and continuous development has a significant role in the exchange of official and non-official information.</i></p> <p><i>The role of the Office in documenting reports and meetings can contribute to the transformation of implicit knowledge into explicit”.</i></p>
(R3)	<p><i>“The implicit knowledge cannot be easily predicted or accessed by the mechanism of action if there are no initiatives and willingness to participate”.</i></p>
(R4)	<p><i>“One of the basic items included in the description of the job of each employee sent to us by the Office is to be fully prepared to provide the necessary knowledge to others and contribute to the development role of the company.</i></p> <p><i>If there is a need to enter into training programs or courses offered by the Office, you must be committed to attendance and participation. Also, participate actively in periodic workshops”.</i></p>
(R5)	<p><i>“There are many steps that help to transform implicit knowledge into explicit knowledge that can be:</i></p> <p><i>Developing good systems of participation, creating channels of discussion on thorny topics, optimizing investment in transforming people's ideas into electronic forms so that they can be easily accessed and used when needed.</i></p> <p><i>I also believe that knowledge is generally built on the Secretariat and can be activated by appropriate communication processes.</i></p> <p><i>“The importance of periodic meetings cannot be ignored, but the nature of their work must be positive and not only as a constant and durable process”.</i></p>
(R6)	<p><i>“Since implicit knowledge is more complex and liable to be lost, the PMO must act to enforce knowledge extraction policies or provide optimal incentives to acquire such knowledge”.</i></p> <p><i>“Attention to periodic meetings, activating teamwork and documentation of various activities have positive roles in obtaining implicit knowledge”.</i></p>
(R7)	<p><i>“Since explicit knowledge is readily accessible and accessible.</i></p> <p><i>Therefore, the process of documentation and optimization should be organized.</i></p> <p><i>But can be accessed by querying, maximizing teamwork, developing incentives and creating a sound competitive environment”.</i></p>
(R8)	<p><i>“By increasing attention to the main characteristics and features of the Organization, such as the interest in the culture of innovation and the culture of cooperation among the members of the Working Group”.</i></p>

	<i>“Attention to the characteristics of the initiative such as supporting senior management of the knowledge management system, linking incentives with quality building as well as coordination of communication and effective communication on the achievement of knowledge management processes”.</i>
(R9)	<i>“Through the creation of incentives, initiatives and interest from people and stakeholders”.</i> <i>“Instilling the concept of honest competition and public interest and love for others and the importance of transferring this knowledge to the development of many related areas within the walls of the company”.</i>
(R10)	<i>“Through the establishment of periodic meetings and documentation of all work and benefit from all successful and unsuccessful experiences and stimulate initiatives and innovations and the development of workshops and awareness programs to increase the importance of knowledge transfer”.</i>
(R11)	<i>“The presence of initiatives and incentives is not enough to get them. That is to say, the best way is through good documentation of all information and knowledge.</i> <i>“In addition to direct cooperation, I mean face-to-face here by encouraging teamwork or regular meetings”.</i>
(R12)	<i>“The process of conversion is through the promotion of teamwork and cooperation and increase the honest competition and away from selfishness and lack of love for others.</i> <i>Trust, honesty and allegiance also have important meanings in transforming implicit knowledge”.</i>
(R13)	<i>“To identify a party to follow this transformation, create the environment of the company to be supportive of this transformation.</i> <i>Develop specific processes and document transition phases. Develop various programs and incentives.</i> <i>“Encourage individuals to work collectively and cooperatively.</i> <i>Raising awareness and maturity of the company on the importance of transforming implicit knowledge into explicit”.</i>
(R14)	<i>“Through the ability to innovate and develop ideas and solutions and use them as added values.</i> <i>Tacit knowledge can be transformed into explicit through collaborative methods such as dialogue or training programs”.</i>
(R15)	<i>“By identifying and monitoring the work of technical, engineering and technological procedures produced by individuals in the organization.</i> <i>“Improving efficiency, cooperation and individual effectiveness contributes to the transfer of implicit knowledge and increased creativity and initiative”.</i>
(R16)	<i>“Can be transformed by social and cooperative interaction. In other words, joint work should be done among members of a single working group with a view to exchanging experiences. And make better decisions in consultation”.</i>

Table 7.7: Analysing the respondents views of the ways to convert tacit into explicit knowledge

7.3.2 Differences that differentiate levels of maturity

The literature review revealed that PMOs are not always the same and that some of their characteristics were not common to all. This clarifies the need to investigate the respondent's views on what differentiates levels of maturity. Three aspects were identified to illustrate the main differentiation. Firstly, it is important to analyse the respondent's views of the PMO maturity levels. Secondly, it is necessary to analyse the respondent's views of the Steps and procedures to establish the PMO. Thirdly, the research analysed the respondent's views of the steps and procedures to evaluate/update the PMO.

7.3.2.1 PMOs maturity levels

The maturity of PMOs were classified into different levels. It was clear that certain classifications were considered to be most relevant to best practices of project management and driven by the functions of the PMO's types and scope of integration in the firm. Respondents identified five main themes for different PMO's types. Firstly, there is the primitive phase where no PMO exists or there are insufficient effective tools to achieve best practice. Respondent 5 referred to this as the *"Primitive Phase No effective practices"*. Respondent 7 described this as *"There are no effective tools to achieve practices"*. Secondly, PMO group or project support/ specific PMO: *"Support: Provides support and assistance when needed. Provide best practices and ideas to correct bugs and defects and achieve best results"*. Respondent 8 observed that: *"I can talk about its types. PMO office, PMO department or PMO group"*. Thirdly, there are PMOs considered as Centres of Excellence: *"A PMO pyramid can be incorporated into a small group linked to specific objectives: "A particular department. Center or unit to seek best practices and create an effective organizational culture. PMO is a highly centralized central office that guides and monitors project performance in a more professional and organizational manner" (R15).*

Fourthly, there is the departmental PMO: *"There are specific mechanisms and methodologies that enable project control and providing appropriate reports on the status of different projects. It does not have absolute responsibility but works to increase transparency and serve stakeholders in making their decisions"* (R8). Fifthly, there is the enterprise PMO: *"I do not know much about maturity levels in this concept, but I can talk about the role of the office for*

us as project managers: *“The office has a purely executive role, which is concerned with achieving the company's strategies and linking the various projects in the remote areas to be a single business block. The office is responsible for the project in terms of providing material liquidity for the business, supporting the executive management of the project, monitoring and directing the work, procedures and activities periodically”* (R2). Finally, there is the directive PMO: *“An effective leadership role in guiding projects with unlimited powers and responsibilities. It works to link the unification of projects as a whole to achieve the overall goals of the company”* (R8).

The PMO's roles and functions may vary depending on the organisation's size and objectives. Therefore, respondent 3 suggested that: *“There must be a specific path to follow as to route a PMO vehicle from point A to point B. It is better to start by applying little tasks and to increase that over time and to develop this concept by motivating employees and increase the awareness of decision makers of the important of implementing the PMO. My simple knowledge about its maturity is to start from basic level to medium and then over time to move toward advanced level based on the size of the company and its activity”*. This argument indicated that: *“It is possible for the Company to prepare a time and process plan commensurate with the Strategic Plan, through which specific criteria are developed to determine the extent to which PMO's maturity levels are evolving. Sometimes the company needs to wait longer to achieve full maturity of the office. Operations can be taken as an example to determine office maturity levels: initial operations, more structured processes, processes that are managed at maximum efficiency, processes that are improved, realized and aligned with the company's strategy”* (R4). On this matter respondent 6 observed that: *“It is possible to divide the maturity of the PMO concept according to the level of the different processes. It is divided into five main sections: Primitive / Structural / Organization / Administrative and Improved. However, it is difficult to start from the top of the pyramid down, companies should consider that this concept needs time in maturity and establishment”*.

Many interviewees identified that the major responsibilities of the PMO could vary from providing PM support to directing the management of project: *“Maturity levels in the PMO concept can be determined by dividing them into two parts: Firstly, the scope of work of the Office: It can be divided into three main sections: First, the PMO group can be 2 to 8 people working in one large project or executed on time. Second: PMO department in the central*

administration. Third: PMO office meaning at the level of the whole company. Secondly, methodology of the Office: It can also be divided into three sections according to the scope of work of the Office: First, the methodology of the work of the Office as a support for the identification and application of project practices in the actual implementation stages. Second: The methodology of the work of the office as a controller for the management and control of the project practices, organization, evaluation and utilization Including in future projects. Third: The methodology of the work of the Office as an executive director to achieve the strategies and objectives of the company in general” (R1).

In addition to this, respondent 11 suggested a scale to indicate the different levels of PMOs: *“First, a weak level of support for projects. Second, the average level is concerned with the control of various actions and try to find practices and the development of administrative organizations. Third, high level, PMO becomes the main mentor for project work and responsible for applying practices”*. A similar approach was suggested by respondent 12 and 13 to suggest PMO levels. Respondent 12 divided the PMO’s levels into three by considering their degree of control and the impact they have on project management within the organisation: *“1. Support: Performs an effective consultative role for projects by providing best practices, training, information, knowledge, lessons learned from other projects. This is a project repository. But the degree of control is considered low. 2. Control: Provides unified project management methodologies, policies, processes and regulations. And the control accuracy is medium. 3. Directive: This type of control is precisely high. PMO controls the direction of various projects”*. Respondent 13 divided them in regard to the importance of the office in overcoming the randomness of the administrative organisations: *“Supporter: Has no authority over project management. Its role is solely based on supporting models, tools and lessons learned for project management. Monitor: has an intermediate control over project management. Training staff, providing quality project management tools. Ensures that different businesses comply with the company's policy. Directive: Has strong control over projects. It assigns project managers and is the primary responsible for their business performance. Achieving best practices and prioritizing the company”*.

Surprisingly, five out of the sixteenth interviewees identified the Centre of Excellence level as an important maturity level of the PMO within the presentation of other’s levels: *“PMO maturity stages can be closely linked to maturity levels in project management: “1- Primitive*

Phase No effective practices. 2- Establish common objectives through the use of technology elements. 3- Link project management practices to trade. 4- Specific objectives for all operations and functions. 5- Effective strategies and continuous development of practices that suit the way the company works” (R5). Respondent 7 argued that: “PMO maturity levels depend on how important this office or department is in achieving the company's expectations and is closely linked to the maturity levels of project management: “1- principals There are no effective tools to achieve practices. 2- A sophisticated reflects the interest of the company to benefit from the practices of project management and work on the creation of standards and organizational principles. 3- Knowledge of the specific paths in the management and implementation of practices. 4- Principal management and support to project managers and methodologies and policies sent to projects Applied. 5- is fully integrated and directly responsible for knowledge management, communication and change in the company and coordinates, organizes and manages operations in accordance with strategies set out in the company plan”. It was also suggested that the roles of Centres of Excellence could achieve the following: “We are in the process of transitioning to a broader and more comprehensive concept of PMO, currently established as a supporter of our various projects, including 8 people working as a group and regularly as a support to senior management of the company: 1- strategic and guidance. 2- To control projects and apply practices. 3- A group of experts working as a support and linking between the top management and various projects” (R9). Respondent 10 explained that: “I know that it is 3 types and we are in the first type, which works as a supporter of the methodology of the work of projects. There are also two other types of control and guidance”.

Finally, respondent 16 believed that: *“Restructuring the company's head office and replacing the PMO concept as a more professional and organized alternative can be difficult”. Other alternatives can be: “Through the creation of a project management support unit. Through the presence of a group of people or centre of excellence in the company mechanism of their work to achieve best practices and develop performance” (R16).*

Respondents	Maturity levels of PMO
(R1)	<p><i>“Maturity levels in the PMO concept can be determined by dividing them into two parts:</i></p> <p><i>1. The scope of work of the Office: It can be divided into three main sections: First, the PMO group can be 2 to 8 people working in one large project or executed on time. Second: PMO department in the central administration. Third: PMO office meaning at the level of the whole company.</i></p> <p><i>2. Methodology of the Office: It can also be divided into three sections according to the scope of work of the Office: First, the methodology of the work of the Office as a support for the identification and application of project practices in the actual implementation stages. Second: The methodology of the work of the office as a controller for the management and control of the project practices, organization, evaluation and utilization Including in future projects. Third: The methodology of the work of the Office as an executive director to achieve the strategies and objectives of the company in general”.</i></p>
(R2)	<p><i>“I do not know much about maturity levels in this concept, but I can talk about the role of the office for us as project managers:</i></p> <p><i>The office has a purely executive role, which is concerned with achieving the company's strategies and linking the various projects in the remote areas to be a single business block.</i></p> <p><i>The office is responsible for the project in terms of providing material liquidity for the business, supporting the executive management of the project, monitoring and directing the work, procedures and activities periodically”.</i></p>
(R3)	<p><i>“There must be a specific path so that we can route a PMO vehicle from point A to point B. It is better to start fewer tasks for the office but over time and develop this concept by employees and increase the awareness of decision makers of the importance of the presence of the office we can create a good environment for the office more functions and features. My simple knowledge is that the office starts from simple to medium levels and then to advanced based on the size of the company and its activity and maturity”.</i></p>
(R4)	<p><i>“It is possible for the Company to prepare a time and process plan commensurate with the Strategic Plan, through which specific criteria are developed to determine the extent to which PMO's maturity levels are evolving.</i></p> <p><i>Sometimes the company needs to wait longer to achieve full maturity of the office.</i></p> <p><i>Operations can be taken as an example to determine office maturity levels: initial operations, more structured processes, processes that are managed at maximum efficiency, processes that are improved, realized and aligned with the company's strategy”.</i></p>
(R5)	<p><i>“PMO maturity stages can be closely linked to maturity levels in project management:</i></p> <p><i>1- Primitive Phase No effective practices.</i></p> <p><i>2- Establish common objectives through the use of technology elements.</i></p>

	<p>3- Link project management practices to trade.</p> <p>4- Specific objectives for all operations and functions.</p> <p>5- Effective strategies and continuous development of practices that suit the way the company works”.</p>
(R6)	<p>“It is possible to divide the maturity of the PMO concept according to the level of the different processes. It is divided into five main sections: Primitive / Structural / Organization / Administrative and Improved. However, it is difficult to start from the top of the pyramid down, companies should consider that this concept needs time in maturity and establishment”.</p>
(R7)	<p>“PMO maturity levels depend on how important this office or department is in achieving the company's expectations and is closely linked to the maturity levels of project management:</p> <p>1- principals There are no effective tools to achieve practices.</p> <p>2- A sophisticated reflects the interest of the company to benefit from the practices of project management and work on the creation of standards and organizational principles.</p> <p>3- Knowledge of the specific paths in the management and implementation of practices.</p> <p>4- Principal management and support to project managers and methodologies and policies sent to projects Applied.</p> <p>5- is fully integrated and directly responsible for knowledge management, communication and change in the company and coordinates, organizes and manages operations in accordance with strategies set out in the company plan”.</p>
(R8)	<p>“1- Support: Provides support and assistance when needed. Provide best practices and ideas to correct bugs and defects and achieve best results.</p> <p>2- Control: There are specific mechanisms and methodologies that enable project control. Provides appropriate reports on the status of different projects. It does not have absolute responsibility but works to increase transparency and serve stakeholders in making their decisions.</p> <p>3- Directive: An effective leadership role in guiding projects with unlimited powers and responsibilities. It works to link the unification of projects as a whole and one system to achieve the overall goals of the company”.</p>
(R9)	<p>“We are in the process of transitioning to a broader and more comprehensive concept of PMO, currently established as a supporter of our various projects, including 8 people working as a group and regularly as a support to senior management of the company:</p> <p>1- strategic and guidance.</p> <p>2- To control projects and apply practices.</p> <p>3- A group of experts working as a support and linking between the top management and various projects”.</p>
(R10)	<p>“I know that it is 3 types and we are in the first type, which works as a supporter of the methodology of the work of projects. There are also two other types of control and guidance”.</p>
(R11)	<p>“1- A weak level of support for projects.</p> <p>2- The average level is concerned with the control of various actions and try to find practices and the development of administrative organizations.</p>

	<i>3- High level, PMO becomes the main mentor for project work and responsible for applying practices”.</i>
(R12)	<p><i>“There are approximately 3 types that vary according to their degree of control and the impact they have on project management within the organization:</i></p> <ol style="list-style-type: none"> <i>1. Support: Performs an effective consultative role for projects by providing best practices, training, information, knowledge, lessons learned from other projects. This is a project repository. But the degree of control is considered low.</i> <i>2. Control: Provides unified project management methodologies, policies, processes and regulations. And the control accuracy is medium.</i> <i>3. Directive: This type of control is precisely high. PMO controls the direction of various projects and monitoring the mechanism of work of the practices and methodologies provided by the Office”.</i>
(R13)	<p><i>“The importance of the Office in overcoming the randomness in the administrative organizations:</i></p> <p><i>Supporter: Has no authority over project management. Its role is solely based on supporting models, tools and lessons learned for project management.</i></p> <p><i>Monitor: has an intermediate control over project management. Training staff, providing quality project management tools. Ensures that different businesses comply with the company's policy.</i></p> <p><i>Directive: Has strong control over projects. It assigns project managers and is the primary responsible for their business performance. Achieving best practices and prioritizing the company”.</i></p>
(R14)	<i>“I can talk about its types. PMO office, PMO department or PMO group”.</i>
(R15)	<p><i>“A PMO pyramid can be incorporated into a small group linked to specific objectives:</i></p> <p><i>A particular department.</i></p> <p><i>Center or unit to seek best practices and create an effective organizational culture.</i></p> <p><i>PMO is a highly centralized central office that guides and monitors project performance in a more professional and organizational manner”.</i></p>
(R16)	<p><i>“Restructuring the company's head office and replacing the PMO concept as a more professional and organized alternative can be difficult”.</i></p> <p><i>“Through the creation of a project management support unit.</i></p> <p><i>Through the presence of a group of people or centre of excellence in the company mechanism of their work to achieve best practices and develop performance”.</i></p>

Table 7.8: Analysing the respondents views of the PMOs maturity levels

7.3.2.2 Steps and procedures to establish PMO

Through asking respondents to identify the steps and procedures of establishing the PMO, the research found that there was an overall consensus that the PMO process must be treated as a project in itself. Therefore, six main themes were identified and can be summarized, as follows: Firstly, the PMO identifies the organisation's maturity level, strategic goals, and business objectives by understanding: *“the internal and external requirements of the company before starting the establishment of the office. Identify a list of recommendations and responsibilities that PMO will address. Develop an appropriate implementation plan in stages, ensuring that each stage is working separately. Communicate with stakeholders to obtain appropriate support. The performance of the Office should be assessed on an ongoing basis”* (R6). It was also suggested that the development and establishment of PMOs must be built on the public interest of the entire firm: *“Identify supporters and to inform them about the importance of this department. Develop a clear plan and structure. Link PMO concepts to bridge company gaps. Identify the department's employees as well as the department's relationship with other departments. Develop methodologies, processes, standards and an appropriate working mechanism. Checking PMO will increase the maturity and knowledge of the company and make a quantum leap in achieving the company's successes”* (R7). The previous point can be used to avoid the most mistakenly establishment of PMO, which is focuses only on defining methodologies without first understanding the organisation's maturity.

Secondly, it is important to select the appropriate PMO types by defining vision and mission: *“1. Determine what type of PMO is appropriate for the company. 2. Identify a specific work plan and tasks. 3. Set long and short-term goals to talk about initial successes. 4. Identify the required support and the nature and size of the task force”* (R5). Respondent 11 connected this factor with the previous ones, arguing that it is important to: *“Analyze the objectives and strategies of the company and stakeholders and identify areas of strength and weakness of current project management practices. Determines the level of maturity of the company and what type of PMO is appropriate. Achieving fast wins and success factors to increase awareness by all parties. Obtain absolute support from senior management. Identify aspects of direct and indirect relations with the parties concerned”*.

When aiming to consider the PMO mission and vision, it can be useful to determine the path of best implementation and how to facilitate efficient and effective PM methodologies that can

be tailored to the organisation's strategies and objectives. Thirdly, it is important to ensure commitment and senior management support and involvement with project managers: *"Overall, as a project manager, I am interested in learning how senior management can interact with and support the office because it gives me an impression of the importance of the project: 1- In the current project our project management team is assembled by the office. 2- Also, the office should provide consistent business references and specific administrative procedures and processes for all projects to achieve good sustainability in the knowledge of the functions of the office. 3- Effective establishment of the office must focus on investing in individuals specifically the required skills and programs prepared for them. 4- Finally see the importance of the evaluation of the Office and the performance of his work from time to time"* (R4). It was also suggested that: *"Initially, the company took the decision to hand over the task of establishing the office to a third party that has already established the office in a number of other countries and has specialists in this field: First: Know the main objectives of the Office. Second: Inform the shareholders or senior management of the guidance of the Bureau to take full approval and the care of the office. Third: Identifying the operations and tools of the Office. Fourth: Clarifying the organizational structure of the office as well as the presence of the office and its relationship to the general structure of the company. Fifth: Create effective communication between the Bureau and other parties to determine what will be done and how important is everyone's contribution to the success of the system of work"* (R1). Therefore, this factor can be one of the key factors in ensuring the success of the PMO in proper collaboration and alignment with the organisation's teams and functions.

Fourthly, it is important to specify the PMO functions, structure, tools, and number of staffs: *"1- Determine the type of office we need. 2- Determine the type of people we need. 3- Determine the type of processes and tools we need. 4- Assessment of maturity levels in our PMO concept. 5- Identify the success factors that the Office helps us achieve"* (R2). Respondent 8 argued that it is important to: *"Determine the number of tasks that will contribute to achieving them. Specify the size and type of PMO. Identify sources and requirements. Determine the period of establishment of the PMO and its stages of development. Determine the methodology, processes and relationship of this concept to other sections. Provide necessary training and development programs"*. PMOs can vary based on their organisational context and the type of PMO should be linked to its functions to maximise its success. Fifthly, it is important to build the PMO methodology, processes, policies, and its relationship with

others. Respondent 9 observed that there was a need to: *“Evaluate the performance of the company and note the importance of the presence of PMO in achieving the needs and activating the business activities. The development of skills, capabilities, competencies and sources and the relationship of other sections with this concept. Full support from stakeholders, their faith and their full knowledge of PMO objectives. Design policies and processes and how to transfer knowledge and build confidence in different projects”* (R9).

Respondent 3 divided the establishment of the PMO into two phases: the preparatory stage and the executive stage: *“It is possible to divide it into two phases: preparatory stage and executive stage: The first stage (preparatory): First, the company's study and scope of work must be studied in full and in detail before starting the establishment of the office. Second, it is possible to design the stages of incorporation both near and long term. Thirdly, the priorities and responsibilities of the Office should be defined. IV Identify the requirements of the sources and location of the office of the structure of the company. Phase II (Executive): Transforming the preparatory plan into an operational plan by defining the common procedures, processes and concepts of the Office. Preparing periodic meetings to complete the foundation stage and ensure its effectiveness. Spread the culture of PMO in the company in general and how important it is to achieve the objectives of the company and develop the work team”*.

Sixthly, it is vital to track PMO success factors and to determine metrics to evaluate its performance. Respondent 12 observed that the: *“PMO Group has been selected to equip the company to move to a new stage. Many experts have been attracted to this field. Workshops were set up and people were sent to take the best experiences and practices that foreign companies have achieved. Limited responsibilities have been identified and greater authority will be given after moving to a more comprehensive and complete phase of the concept”* (R12). This helps to define the PMO integration approach in the organisation and to evaluate how people communicate and interact with those in other divisions. However, respondent 10 suggested the establishment of the PMO to work as a Centre of Excellence to support best practice and to encourage experts to communicate with others: *“We established the PMO team as a supporter of projects. We have attracted an outside institute to help us establish this concept. Select team members with sufficient experience. Set a specific budget. Define goals and responsibilities”*.

Respondents	Steps and procedures to establish PMO
(R1)	<p><i>“Initially, the company took the decision to hand over the task of establishing the office to a third party that has already established the office in a number of other countries and has specialists in this field:</i></p> <p><i>First: Know the main objectives of the Office.</i></p> <p><i>Second: Inform the shareholders or senior management of the guidance of the Bureau to take full approval and the care of the office.</i></p> <p><i>Third: Identifying the operations and tools of the Office.</i></p> <p><i>Fourth: Clarifying the organizational structure of the office as well as the presence of the office and its relationship to the general structure of the company.</i></p> <p><i>Fifth: Create effective communication between the Bureau and other parties to determine what will be done and how important is everyone's contribution to the success of the system of work”.</i></p>
(R2)	<p><i>“1- Determine the type of office we need.</i></p> <p><i>2- Determine the type of people we need.</i></p> <p><i>3- Determine the type of processes and tools we need.</i></p> <p><i>4- Assessment of maturity levels in our PMO concept.</i></p> <p><i>5- Identify the success factors that the Office helps us achieve”.</i></p>
(R3)	<p><i>“It is possible to divide it into two phases: preparatory stage and executive stage:</i></p> <p><i>The first stage (preparatory): First, the company's study and scope of work must be studied in full and in detail before starting the establishment of the office.</i></p> <p><i>Second, it is possible to design the stages of incorporation both near and long term. Thirdly, the priorities and responsibilities of the Office should be defined.</i></p> <p><i>IV Identify the requirements of the sources and location of the office of the structure of the company.</i></p> <p><i>Phase II (Executive): Transforming the preparatory plan into an operational plan by defining the common procedures, processes and concepts of the Office.</i></p> <p><i>Preparing periodic meetings to complete the foundation stage and ensure its effectiveness. Spread the culture of PMO in the company in general and how important it is to achieve the objectives of the company and develop the work team”.</i></p>
(R4)	<p><i>“Overall, as a project manager, I am interested in learning how senior management can interact with and support the office because it gives me an impression of the importance of the project:</i></p> <p><i>1- In the current project our project management team is assembled by the office.</i></p> <p><i>2- Also, the office should provide consistent business references and specific administrative procedures and processes for all projects to achieve good sustainability in the knowledge of the functions of the office.</i></p> <p><i>3- Effective establishment of the office must focus on investing in individuals specifically the required skills and programs prepared for them.</i></p> <p><i>4- Finally see the importance of the evaluation of the Office and the performance of his work from time to time”.</i></p>
(R5)	<p><i>“1. Determine what type of PMO is appropriate for the company.</i></p> <p><i>2. Identify a specific work plan and tasks.</i></p> <p><i>3. Set long and short-term goals to talk about initial successes.</i></p> <p><i>4. Identify the required support and the nature and size of the task force”.</i></p>
(R6)	<p><i>“Understand the internal and external requirements of the company before starting the establishment of the office.</i></p> <p><i>Identify a list of recommendations and responsibilities that PMO will address.</i></p>

	<p><i>Develop an appropriate implementation plan in stages, ensuring that each stage is working separately.</i></p> <p><i>Communicate with stakeholders to obtain appropriate support. The performance of the Office should be assessed on an ongoing basis”.</i></p>
(R7)	<p><i>“It is difficult to develop concepts and a ready mode of work for the PMO department, as it must be built on the public interest of the company: Identify supporters and inform them of the importance of the department. Develop a clear plan and structure. Link PMO concepts to bridge company gaps. Identify the department's employees as well as the department's relationship with other departments. Develop methodologies, processes, standards and an appropriate working mechanism. Checking PMO will increase the maturity and knowledge of the company and make a quantum leap in achieving the company's successes”.</i></p>
(R8)	<p><i>“Determine the number of tasks that will contribute to achieving them. Specify the size and type of PMO. Identify sources and requirements. Determine the period of establishment of the PMO and its stages of development. Determine the methodology, processes and relationship of this concept to other sections. Provide necessary training and development programs”.</i></p>
(R9)	<p><i>“Evaluate the performance of the company and note the importance of the presence of PMO in achieving the needs and activating the business activities. The development of skills, capabilities, competencies and sources and the relationship of other sections with this concept. Full support from stakeholders, their faith and their full knowledge of PMO objectives. Design policies and processes and how to transfer knowledge and build confidence in different projects”.</i></p>
(R10)	<p><i>“We established the PMO team as a supporter of projects. We have attracted an outside institute to help us establish this concept. Select team members with sufficient experience. Set a specific budget. Define goals and responsibilities”.</i></p>
(R11)	<p><i>“Analyze the objectives and strategies of the company and stakeholders and identify areas of strength and weakness of current project management practices. Determines the level of maturity of the company and what type of PMO appropriate. Achieving fast wins and success factors to increase awareness and achieve full tasks. Obtain absolute support from senior management. Identify aspects of direct and indirect relations with the parties concerned”.</i></p>
(R12)	<p><i>“PMO Group has been selected to equip the company to move to a new stage. Many experts have been attracted to this field. Workshops were set up and people were sent to take the best experiences and practices that foreign companies have achieved. Limited responsibilities have been identified and greater authority will be given after moving to a more comprehensive and complete phase of the concept”.</i></p>

Table 7.9: Analysing the respondents views of the Steps and procedures to establish PMO

7.3.2.3 Steps and procedures to evaluate/update PMO

Defining a set of procedures that measure the PMO's performance is important. Respondent 1 argued that the PMO performance can be measured by assessing the performance and success of the following activities and practices. Firstly, by conducting formal evaluations of project managers and PMO staff: *"First: Evaluation of the development of standards and methods of project management and how to maintain them. Second: Evaluation of the development of knowledge gained and the transfer of past experiences and how to maintain them. Third: Evaluate the development of the administrative functions of the company and its work effectively. Fourth: Evaluate the performance of the work of the Office in the development of human resources and help the project team. Fifth: Evaluation of the performance of the Office as a consultant and control in the management of various projects of the company. Sixth: Evaluation of the performance of the Office in providing and preparing training programs to apply modern and effective concepts in project management"* (R1). Respondent 8 believed the development of staff competencies and increased loyalty can have a positive impact: *"Success rate of projects with and without PMO. Develop staff competencies and increase their loyalty. Achieve unified management policies, practices and regulations. Increased stakeholder interest in this concept. Move over time to greater tasks and powers"*.

Secondly, it is important to evaluate the feedback of customer and stakeholders: *"Assessing the extent to which departments interact with each other through the Office, as well as the extent to which individuals know the value and functions of the Office, gives an impression of the performance of the Office: 1- Measuring levels of transparency, participation of decisions and periodic meetings with project managers helps to determine the success and application of this concept. 2- Accessibility and accessibility to knowledge and development of team skills and no need to take longer time in the implementation of business. 3- Improve the efficiency of the distribution of resources and achieve the best practices in modern project management"* (R4). Respondent 3 suggested the following factors were important: *"1- Reduce costs and achieve customer satisfaction. 2- Implementation of the project according to preliminary estimates and timetables prepared in advance. 3- Note the budget performance and efficient use of natural and human resources. 4- Commitment and absolute attention to achieve the company's strategy and application of best practices in project management and effective investment in individuals, which reflects the maturity of the institution"*.

Thirdly, it is vital to evaluate the reduction of cost, time, and scope of work: *“Achieving success indicators such as reducing costs and reducing dependency on resources that exceed the company's need. Reduce the time factor in the execution of different businesses and activities. The amount of knowledge gained and the scope of the changes. Satisfaction of employees and employees and their knowledge of the company's objectives”* (R6). Fourthly, it is important to evaluate project management practices and their effectiveness: *“Quantity of existing project management practices. Take advantage of experience and develop business performance and staff. Increase the success rate of projects. Improved reporting mechanism. Act uniform and equally distributed policies and regulations. Conducting research on the needs of project management. Attracting appropriate administrative competencies. Qualifying project managers and finding appropriate training programs”* (R11).

Fifthly, it is important to measure the success rate of projects with and without PMO existence. Respondent 2 describes this in the following way: *“1- Was the Office able to support project managers and facilitate their tasks as well as to achieve and address their needs and provide appropriate training programs. 2- Has the Office been able to select the appropriate project team and identify tasks according to project needs. 3- Has the Office been able to identify similar aspects of work among individuals or sections of the project and to activate this relationship in gaining knowledge and transferring experiences within and outside the project. 4- Can the Bureau create best practices and turn them into knowledge to be used in the implementation of future projects. 5- Does the office contribute to the various phases of the project from start to finish or its role is limited to a particular stage”*. Respondent 7 suggested that: *“The establishment of a PMO department should go through phases in order to facilitate the reading and evaluation of each phase. PMO maturity stages can be determined by the maturity stages of project management practices. Has it been applied? Have you developed from the company format? PMO assessment can depend on the amount of resources exploited, reduce costs and increase the success rate of projects. Determine if the PMO department is an important factor in supporting future projects in accordance with the knowledge and experience gained”*.

Sixthly, it is important to assess the achievement of unified management policies and practices: *“The performance of the Office can be assessed through the following: 1. The level of support it provides, and the training programs provided by the percentage of completion in the work.*

2. Identify a specific work plan and tasks. 3. The extent to which the PMO and its relationship to the other departments are competent. 4. The quantity and method of professional practices” (R5). It also became clear that it was important to: “Look for successful experiences of others and attract qualified competencies in this regard. The importance of the Office in overcoming the randomness in the administrative organizations. 1- Decrease in project failure rate. 2- Significant development in the cost balance, schedule and scope of work. 3-Distribution of sources by primary and return on investment. 4- Linking the projects to the strategic objectives of the company. 5-The extent of customer satisfaction with the quality of business performance. 6-Increase profits as expected despite the difficulties and challenges” (R9).

Seventhly, it is important to evaluate the development of the organisation’s maturity level based on knowledge gained. To do this, the following factors were mentioned by respondent 10: “Project success. Increase administrative organization. More effective control of project management. The volume of development in the efficiency of employees. Achieve uniform and applicable practices. Obtain appropriate support. The size of the company and the quantity of projects and their need for existing administrative organizations. The presence of competencies that have the capacity to empower the office. Do not rush to decide and give a good chance to get the expected results”. Respondent 12 mentioned the importance of having some ongoing training programs and for the PMO to behave as a Centre of Excellence: “Training and ongoing support as well as the willingness and enthusiasm of decision-makers to achieve this concept. PMO is currently a center of excellence and an appropriate reference to solve problems and study opportunities, weaknesses and strengths. Increase interest in project management approaches. Increasing the desire of people to obtain certificates in the management of projects”.

Respondents	Steps and procedures to evaluate/update PMO
(R1)	<p><i>“Office performance can be assessed by assessing the performance and success of these activities and practices:</i></p> <p><i>“First: Evaluation of the development of standards and methods of project management and how to maintain them.</i></p> <p><i>Second: Evaluation of the development of knowledge gained and the transfer of past experiences and how to maintain them.</i></p> <p><i>Third: Evaluate the development of the administrative functions of the company and its work effectively.</i></p> <p><i>Fourth: Evaluate the performance of the work of the Office in the development of human resources and help the project team.</i></p> <p><i>Fifth: Evaluation of the performance of the Office as a consultant and control in the management of various projects of the company.</i></p> <p><i>Sixth: Evaluation of the performance of the Office in providing and preparing training programs to apply modern and effective concepts in project management”.</i></p>
(R2)	<p><i>“1- Was the Office able to support project managers and facilitate their tasks as well as to achieve and address their needs and provide appropriate training programs.</i></p> <p><i>2- Has the Office been able to select the appropriate project team and identify tasks according to project needs.</i></p> <p><i>3- Has the Office been able to identify similar aspects of work among individuals or sections of the project and to activate this relationship in gaining knowledge and transferring experiences within and outside the project.</i></p> <p><i>4- Can the Bureau create best practices and turn them into knowledge to be used in the implementation of future projects.</i></p> <p><i>5- Does the office contribute to the various phases of the project from start to finish or its role is limited to a particular stage”.</i></p>
(R3)	<p><i>“1- Reduce costs and achieve customer satisfaction.</i></p> <p><i>2- Implementation of the project according to preliminary estimates and timetables prepared in advance.</i></p> <p><i>3- Note the budget performance and efficient use of natural and human resources.</i></p> <p><i>4- Commitment and absolute attention to achieve the company's strategy and application of best practices in project management and effective investment in individuals, which reflects the maturity of the institution”.</i></p>
(R4)	<p><i>“Assessing the extent to which departments interact with each other through the Office, as well as the extent to which individuals know the value and functions of the Office, gives an impression of the performance of the Office:</i></p> <p><i>1- Measuring levels of transparency, participation of decisions and periodic meetings with project managers helps to determine the success and application of this concept.</i></p> <p><i>2- Accessibility and accessibility to knowledge and development of team skills and no need to take longer time in the implementation of business.</i></p> <p><i>3- Improve the efficiency of the distribution of resources and achieve the best practices in modern project management”.</i></p>
(R5)	<p><i>“The performance of the Office can be assessed through the following:</i></p> <p><i>1. The level of support it provides, and the training programs provided by the percentage of completion in the work.</i></p> <p><i>2. Identify a specific work plan and tasks.</i></p> <p><i>3. The extent to which the PMO and its relationship to the other departments are competent.</i></p> <p><i>4. The quantity and method of professional practices”.</i></p>
(R6)	<p><i>“Achieving success indicators such as reducing costs and reducing dependence on resources that exceed the company's need.</i></p> <p><i>Reduce the time factor in the execution of different businesses and activities.</i></p> <p><i>The amount of knowledge gained and the scope of the changes.</i></p>

	<i>Satisfaction of employees and employees and their knowledge of the company's objectives”.</i>
(R7)	<p><i>“The establishment of a PMO department should go through phases in order to facilitate the reading and evaluation of each phase. PMO maturity stages can be determined by the maturity stages of project management practices. Has it been applied? Have you developed from the company format? PMO assessment can depend on the amount of resources exploited, reduce costs and increase the success rate of projects. Determine if the PMO department is an important factor in supporting future projects in accordance with the knowledge and experience gained”.</i></p>
(R8)	<p><i>“Success rate of projects with and without PMO. Develop staff competencies and increase their loyalty. Achieve unified management policies, practices and regulations. Increased stakeholder interest in this concept. Move over time to greater tasks and powers”.</i></p>
(R9)	<p><i>“Look for successful experiences of others and attract qualified competencies in this regard. The importance of the Office in overcoming the randomness in the administrative organizations. 1- Decrease in project failure rate. 2- Significant development in the cost balance, schedule and scope of work. 3-Distribution of sources by primary and return on investment. 4- Linking the projects to the strategic objectives of the company. 5-The extent of customer satisfaction with the quality of business performance. 6-Increase profits as expected despite the difficulties and challenges”.</i></p>
(R10)	<p><i>“Project success. Increase administrative organization. More effective control of project management. The volume of development in the efficiency of employees. Achieve uniform and applicable practices. Obtain appropriate support. The size of the company and the quantity of projects and their need for existing administrative organizations. The presence of competencies that have the capacity to empower the office. Do not rush to decide and give a good chance to get the expected results”.</i></p>
(R11)	<p><i>“Quantity of existing project management practices. Take advantage of experience and develop business performance and staff. Increase the success rate of projects. Improved reporting mechanism. Act uniform and equally distributed policies and regulations. Conducting research on the needs of project management. Attracting appropriate administrative competencies. Qualifying project managers and finding appropriate training programs”.</i></p>
(R12)	<p><i>“Training and ongoing support as well as the willingness and enthusiasm of decision-makers to achieve this concept. PMO is currently a center of excellence and an appropriate reference to solve problems and study opportunities, weaknesses and strengths. Increase interest in project management approaches. Increasing the desire of people to obtain certificates in the management of projects”.</i></p>

Table 7.10: Analysing the respondents views of the Steps and procedures to evaluate/update PMO

7.4 Discussion of findings

In order to link the descriptive analysis at each level with the cross-analysis between different maturity levels, the first part of the discussion of findings will examine the PMO value and its implementation. Specifically, it will measure the roles and success factors of the PMO and then compare them with the common problems and difficulties. The main steps and procedures to establish and evaluate PMOs will be discussed, followed by an investigation of the maturity levels of the PMOs.

The second part of the discussion will consider the need for KM and its implementation. In particular, it will analyse the effective roles of KM to organisational learning and the necessary components of KM and their effectiveness. It will consider types of KM and procedures to convert tacit knowledge into explicit knowledge via the PMO. The final part of this discussion will focus on the contribution of PMOs to both KM and PM practices. In particular, it will analyse the PMO possible solutions/options for encouraging KM processes and perspectives necessary for facilitating KM implementation via PMOs. Lastly, it will explore the effect of PMO functions on PM practices and PMs responsibilities.

7.4.1 Investigation of the PMO value and its implementation

The PMO is, to a large extent, about improving business performance. It should work as an agent for spreading PM standards, practices, and culture throughout the organisation by recognising the reasons behind a project's failure. The PMO can also increase the organisation's maturity level, project efficiency, and help quantify what impacts on the project's success. A large number of organisations are trying to find modern methods to use to manage business within construction projects. As a result of applying those types of methodologies, companies are becoming more successful in achieving their desired goals. Equally importantly, PMOs need to demonstrate how they improve business performance by, for example, assisting and supporting an organisation to select the types and sizes of projects that are appropriate to their capabilities and to the company's potential. Various definitions of the PMO and its concept have been presented by all of the interviewees.

Respondents classified the PMO in different ways. Firstly, ten out of the sixteen interviewees defined the PMO as Centre of Excellence to increase the maturity of organisation. The flexibility of the PMO's centre is: *"To provide models, information, technical support and training to the project team without imposing any control over their projects or activities"* (R9). This centre can be used as: *"A tool and methodology for achieving project management objectives which depend on the procedures for starting, planning, implementing, adjusting and closing work according to meet specific objectives and standards at a pre-agreed time"* (R10).

Secondly, other respondents related its importance to the role it plays in developing organisational project management maturity. Respondent 10 noted that the: *"PMO has contributed to the evaluation, standardization and re-introduction of refined practices and processes in the implementation of future projects. It the backbone of the application and management of modern project management methodologies, which is reflected in the interest of the organization"* (R10). Thirdly, as the number and complexity of projects throughout the world has increased, it was suggested that the PMO could standardise practices, policies, and procedures and has therefore been becoming increasingly important: *"To manage the activities and events of the joint projects by linking them as one working system through PMO"* (R2).

Fourthly, the popularity and expansion of the PMO among organisations appears to be related to its function as a centre of knowledge that documents various projects: *"The PMO concept is the main engine that aims to apply knowledge, techniques and skills in various project activities according to company strategies"* (R6). Fifthly, the PMO enables the development of common standards and methodologies to contribute to improved business performance: *"There are two main reasons for the establishment of the Office: the first concerns the application of standardized project management standards and the second is to try to increase the success rates of projects and reduce the factors of failure"* (R4). Sixthly, the PMO can assist senior management with the progress of various projects and support the project managers by relieving *"pressure on senior management and help[ing] regulate and control the environment of different enterprises"* (R3). Figure 7.5 summarises the main themes of the PMO concepts, as follows:

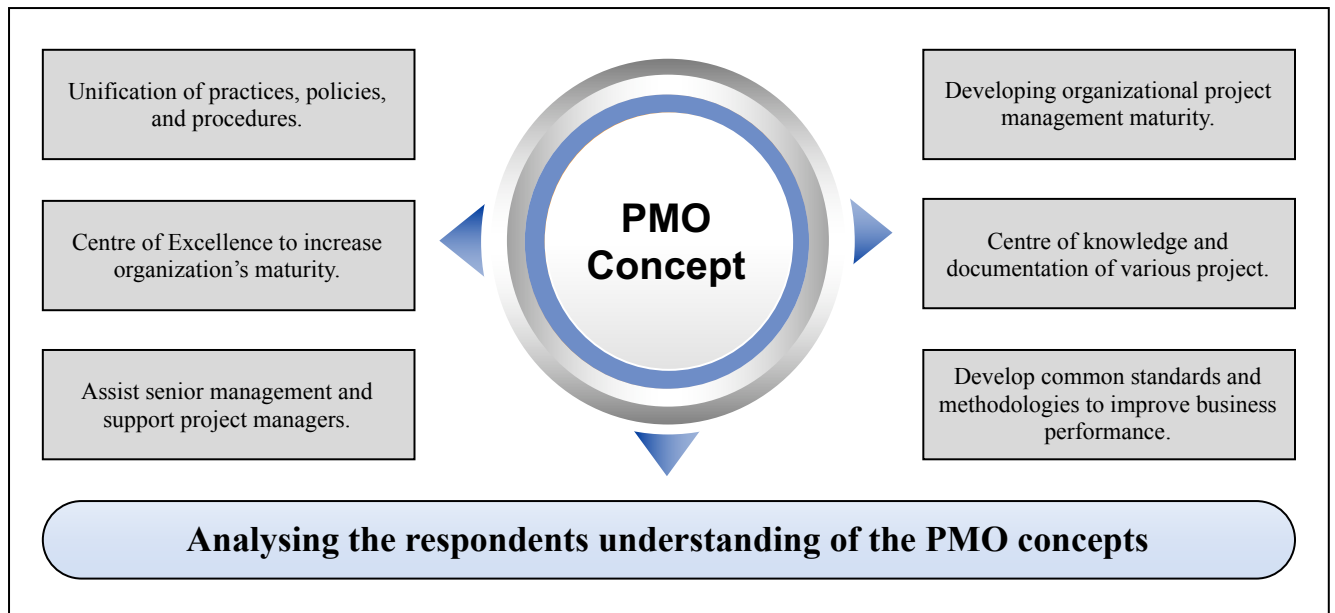


Figure 7.6: Summarising the main themes of PMO concepts

7.4.1.1 PMO roles and success factors Vs. common problems and difficulties

The literature review highlighted how the majority of government projects in the KSA are suffering from the problem of faltering and delayed projects. The reasons for projects to be abandoned in the KSA can vary. Interviewees identified around 35 common problems and difficulties that cause delay and failure in many projects. However, different maturity levels of PMO had different number of success factors as presented in table 7.11. Equally importantly, respondents identified 37 of PMO roles and success factors in improving business performance and increasing project success rates. Similarly, to the common problems and difficulties, the success factors of PMO had different factors by considering their different maturity levels of PMO. It is noticeable that the lowest level of PMO represented by the Centre of Excellence PMOs have the highest number of factors to improve business performance and increasing project success rates. However, organisations with no PMO were the most likely to suffer, struggling with a large number of factors that affected the completion and management of construction projects. The interviewees mentioned some of the factors that could lead to failure, such as not benefiting from previous projects. For example: *“Not benefiting from the experience of the competition companies or previous projects of the company” (R1)*. Dealing with new immigration controls represented the most significant cause of delay: *“The new laws developed by the Saudi government to keep up with the Saudi vision 2030 have had a significant impact on the proportion of our foreign employees. So many of them no longer see that Saudi*

Arabia is fulfilling its financial demands as before” (R8). It was also suggested there were no obvious standards and policies that could be added in between similar projects under the same organisation: “Operations, activities and policies always vary from project to project. The existence of regulatory bases and specific laws we do not have. Sometimes the company's possibilities do not allow it to enter into new projects” (R15).

Factors	Common problems and difficulties affecting the management and completion of construction projects in KSA	Expected and identified PMO roles and success factors in improving business performance and increasing project success rates
Level-0	<ol style="list-style-type: none"> 1. The difficulty of communications and coordination 2. Not having unified management regulations or well known practices 3. Change is very slow to follow evaluation and modern ages 4. Operations, activities, and policies always vary from project to another 5. Sometimes the firm’s possibilities do not allow to enter into new projects 6. Delay in receiving payments from clients 7. Low capabilities of project managers and project teams 8. Not benefiting from previous experience in an ideal and informed ways 9. Find difficulties in dealing with the new immigration control changes 10. High cost of maintaining professional PM staff 	<p>Expected as their was no PMO in this level:</p> <ol style="list-style-type: none"> 1. Monitoring the cost, time, and expenses 2. Making decisions based on accurate databases 3. Identify project priorities to share resources 4. Implement common strategies and methodologies 5. Provide Communications and coordination 6. A grate regulatory tool to observe and find ideal solutions 7. Provide training and incentive programs 8. Support the application of PM practices 9. Attract expert and qualified current and new employees 10. Create databases and gathering information about projects
Level-1	<ol style="list-style-type: none"> 1. Weak understanding of terms and contractual formats between the contracting parties 2. Speeding up the work to address delays without previous notice 3. Unforeseen the risks that may affect the execution and management of projects 4. Difficulty in managing and distributing resources between projects 5. Lack to benefit from previous experiences or of others’ experiences 6. Random administrative organisations and lack of project managers competencies 7. Lack of information about the domestic market and government rules 8. Increasing the cost of foreign staff in regards with new immigration changes 	<ol style="list-style-type: none"> 1. Provide unified administrative organisations 2. Center of excellence to provide training, guidance, and supervision 3. Distribution of various resources equally and as needed 4. Develop specific and consistent operations to achieve KM 5. Helps to manage the sharing of resources, experiences, and risks 6. Store information and valuable knowledge with easy and save access 7. Rising the maturity levels of the company with latest and best practice 8. Train appropriate national talent to cope with company new strategy 9. Maintain knowledge and experience to deal with new immigration control changes 10. Develop plan to employee national cadres 11. Taken advantage of foreign cadres before leaving
Level-2	<ol style="list-style-type: none"> 1. Absence of coordination among department and projects 2. Ineffective communication channels 3. Inability to enter into large or complex project 4. Focusing only on the financial return 5. Lack of transparency and clarity of current and future strategies 6. Lack of accurate measurement indicators 7. Subcontractors not qualified for the work 8. Shortage of experts after the introducing of immigration controls and new changes 9. Losing a large number of knowledge and lessons learnt not effective 	<ol style="list-style-type: none"> 1. Archiving appropriate administrative regulations 2. Support the unification of policies and procedures 3. Center of excellence to increase staff efficiency and capabilities 4. Distribute resources efficiently 5. Dealing with the shortage of cash and delayed payment 6. Develop a methodology to achieve best PM practice and standards that fit company 7. Closing the gaps between different department and projects 8. Provide tangible and repeatable benefits to the company’s long term
Level-3	<ol style="list-style-type: none"> 1. Not benefiting from previous experiences 2. Decisions are usually taken individually 3. Employees do not know the company’s objectives and their strategies 4. Slow in responding to market changes and new policies introduced by the government 5. Weakness in using modern management tools and practices 6. Lack of local competencies and weak qualifications of project managers 7. The availability of resources and the rising cost of professional staff 8. Lack of project managers and project management teams 	<ol style="list-style-type: none"> 1. Possibility of taken appropriate decisions 2. Distributed resources appropriately to different projects 3. Share with employees the goals and plans that need to be accomplished 4. Increase transparency about company policies and standards 5. New employees can understand their tasks before transferring to the projects 6. Reducing the cost and general expenses 7. Develop, qualify, and train employees 8. Encouraging PM initiatives and practices

Table 7.11: Common problems and difficulties Vs. PMO roles and success factors

7.4.1.2 Steps and procedures to establish and evaluate PMOs

Setting up or restructuring and running a PMO has become the main objective of both governmental and private sectors. The establishment of the office does not mean that there are no more steps to assess the performance and maintain the development of the PMO and to achieve the greatest benefit out of it. The organisation needs to continuously identify the organisation's maturity level, strategic goals, and business objectives; to: *“Understand the internal and external requirements of the company before starting the establishment of the office. Identify a list of recommendations and responsibilities that PMO will address. Develop an appropriate implementation plan in stages, ensuring that each stage is working separately. Communicate with stakeholders to obtain appropriate support. The performance of the Office should be assessed on an ongoing basis”* (R6). It was also suggested that developing or establishing PMOs must be built on the public interest of the entire firm. It is important to: *“Identify supporters and inform them of the importance of the department. Develop a clear plan and structure. Link PMO concepts to bridge company gaps. Identify the department's employees as well as the department's relationship with other departments. Develop methodologies, processes, standards and an appropriate working mechanism. Checking PMO will increase the maturity and knowledge of the company and make a quantum leap in achieving the company's successes”* (R7).

The evaluation of PMOs can be provided to support the reasons behind establishing this office. The analysis of the interviews shows that there are various metrics to evaluate PMO performance. The interviews clarified the needs of organisations to assess the evaluation of PMOs must go through different stages in order to see how the office can deal with the various procedures of the project. Understanding the right processes for evaluating PMOs is a key part of getting more accurate results. For instance, the improvement of PMs and PMO staff can test the PMO status. Factors such as evaluating success rates and how best the office can strongly deal with PM practices can give a good indication that the office has started to show positive features. Respondents agreed that the PMO performance can be assessed by assessing the performance and success of the following activities and practices. Firstly, formal evaluations of project managers and PMO staff can be conducted: *“First: Evaluation of the development of standards and methods of project management and how to maintain them. Second: Evaluation of the development of knowledge gained and the transfer of past experiences and*

how to maintain them. Third: Evaluate the development of the administrative functions of the company and its work effectively. Fourth: Evaluate the performance of the work of the Office in the development of human resources and help the project team. Fifth: Evaluation of the performance of the Office as a consultant and control in the management of various projects of the company. Sixth: Evaluation of the performance of the Office in providing and preparing training programs to apply modern and effective concepts in project management” (R1). Respondent 8 believed that the development of staff competencies and increases loyalty can have a positive impact: “Success rate of projects with and without PMO. Develop staff competencies and increase their loyalty. Achieve unified management policies, practices and regulations. Increased stakeholder interest in this concept. Move over time to greater tasks and powers”.

Factors	Steps and procedures to establish PMOs	Steps and procedures to evaluate and update PMOs
First	Ensure commitment and senior management support and involvement from project managers.	The evaluation of project management practices and their effectiveness.
Second	Select the appropriate PMO types by defining its vision and mission.	The development of organizational maturity level based on the knowledge gained.
Third	Specify the PMO functions, structure, tools, and number of staff.	The success rate of project completion with and without PMO existence.
Fourth	Build the PMO methodology, processes, policies, and its relation with other parties.	Customer and stakeholders feedback evaluations.
Fifth	Track the PMO success factors and determine metrics to evaluate its performance.	The reduction of cost, time, and scope of works.
Sixth	Identify the organisation’s maturity levels, strategic goals, and business objectives.	The achievement of unified management policies, practices, and regulations.
Seventh		Formal evaluations of project managers and PMO staff.

Table 7.12: Steps and procedures to establish and evaluate PMOs

7.4.1.3 Maturity levels of PMO

As discussed earlier in the literature review, the majority of researchers, including Al-Nahj (2012), Daptiv (2013), Andrew (2013), Jordan (2015) assume that the PMO's core function can be divided into three maturity levels: supportive, controlling, and directive. Similarly, the outcome of the interviews suggesting these maturity levels of PMO as illustrated in (figure7.6). Firstly, there is the primitive phase where no PMO exists or the availability of effective tools to achieve practices is not implemented. Secondly, the PMO group or project support/ specific PMO. Thirdly, Centre of Excellence PMOs. Fourthly, departmental PMOs. Fifthly, enterprise PMOs. Respondents also suggested that, over time, organisations are moving from an operation and tactical PMO towards a more directive and strategic level of PMO. However, respondents revealed that each maturity level of PMO has its own strategy and role in the delivery of the organisation's output as pointed out in figure 7.6.

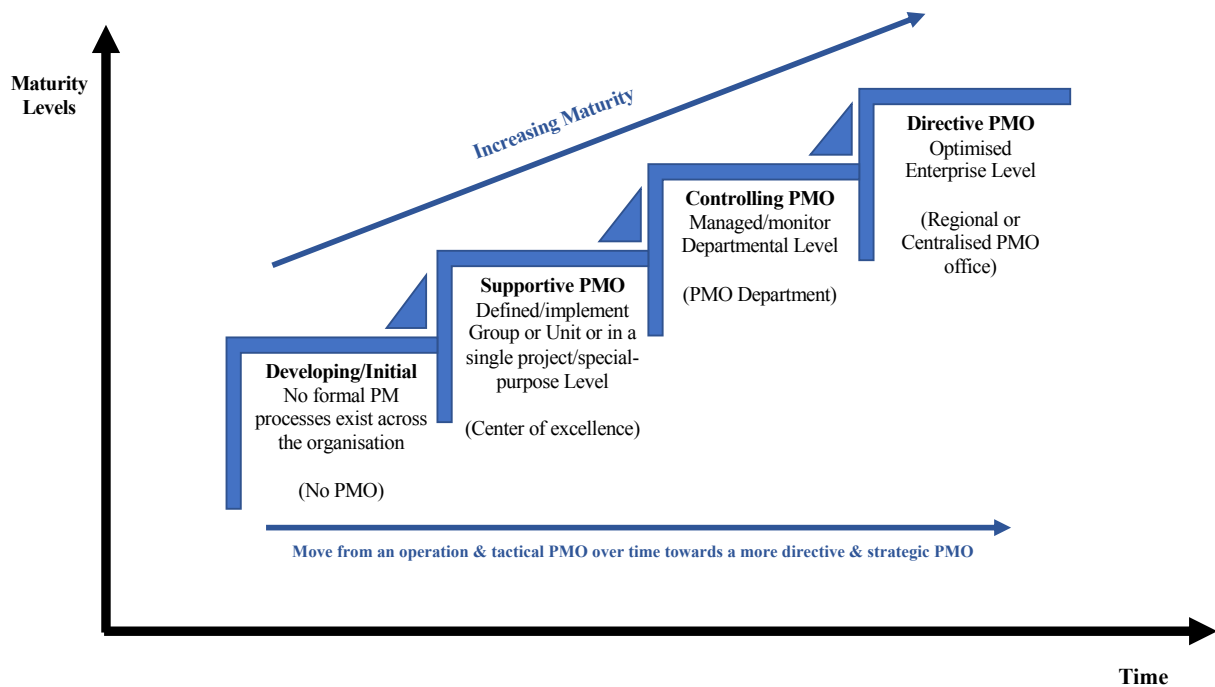


Figure 7.6: Different maturity levels of PMO

The PMO's roles and functions may vary depending on the organisation's size and objectives. For instance, respondent 3 suggested that: *“There must be a specific path so that we can route a PMO vehicle from point A to point B. It is better to start fewer tasks for the office but over time and develop this concept by employees and increase the awareness of decision makers of the importance of the presence of the office we can create a good environment for the office more functions and features. My simple knowledge is that the office starts from simple to medium levels and then to advanced based on the size of the company and its activity and*

maturity". Many interviewees identified that the major responsibilities of the PMO could range from providing PM support to directing management of project: "Maturity levels in the PMO concept can be determined by dividing them into two parts: Firstly, the scope of work of the Office: It can be divided into three main sections: First, the PMO group can be 2 to 8 people working in one large project or executed on time. Second: PMO department in the central administration. Third: PMO office meaning at the level of the whole company. Secondly, methodology of the Office: It can also be divided into three sections according to the scope of work of the Office: First, the methodology of the work of the Office as a support for the identification and application of project practices in the actual implementation stages. Second: The methodology of the work of the office as a controller for the management and control of the project practices, organization, evaluation and utilization Including in future projects. Third: The methodology of the work of the Office as an executive director to achieve the strategies and objectives of the company in general" (R1).

Levels	Maturity Levels of PMOs
Zero	Primitive phase (no PMO or effective tools to achieve practices.
First	Center of excellence PMOs provide the organization with methodologies, standards, and tools to enable project teams and project managers to deliver project successfully.
Second	Organisational unit PMO/ Divisional PMO/ Departmental PMO provide control for business services or units.
Third	Enterprise PMO/ Strategic PMO provide directive roles to align projects and organisatioin's units to corporate strategy and ensuring appropriate enterprise governance.

Table 7.13: Different maturity levels of PMO

7.4.2 Investigation of the need of KM and its implementation

Interviewees classified KM in different ways: Firstly, to identify different processes to manage the appropriate knowledge: *“Knowledge management is the creation of appropriate knowledge through which the scope and needs of the project are identified and knowledge of appropriate strategies such as processes, skills, knowledge, tools, techniques which are ultimately aimed at delivering the project correctly”* (R1). Secondly, to achieve organisational learning based on lessons learned: *“KM is the process through which knowledge and experience resources are shared and shared with individuals and the organization in order to raise awareness and achieve the required learning for the organization. It is the process of motivating and encouraging individual or collective initiatives that increase knowledge acquisition and best use by companies”* (R4).

Thirdly, to prepare a healthy environment and organisational culture to facilitate the adoption of knowledge: *“Knowledge management is the ability of the institution to achieve unity and work as one entity that meets different needs”* (R7). Fourthly, to apply knowledge for decision-making and problem solving to support the management of projects: *“Knowledge management: is the main engine to extract the information, skills and experience available both in the sources of technology or the human mind and then converted, published and stored and linked to decision-making and problem-solving”* (R6). Fifthly, to extract information, skills, and experience to improve business performance and prevent knowledge from whether loss or copy by other competitors: *“The process of improving the effectiveness and efficiency of individuals and the organization in order to create more expertise and information that will help to prevent this knowledge from being lost as people leave the company”* (R2). Sixthly, to create practices that are able to increase knowledge contents and its types: *“Knowledge management is based on both science and knowledge, whether implicit or apparent knowledge”* (R5).

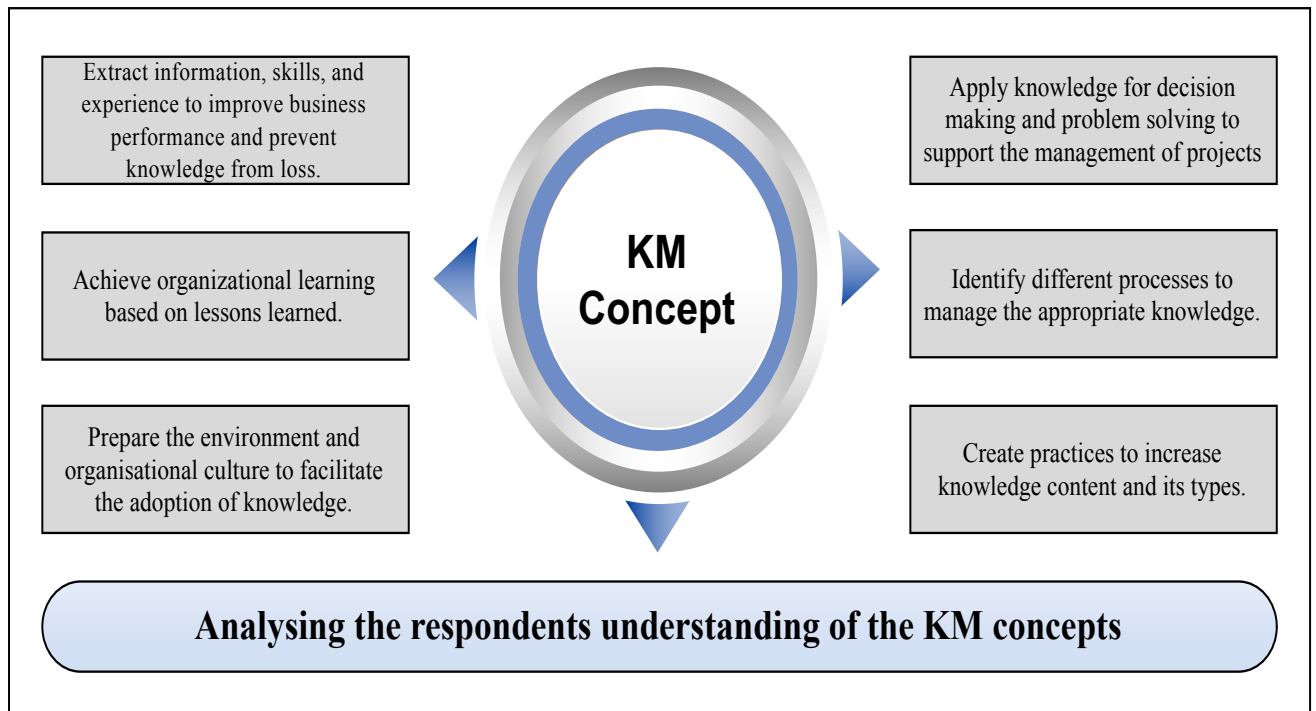


Figure 7.7: Summarising the main themes of KM concepts

7.4.2.1 The effective roles of KM to organisational learning

To understand the relation between both KM and OL, interviewees were asked to point out how KM can support OL and how the practices of OL works to facilitate knowledge. The respondents largely discussed the effective roles of KM for OL. Respondent 4 proposed that the increasing utilisation of KM would have a positive impact on the maturity of the organisation: *“Employees’ knowledge of the company’s short- and long-term policies and objectives has positive implications for the company becoming mature”*. Respondents also gave more examples of the practices of OL. For instance, (R2) revealed that the ability of organisation to constantly change would indicate the organisation’s learning level: *“In the implementation of projects there are many successful and unsuccessful experiences and the extent of the company’s ability to learn to benefit from these experiences gives it an organizational learning feature. Is the ability of the company to constantly change and adopt effective policies and regulations in which all employees participate?”*.

A number of interviewees agreed that PMO roles are effective for encouraging and facilitating the various processes of KM: *“PMO works to link knowledge management to a specific system that helps them create and validate knowledge assets. If PMO is the main engine of various knowledge management processes which aims at the end of the road to achieve an educated organization”* (R7). The relationship between KM and organisational learning can reflect on the maturity of the organisation: *“The importance of the relationship between knowledge management and organizational learning can be clarified. Organizational learning is the primary goal of knowledge management. Also, organizational learning focuses on processes, while knowledge management focuses on the content of acquired knowledge, organizational learning helps to achieve sustainable development in the optimal use of knowledge”* (R6).

The approach of organisational learning can be seen in different practices: *“Behavior change Based on the outcome of past experience and different practices, it focuses primarily on the amount of knowledge acquired. I can say that the organization learns as human learns and through this educational process, the employee at first acquires many concepts and practices and thus becomes the competence and merit on which the organization depends”* (R5). It was suggested that the success of the organisation to apply various practices of organisational learning will build up the maturity of the organisation: *“Continued improvement in the performance of the company and change strategies for the better and the creation of success factors. It gives an indication that the organization has become educated. Knowledge management is part of this system”* (R11). It also became clear that the development of the KM systems supports the development of organisational learning, representing: *“a direct relationship and aim to achieve the objectives of the company as a public entity. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time”* (R13).

7.4.2.2 The necessary components of KM and their effectiveness

Through asking interviewees about the key components of KM at each maturity level of PMO, there was a strong agreement from all that people have an important impact on the success or failure of knowledge. (R2) confirms this need as: *“I believe that people are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge”*. However, (R1) added two more components of knowledge: *“The components of knowledge can be divided into three levels: processes, people and technology”*. It also became clear that the components of knowledge can be divided into different parts: *“The classification of knowledge is divided into many viewpoints, but it is possible to talk about one another: cognitive knowledge, causal knowledge, knowledge of purpose, knowledge of the administrator. Components of knowledge are human processes and how to develop appropriate mechanisms”* (R7).

In regard to this argument, (R10) suggested that: *“Components of KM can be gained through the interaction of people among themselves or through the management of processes or the creation of effective technology factors and practices to acquire knowledge”*. Otherwise, respondent 14 divided the components of KM into three different perspectives: *“Knowledge management can be viewed from several perspectives: First, from a technical perspective. Second, from the perspective of organizational culture. Third, from a financial perspective. The main component of knowledge is human power because it is the foundation that is conveyed through individual knowledge to organizational knowledge”*. People represented the most important component of KM: *“People are the primary drivers of knowledge, so effective processes must be identified to achieve the management objectives of this knowledge”* (R13). Table 7.14 described the important components to enable KM implementation via the PMO, as follows:

People	Processes	Technology
<ul style="list-style-type: none"> ▪ Knowledge begins and ends with people. Educated organizations to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge as key drivers in the development of the company ▪ People are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge. ▪ The basic sources of knowledge based on the human being is interacting with its types and achieve its objectives. ▪ People are the primary drivers of knowledge, so effective processes must be identified to achieve the management objectives of this knowledge. ▪ Internal sources of knowledge: They can be acquired through implicit knowledge. Such as individuals working in the field and the activation of organisational culture. ▪ External sources: It can be gained by taking advantage of the recruitment of experts from outside the organisation or follow the competition companies and assess their areas of strength and weakness. ▪ Theoretical knowledge through the academic qualification or knowledge acquired through past experience and the working environment. 	<ul style="list-style-type: none"> ▪ External knowledge such as research, studies and previous experiences of competitors. ▪ Internal knowledge such as processes, procedures and internal activities of the company. ▪ From the process of lesson learnt ▪ Preparing unified policies and processes ▪ A clear system and reference for how to transfer and store information and experiences and how to reuse them later. 	<ul style="list-style-type: none"> ▪ Through the creation of effective technology factors and practices to acquire knowledge. ▪ Find appropriate technology to classify knowledge such as cognitive knowledge, causal knowledge, knowledge of purpose, knowledge of the administrator. ▪ Preparing unified technologies and techniques. ▪ The existence of well-known administrative and policy systems through the Office helps to make it faster.

Table 7.14: Important components to enable KM implementation via PMO

7.4.2.3 Types of KM and procedures to convert tacit knowledge into explicit via PMO

To categories the different types of project knowledge, interviewees were asked to enumerate its types. All respondents agreed that knowledge in general can be classified into tacit and explicit knowledge. For example, (R1) noted that: *“The type of knowledge can easily be divided into two groups: first explicit or virtual knowledge, which is characterized by external manifestations and can be expressed in writing and speaking and the possibility of conversion using simple technology. The second group is the implicit knowledge which is the most difficult*

and complex as it expresses the inner sense and the speed of intuition and good expectation of events. Is a subtle knowledge that describes the behavior and mentality of individuals and can only be transmitted through social interaction". In this line, (R3) agreed that: *"The implicit knowledge can represent 90% of the knowledge. Which is the most dangerous element of knowledge for its loss and the lack of optimal utilization of it"*. This requires the organisation to find some ways to invest more in the capturing of implicit knowledge as it seems much more difficult to obtain.

A number of interviewees identified high variances in the types of project knowledge. Interviewees noted that knowledge can be classified as tacit or explicit knowledge: *"Types of knowledge are either explicit and can be transferred in periodic reports, documents, contracts, etc. Implicit knowledge exists in the thinking and logic of people, which requires the planting of initiatives and the presence of a good desire to transfer them"* (R9). Respondent 10 argued that: *"In an enterprise environment, more explicit knowledge can be documented in documents. In the senior management of the company, knowledge is implicit, because of the large number of experts"*. Respondent 15 explained the differentiation in the following way: *"Know what - why - how - to who, which is divided into two main sections are: Tacit knowledge: the remaining part of the head of the individual in terms of experience, previous information, visions and personal ideas. Explicit knowledge: which can be obtained clearly through documents, periodic reports and others"*.

Many interviewees defined the major ways of converting tacit knowledge into explicit. Six main themes were identified and can be summarised in the following way. Firstly, it is important to develop effective strategies, policies, and processes; knowledge: *"Can be transformed by developing effective strategies and policies to observe and store practices in the Office's databases to be used as future information"* (R1). Secondly, it is vital to activate appropriate system of incentives and rewards: *"Activate the role of the Office to be a key catalyst to encourage the transfer of this knowledge and share with others. I believe that the activation of the system of incentives and rewards has a big role in this aspect"* (R1). Thirdly, it is important to raise awareness and to qualify people via the Centre of Excellence: *"I believe that the work of the Office as a center of excellence and a qualitative shift of the institution through the process of training and continuous development has a significant role in the*

exchange of official and non-official information. The role of the Office in documenting reports and meetings can contribute to the transformation of implicit knowledge into explicit” (R2).

Fourthly, it is important to document various project activities and periodic meetings: *“The importance of periodic meetings cannot be ignored, but the nature of their work must be positive and not only as a constant and durable process” (R5).* Fifthly, the culture of innovations, cooperation, and trust must be encouraged: *“By increasing attention to the main characteristics and features of the Organization, such as the interest in the culture of innovation and the culture of cooperation among the members of the Working Group” (R8).* Sixthly, it is important to create communication channels, teamwork, and initiatives: *“There are many steps that help to transform implicit knowledge into explicit knowledge that can be: Developing good systems of participation, creating channels of discussion on thorny topics, optimizing investment in transforming people's ideas into electronic forms so that they can be easily accessed and used when needed. I also believe that knowledge is generally built on the Secretariat and can be activated by appropriate communication processes” (R5).* Table 7.15 identifies the different types of KM and their implementation via the PMO, as follows:

Explicit knowledge	Tacit knowledge	Steps and procedures to convert tacit into explicit knowledge via PMO
<ul style="list-style-type: none"> ▪ Described by external manifestations ▪ Expressed by discussion and writing ▪ Characterized by external manifestations and can be expressed in writing and speaking and the possibility of conversion using simple technology. ▪ Exists in the thinking and logic of people, which requires the planting of initiatives and the presence of a good desire to transfer them. ▪ In an enterprise environment, more explicit knowledge is obtained in the documents, reports and database and can be easily transferred. ▪ Knowledge is generated on a daily and continuous basis and all successful or failed experiences can be obtained as knowledge, for example: implementation methods, use of new materials for construction at lower costs and faster completion, better handling of disputes and satisfactory resolution of all the parties. 	<ul style="list-style-type: none"> ▪ Exist in the minds and behaviors ▪ Described by the internal sense and intuition ▪ Expressed by experience and responsiveness ▪ In the senior management of the company, knowledge is implicit, because of the large number of experts. ▪ The implicit knowledge that exists in the experiences, practices and values of the persons. ▪ The most difficult and complex as it expresses the inner sense and the speed of intuition and good expectation of events. ▪ A subtle knowledge that describes the behavior and mentality of individuals and can only be transmitted through social interaction. ▪ The implicit knowledge can represent 90% of the knowledge. Which is the most dangerous element of knowledge for its loss and the lack of optimal utilization. 	<ul style="list-style-type: none"> ▪ Creating and supporting the effective strategies, policies, and processes ▪ Setting up and activating appropriate system of incentive and rewards ▪ Rising awareness and qualifying people via PMO center of excellence ▪ Documenting various activities and periodic meeting ▪ Encouraging the culture of innovation, cooperation, and trust ▪ Creating communications channels, teamwork, and initiatives

Table 7.15: Types of KM and their implementation via PMO

7.4.3 Investigation of the contribution of PMOs to encourage and support KM implementation

The interviewees revealed that the PMO can play many roles for encouraging KM processes. (R1) proposed the office to be the first call for addressing any project matters: *“The Office is considered the most important reference through which the employees are sent to many workshops and conferences, both internally and externally according to the needs of the work. The company is currently working on providing effective internal programs and courses offered by specialists in many fields”*. (R4) agreed with (R1) that: *“The amount of training programs and the extent of benefit from them is another factor. I cannot overlook that the office is a 100% shareholder but through periodic meetings with our office members we have good information that the next is better”*. However, (R3) argued that the PMO should be known as a center of excellence to enforce and encourage best practices: *“As far as I know about PMO, there are many researchers and practitioners in this field who have rated the office as a learning center where the company can achieve best practices, transfer experiences and provide full support”*. According to (R3), PMO roles can participate mainly in the organisation’s policies and strategies: *“The office is a major shareholder and I can say that it is currently the only one to provide the necessary support to our project managers and try to develop their abilities and skills and work on them to be used optimally in the management and development of the projects they are working on. I can also talk that a future plan has been put in place to increase the office's tasks and prepare it for ongoing training sessions. I also do not forget the attention of the Office in trying to find a suitable environment through which all members of the team and department managers can participate in achieving the objectives of the company and enforce the policies of the office”*.

A number of interviewees agreed that the PMO roles are effective for encouraging and facilitating the various processes of KM: *“PMO works to link knowledge management to a specific system that helps them create and validate knowledge assets. If PMO is the main engine of various knowledge management processes which aims at the end of the road to achieve an educated organization”* (R7). Respondent 5 pointed out the importance of the PMO department to provide programs and coaching for project teams: *“In response to your question about the programs offered by the PMO department, we have a plan to send our employees to gain knowledge and experience, as well as our work during the previous period to provide*

developmental and cultural programs to share experiences. The focus of the department on developing staff skills and investing optimally in creating an appropriate working environment, has positive implications for understanding and understanding the company's strategic objectives” (R5).

The contribution of the PMO to develop an effective KM system not only involves the use of technology factors but also links the employees of the organisation and connects them with experts in the same field: *“The contribution of PMO is to develop an effective knowledge management system that not only involves the use of technology factors but also links the employees of the organization and connects them with experts in the same field. PMO's contribution is to rely on human activity to generate more knowledge than to rely on computer usage and communication links may not be effective. The above factors can be achieved only through PMO's role in providing appropriate training programs” (R6).* It was also confirmed that the availability of the PMO department can: *“Maximize knowledge management and disseminate its culture in the institution and to find effective programs such as PMO” (R8).*

Unsurprisingly the majority of respondents alluded to the roles of PMO as a Centre of Excellence: *“The role of PMO in managing knowledge processes ultimately gives an educated organization based on a large database. It is possible to activate the role of the Center of Excellence through PMO in providing training courses. Contributing to raising awareness among people of the importance of the existence of this concept and that if implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general. It is possible to speak here about the effective role of PMO as a center of excellence. The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company” (R9).* Further to this, (R10) added the following factors: *“Build organizational memory. The good concept PMO contributes to the development of skills in individuals. Increase the outcome of creativity. The dissemination of useful ideas. Facilitate more effective cooperative processes”.* A perspective reinforced by (R11) who observed: *“PMO's knowledge management processes ensure continued knowledge acquisition and organizational learning. To maximize the role of PMO, there must be appropriate programs to develop capabilities and capabilities”.* However, (R12) argued that the effectiveness of the PMO group was not as it should be: *“The role of PMO is*

not noticeable in providing great support in providing training programs and sending administrative competencies to develop them or to attract qualified competencies”.

7.4.3.1 PMO possible solutions/options for encouraging KM processes

Through asking interviewees about the implementation of KM processes at each maturity level of PMO, the following main themes were identified:

Creation and activation process

Interviewees were asked to illustrate the PMO roles to create and activate knowledge. A number of interviewees identified the PMO department as making a real contribution to the process of knowledge creation: *“Creating knowledge management initiatives should be conducted by PMO to verify the importance of the presence of this department”* (R6). PMO roles to transform different types of knowledge were discussed again by respondent 7: *“Knowledge creation is done by transforming knowledge into practices and activities that can be used to maximize the spread of knowledge”*. Respondents identified that many companies apply Nonaka’s model (SECI): *“Knowledge creation initiatives have been designed through the implementation of the SECI concept, which reflects processes and practices within and outside the company, as well as assessment of teamwork and knowledge of community coordination and outreach”* (R5). The interviews revealed that the PMO structure can support the creation of knowledge: *“The PMO group should have a detailed structure for the performance of the work of the knowledge management process and who are the people concerned and what means will be used and what is the importance of managing this knowledge to the people and the interest of the company as an entity”* (R12).

Capturing and classifying process

Interviewees were asked to explain the important roles of the PMO office to capture and classify knowledge. Respondent 4 discussed the classification of knowledge in the following way: *“The classification of knowledge with the identification of knowledge sources as well as the selection of what suits and fits the direction of the company gives a positive impact to the acquisition of knowledge”*. Respondent 3 remarked that the selection of knowledge involved the following procedures: *“By defining the system of querying knowledge and repeating questions”* (R3). (R4) argued that there is only one possible solution: *“The best way here for*

the acquisition can be to activate the teamwork and the initiative of the Office to contribute to the development of staff awareness of its importance in developing their skills and achieving the desired goals. Activating the role of people in business leadership and keeping pace with development helps to acquire and discover their knowledge". The majority of those interviewed identified PMO roles to capture knowledge: *"To acquire knowledge, it is necessary to know what sources of knowledge in the projects can be classified as follows: First, knowledge of trade: procurement and sales, resource management and strategic plan. Second, knowledge of techniques: the importance of bringing tools and devices and processes that increase productivity and reduce the effort, time and cost. Third, product knowledge: product quality, customer satisfaction and price competition. Fourth, project management knowledge: Key processes in project management, time management, costs and resources. Fifth, knowledge of administrative organizations: the role of communication, coordination and cooperation in the acquisition of knowledge"* (R7). However, (R9) considered the rehabilitation of people as most important: *"To determine the mechanism of acquisition of knowledge and who are the people concerned to take this responsibility, the rehabilitation of people and the identification of practices"*. Respondent 10 had the following to say about the importance of capturing knowledge: *"PMO group should be responsible for the classification of knowledge types within the organization: for example, the knowledge of customers, the state of the market, the work carried out and then work to determine their importance to the organisation. Acquire knowledge from different sources, internally such as repositories of knowledge, discussion and communication between departments and projects"*.

Sharing and transferring process

Sharing and transferring valuable knowledge represented the most significant issue that was identified by participants. For example, (R4) assumed that: *"It is very difficult to determine the extent to which PMOs has contributed to the promotion of knowledge as our work as project managers is limited to the delivery and fulfilment of the Office's requirements"*. In addition to this, (R2) believed that: *"The knowledge management infrastructure must be developed by the Office from time to time according to the needs of the company"*. The majority of those interviewed identified the main roles of PMO to support the transferring and sharing of knowledge. The main practices of PMO were explained by respondent 6: *"PMO presence is an important factor in increasing the growth and maximization of knowledge by sharing, communication, exchange of ideas, skills and experiences. are positive factors in the spread of*

knowledge”. The firms were required to offer: *“Effective communication between departments and easy access to knowledge has a positive impact in knowledge transfer”* (R8). Secondly, interviewees noted that the content of knowledge is significant in knowing which type of knowledge is valuable or not: *“PMO's role in knowledge transfer should focus on several practices, including: finding an appropriate means to transfer knowledge, whether people or tools. There is an incentive to carry out knowledge transfer. Demonstrate knowledge content”* (R6). Timing is critical in knowledge transfer: *“The Department's work on the transfer of knowledge in a timely manner at the appropriate place helps to spread knowledge and increase its importance”* (R5).

A number of interviewees identified that the sharing of knowledge is dependent on the culture of organisation: *“The presence of innovative and effective systems to encourage the members of the project team to keep pace with knowledge management procedures. There must be a clear vision of the tasks of the people in order to increase the Organization's culture of knowledge dissemination. Knowledge management practices both in senior management and in projects must be integrated with the company's overall levels”* (R9). In addition to this (R11) proposed that: *“Managing knowledge transfer and dissemination processes requires an encouraging and stimulating organizational culture, which is a set of values, behavior, beliefs and intuitions within the scope of work that occur naturally between the interaction of individuals with each other and the expectations of officials for the way others work and the return of their actions”*.

Application and re-using process

Unsurprisingly, the majority of respondents do not mention appropriate information about the roles of PMO to apply and/or re-use knowledge. However, (R1) argued that: *“Since the work of the Office focuses specifically on the development and standardization of procedures and policies in the organisation based on the knowledge gained. As well as the role of the Office in linking this acquired knowledge to the problems and difficulties encountered in managing and implementing the business”*. (R1) also divided the roles of PMO in the following way: *“Adoption and support of knowledge: This is done through the management of documents such as periodic reports. Application and activation of knowledge: through the development of effective systems to control and disseminate knowledge”*. (R2) focused more on the following aspects: *“I think that PMO should always tried to apply best practices, whether in project*

management or knowledge, and to encourage its use in accordance with business needs. Documenting and building a database through the office and a static reference helps to increase the success of this process". The roles of PMO department to support the application and re-use of knowledge were discussed and can be summarised in the following observation: "I see through the work of PMO on the adoption and the creation of methodologies, policies and activities unified that it works to apply a comprehensive knowledge of the entity of the company" (R8). The quality of knowledge via PMO seems to be the significant roles as it has been agreed by all respondents: "Urgent solutions to enterprise problems as well as low reliance on experts in the implementation of business, and easy access to accurate information and increase the contribution of people to know the importance of knowledge gives good impressions on the optimal use of knowledge" (R7). Whereas respondent 6 was struggling to not clearly agreed on this: "Knowledge that cannot be applied or used to solve problems or that do not help to grow and adapt factors is costly and redundant knowledge about the company's need". Therefore, it was suggested: "The role of PMO in applying knowledge should be concerned with these processes: First, optimal use. Second, reuse when needed or in new project. Third, maximize the use of content" (R7).

7.4.3.2 Perspectives necessary for facilitating KM implementation via PMOs

Similarly to the previous section, interviewees were asked to clarify the perspectives necessary to facilitate the implementation of KM processes at each maturity level of the PMO. The following main themes were identified:

Organisational structure

There was an agreement by all respondents that the PMO structure can create and activate valuable knowledge. (R2) explained the difference between the organisational structure and the PMO's structure in the following way: "In the project, we have a specific organizational structure of tasks and its relationship with other departments. PMO has a completely independent organizational structure. I suggest that there be an organizational structure that links the PMO to the structure of the project and explains how to create the knowledge and people concerned". (R1) confirmed that the PMO structure should accept or reject order internally have to go through several approval parties and cannot be relaying in personal

judgment: *“I see that the presence of the PMO office has become an absolute priority in creating many knowledges. Since PMO does not rely on one person or a specific department to implement and manage tasks. The nature of the work of the office depends in its style that the process of making a particular decision must be taken by more than one person and here can create a lot of important knowledge”*.

Furthermore, it was suggested that the PMO structure creates and activates knowledge as: *“The PMO Division falls under the Senior Management structure as a supporting section. This department works in relation to all the different sections of the company. The department has an independent organizational structure of 8 persons who are constantly present in the central administration. The Center has correspondents in many projects to achieve the goals of the pre-set. I see the extent to which the department is able to unify and share the company's strategic objectives with knowledge management, which is the main focus of the effectiveness of the structure of this department”* (R5). Respondent 6 proposed that: *“The role of PMO is in controlling the identification of relationships. Application of scope of supervision, delegation of authority, distribution of work and responsibilities. The role of PMO has helped define the functional description of each cell in the structure and thus help to activate the appropriate knowledge”*. The interviews revealed that the PMO structure can support the creation of knowledge: *“The PMO group should have a detailed structure for the performance of the work of the knowledge management process and who are the people concerned and what means will be used and what is the importance of managing this knowledge to the people and the interest of the company as an entity”* (R12). This approach to participate in the creation of knowledge can improve the capturing of knowledge as: *“The concept of PMO works to turn the life of the demand from one hand to another and then resubmit the application with approval or rejection with the appropriate recommendations. A large number of knowledges are created and organisation needs to have a mechanism or a detailed structure of knowledge rotation”* (R9).

Competitive advantage

The contribution of the PMO for achieving competitive advantage were discussed by all. For example, (R1): *“The role of the office should be coordinated to confirm this relationship. The development of decision-making in PMO's knowledge-based office will contribute to the company's competitive advantage. The company must also work through the Office to have a modern knowledge management system and more complicated to the competition companies*

to imitate". (R2) proposed that the role of the PMO office is: *"to protect this knowledge from its transfer to externally competitive companies or from the loss of its internal acquisition. I believe that the work of the Office mainly to find and apply best practices in project management, create an organized work environment and benefit from investment in knowledge is a key component in achieving competitive advantage"*.

PMO departments could contribute to achieving competitive advantage by: *"Categorizing the knowledge correctly by PMO and determining its type has a key role in activating the cultural advantage of the company and increasing its position in the market"* (R5). Respondent 7 agreed that: *"Three main steps must be taken by the PMO department to acquire knowledge by acquiring the appropriate knowledge, information and experience and providing it to relevant people and departments in a timely manner. The ease, speed, and relevance of different knowledge management processes by PMO are those who determine their use as a competitive advantage"*. It also became clear that the investment in establishing the PMO group had a positive impact on competitive advantage: *"The speedy of doing business by taking advantage of previous experiences and knowledge. The provision of appropriate means and the distribution of resources based on good knowledge in terms of the need for different organisation's projects"* (R11). Therefore, it was suggested that the: *"PMO should act quickly to acquire knowledge from current staff and knowledge from competitors in the field. To monitor business on a continuous basis and not to allow competitors to benefit from hiring employees and transfer their valuable knowledge"* (R9).

Organisational culture

The interviews revealed a number of PMO roles that helped to address organisational culture: *"The role of the work of the Office is an alternative to the concept of senior management in a more professional and effective and its focuses on the standardization of polices and various practices. That is, the Office is the one who communicates directly with project managers on a permanent and continuous basis. So, I can talk about the important role of project managers in the success of PMO's first roles and then talk about their role in the successful transfer of knowledge"* (R3). The PMO can help to establish a consistent organisational culture: *"In the past, work was closer to random and did not benefit from the exchange of experiences and teamwork. The role of the department is now positive in supporting the work as one system working according to specific plans"* (R5). Therefore, everyone should know how KM affects

the overall performance of the organisation: *“The PMO can take on the role of senior management in promoting teamwork to share valuable knowledge”* (R6). Working on the healthy projects environment can overcome the poor competition among the members of the team, which was suggested by respondent 7 to achieve: *“There is a significant impact between organizational culture and knowledge transfer, so PMO should increase awareness and educate the staff on the importance of sharing knowledge and linking it to reward programs”*. If this not working properly, there is a good chance that the spread of knowledge will be reduced. Respondent 8 believed that the PMO’s role in the management of projects was: *“Purely practical, but when we need to know and solve some of the problems that face us, we communicate directly with the PMO, which in turn sends us specialists in this field. The role of PMO in creating an integrated organizational culture has a positive impact on achieving the company's overall objectives. The role of senior management is ineffective in this regard”*.

The ability of the PMO to spread knowledge culture throughout the organisation was emphasised by the majority of respondents. Respondent 9 observed that it was important to: *“Understand the importance of the role of PMO team members in supporting best practices and promoting teamwork and collaboration. Understand the importance of knowledge sharing and how it helps to develop the maturity of the company and how it is reflected in ensuring individuals for their jobs and the possibility to develop their skills and achieve their goals”*. (R9) observed that: *“PMO team members and project managers should be aware of their role in promoting knowledge transfer”*. Respondent 11 proposed the role of the PMO to: *“consider 3 fundamentals in achieving organizational culture: values - standards - practices. The role of PMO helps to spread a single regulatory framework, which reduces the resort to always more severe measures”*.

Human resource management

The interviews revealed a number of factors that can be provided by the PMO office to support HR management. (R1) argued that the office should therefore focus on two key factors in the application and re-use of knowledge: *“1- Contribution of knowledge in developing the skills, expertise and capabilities of the members of the working group. 2- Contribution of knowledge in the development of human resources management work system, both within the PMO office or through its presence in the enterprise environment. The PMO concept not only relies on human resources management in knowledge management but relies on all other management*

departments as well as the knowledge gained from implementing different projects". With the introducing of PMO's concepts nowadays, there is a confusion between the PMO and HR management; the *"The PMO concept as a head office or as a sub-section can define the mechanism of human resources management. The mechanism of PMO department is to keep pace with advances in technology, keeping pace with temporal and spatial variables and optimizing the use of the latest practices. As it has become very difficult especially in large companies to increase the burden and burdens on human resources management in the evaluation of the performance of employees and determine the salary scale and exchange dates in addition to knowledge management and assistance in development and training. PMO is currently a key player in supporting human resources management and reducing tasks"* (R6). This explains in depth the similarities and differences between these departments. When asked about the level of support the PMO offers to HR management, respondent 5 remarked that: *"PMO levels and types are those who define the HR department. Specifically, if PMO acts as a separate department of senior management, its role is independent of human resources and relations between them are based on knowledge of similar and different roles among them"*. In addition to this, respondent 8 identified that: *"The presence of PMO helps in supporting human resources and focuses its work on monitoring the employees of the company"*.

Therefore, with the creation of the PMO, there is an overlap of responsibilities and functions between the office and HR management. Respondent 7 believed that the: *"PMO is beginning to take the lion's share in the application, storage and reuse of knowledge. Periodic reports that reach the office carry a lot of knowledge and experience, the role of PMO must be documented and the development of an appropriate mechanism for reuse either in training programs or activate the role of project managers in the transfer of new knowledge"*. (R10) observed some similarities between the PMO and HR management and suggested that the relationship needed to be clarified: *"This group is concerned with the management of knowledge operations and trying to make the most of them, which fulfils the aspirations of the company. There is a direct relationship to the role of human resources and PMO, but the responsibilities of each party must be determined so that there is no duplication or overlapping of powers"*.

7.4.3.3 PMO functions to support PM practices and Project manager's responsibilities

There are many tasks that the PMO works on, as noted in the interviewees' answers, but by focusing on similar and more frequent factors, the following can be seen: the PMO is an important and key factor in assisting and supporting project managers: *“Effective PMO can provide project managers with the necessary support in terms of providing well-informed advice, such as financial balance, resource management and decision-making”* (R1). The role of the Office in supporting project managers may include the allocation of resources: *“In the event of a shortage of human resources or elements of the project, I can make a request to the office and be dealt with and respond satisfactorily”* (R4). It also became clear that the function of the PMO to support project managers is useful: *“I think that the Office has become a good supporter in reducing the burden on project managers and reduce their functions outside the walls of projects. When a new contract is required with the subcontractors, PMO provides an appropriate profile of the previous work of these contractors. The office also supports the selection of the best prices by comparing them and negotiating on behalf of project managers to obtain a competitive and satisfactory price for all parties* (R5). However, project manager as represented by respondent 15 explained their needs to PMO as: *“I need coordination and good communication with the decision makers as well to help provide urgent solutions and deal perfectly with the trends and difficulties that limit the completion of the work. Making decisions personally presents me with problems with senior management”*.

There was general agreement that the main office function is to support project management practices and apply best practices: *“The effective role of the Office improves project management practices and promotes knowledge and consistency among different task forces”* (R1). Respondent 2 defined the role of the Office in supporting enterprise management practices, thus: *“As for its role in achieving modern enterprise practices, it is the primary engine that is followed up and supported from time to time in accordance with the company's capabilities”*. (R4) tried to simplify this concept in in the following way: *“PMO is a real tool to apply as much modern practice as possible”*. Furthermore, it was suggested that the PMO often resulted in internal and external benefits: *“First, internally, it works to close the gap between the different departments of the administration and the projects that are implemented at the same time. Second: Externally works to create effective communication channels with stakeholders and clients and work on developing company strategies. PMO provides tangible*

and repeatable benefits to the company's long term. It also develops a methodology for achieving best practices in project management and defining standards that fit the company's brand” (R8).

All respondents saw a strong connection between the role of PMO as a centre of excellence and the ability to achieve best practices: *“PMO's mechanism to provide unified systems and processes that give more time for project managers to carry out their necessary work. The planning, reporting, documentation, dispute resolution and selection of subcontractors should also be the responsibility of the PMO team members” (R10).* Respondent 16 suggested that the PMO could assist in gathering information and identifying the data needed for project management through the creation of *“databases, processes and various workflow tasks, provide appropriate support for different projects according to the company's priorities and strategies”*. Figure 7.8 summarises the main function of the PMO for the whole organisation:

Maturity Levels of PMO	PMO Functions	Effect of PMO Functions on PM Practice (Office Based)	Effect of PMO Functions on PM Practice (Project Based)
Level 0 Developing/ Initial No PMO	No formal PM processes exist across the organisation	<ul style="list-style-type: none"> There is a difficulty of communication and coordination between departments within head office. Limitation of unified management regulations and processes. Random in operations, activities and policies. Poor respond to provide urgent solutions and deal with the difficulties that limit the completion of work work on time. Making decisions personally presents some problems between senior management and head of departments or others. 	<ul style="list-style-type: none"> The evolution is very slow in giving opportunity for change and not benefiting from the knowledge of previous projects. There is independence in the implementation of projects under the same company that represent the need of well communication and coordination. Poor reporting lines and slow assist of gathering information about the status of project. There is a limitation for providing training programs from human resources and/or the development management.
Level 1 Supportive PMO Defined/ implement Group or Unit or in a single Project Level (Center of Excellence)	To support and increases PM awareness To provide methodologies, standards, and tools to enable project teams and project managers to deliver project successfully	<ul style="list-style-type: none"> Distribution of various resources equally on projects and lead the project schedule and budget and dealing with the issues facing the project, especially in the delivery of works. Standardization of standards, methodologies and processes, which helps project managers to focus well on the implementation of their work. Helps to manage the sharing of knowledge, resources, methodologies, tools and techniques for the success of projects according to priority. Provides supervision, training, guidance and development of management methodology for project managers and employees in various departments. 	<ul style="list-style-type: none"> Provide effective training and development programs after examining the needs of employees and project managers. Create a link between the staff and their administrative references in order to provide continuous counselling and guidance, especially for the new team members. A good information store containing all the data and details of the current and previous projects with the identification of easy and safe ways to access them when needed. Increase the efficiency of people and develop their skills.
Level 2 Controlling PMO Managed/ Monitor Departmental Level (PMO Department)	To control and manage PM practice in the PMO To integrate PM practices with the organisational goals and strategies To provide control for business services or units	<ul style="list-style-type: none"> Provide basic coordination among departments within the head office and between the company's various projects and supporting effective Communication channels. Achieving appropriate administrative regulations and supporting the unification of policies, procedures. Increasing staff efficiency and developing their capabilities through the development of appropriate programs. Negotiating on behalf of project managers to obtain a competitive and satisfactory price and quality. The ease of making decisions based on the strict control of the completion of projects and to inform the senior management of the latest developments of each stage. Optimal investment and efficiency in the project management team and their knowledge and sources are distributed according to the entire interest of the company. PM practices become more clear and easy and are documented correctly and insuring all projects are operated according to the company's strategies. 	<ul style="list-style-type: none"> Increasing the transparency and clarity of the staff knowledge about the strategies and objectives of the company. Overcoming the shortage of cash and delayed payments in projects. Advising and monitoring in supporting project quality and ensuring best practices and avoiding to enter projects that larger than the capabilities of the company. Supporting the modern management methods in conducting business and achieving strategies and working to close the gap between the different departments of the administration and the projects that are implemented at the same time. Provide more accurate information and more details about staff and performance for stakeholders and clients and Provide qualified trainers and consultants to develop the capabilities of team members. Evaluate the performance of the project and always align it with the company's objectives, which enables project managers to know the project's success trends in advance.
Level 3 Directive PMO Optimised/ Strategic Enterprise Level (PMO Regional or Centralised office)	To have more directive roles in developing, managing, and optimising the PM best practice To insure all PM practices are applied across the entire organization To provide directive roles to align projects and organisation's units to corporate strategy and ensuring appropriate enterprise governance.	<ul style="list-style-type: none"> Direct and distribute resources to projects appropriately and provide project managers with the necessary support in terms of providing well-informed advice, such as financial balance, resource management and decision-making. Encouraging PM initiatives and practices in line with company's policies and promotes knowledge and consistency among different project teams. Benefiting from the experience of the competition companies or previous projects of the company. Reducing costs and general expenses and setting specific terms of reference for project managers and making irresponsible decisions and develop, qualify and train employees by what the organisation demands. Finding the appropriate processes that control the elements of knowledge and how to disseminate knowledge through the use of technology or their own initiatives. Directing KM processes such as knowledge of labour laws, contractual conditions, administrative regulations, administrative structure, working environment, responding to events, good expectation of hazards. 	<ul style="list-style-type: none"> Help to increase the transparency about company policies and directing the coordination and communication. New employees are transferred to the project by the office with a full description of the their work and the tasks they are asked to do. Directing and optimising the management and resources of each project by priorities and its linkage to the objectives of the strategic goals of the entire company. Directing the Selection of a suitable and qualified team for the potential of the project and taking advantage of the company's method and methodology in project management. Maintaining and directing the access to previous project documents and train the team members and develop their knowledge background and skills in accordance with the rules and requirements of the specific work nature. Develop and manage project activities, expertise, knowledge, abilities and management skills, follow-up, supervision, support, consultation, standardization of practices, guidance and use best methodologies in PM.

Figure 7.8: The effect of PMOs functions on the availability of PM practice

7.5 Proposed conceptual maturity framework based on the qualitative analysis

Construction firms have to survive and thrive in today's knowledge-based economy, which is increasingly become more unstable and competitive. In order to meet this challenge, it is critical that the construction sector regularly improves business performance within the organisation, among projects and with different partners to ensure organisational productivity and profitability. Indeed, trends like the new immigration control and the increasing difficulty and complexity of the market have pushed many organisations to apply and adopt more modern administrative procedures. In this context, the quality of knowledge being created, captured, transferred, and applied, as well as the utilisation of best PM practices, can directly affect the quality of an organisation's outcomes. This means that the appropriate implementation of these practices via different PMO maturity levels will directly affect the successful delivery of projects and the improvement of organisational performance. Therefore, it is important for modern organisations to assess and understand the proposed conceptual framework, which is presented in the following pages to give more details about the continuations of each maturity level of the PMO.

The integration of KM processes at different maturity levels of PMOs will be assembled and configured in the next chapter. Such an understanding of their implementation will be guided by the different maturity levels of PMOs, which can help to identify, measure, and select the appropriate level according to the organisation's needs and maturity. For instance, Center of Excellence PMOs can support and encourage the implementation of KM by building organisational memory, developing individuals' skills, increasing the outcome of creativity, managing KM processes, providing training and coaching, rising awareness among people, sending employees to different workshop, and by developing standards, regulations, and practices. The PMO department can contribute to achieve the following success factors: spread KM culture, rely more on human activity, link KM to specific systems, qualify project managers and project teams, and provide healthy working environments. The existence of the PMO as an office can help the implementation of KM by encouraging the following aspects: enabling employees to acquire adequate knowledge, provide effective programs, create centers of excellence, support project managers, develop strategic plans, optimise the working environment, and apply new policies and roles. These factors enable the PMO to maintain valuable knowledge.

Maturity Levels of PMO		Key Factors of KM Implementation via PMO							
Level 0		KM processes and their main challenges							
Primitive Phase Developing/Initial		Knowledge Creation		Knowledge Capturing		Knowledge Sharing		Knowledge Application	
<ul style="list-style-type: none"> Individualised approaches to knowledge management using lesson learnt mentality – no organization interface No-PMO or effective tools to achieve practices No formal PM processes exist across the organisation 		Steps to create knowledge	The result of not creating knowledge	Steps to capture knowledge	The result of not capturing knowledge	Steps to disseminate knowledge	The result of not sharing knowledge	Steps to apply/re-use knowledge	The result of not re-using knowledge
<p>The effective roles of KM to organisational learning (OL)</p> <ul style="list-style-type: none"> Development of OL to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time. Development of KM to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time. Learning is based acquiring knowledge: Knowledge management is a good factor to gain the best lessons and experiences. Learning is based on acquiring knowledge and developing appropriate processes to maximize their utilization. Peoples' knowledge is important for OL: Knowledge management helps to care for people and their role is effective in increasing the maturity of the company. Knowledge management through the mechanism of its work to benefit from previous experiences and knowledge gained and different information contribute to increase the level of learning and maturity in the company. KM achievement for OL: The constant change and stay in the competition reflect learning styles, as well as lessons learned to facilitate the implementation of future projects and meet challenges. Increased transparency, availability and accessibility of information, teamwork and continuous communication are all positive impacts that contribute to organizational education. 		<ul style="list-style-type: none"> Senior management must take action and consider the importance of creating knowledge. There must be a formal system or people involved in managing knowledge management. Provide clear policies and processes to create knowledge Knowledge creation must be built on clear foundations and processes, such as what are the sources of knowledge? Including those concerned with the management, coordination and monitoring of their work? Determine how knowledge types are converted? What knowledge does the organization really need to be activated? 	<ul style="list-style-type: none"> Contributed to the creation of wrong decisions and do not take advantage of previous knowledge. Awareness and attention are missing for contributing in knowledge management practices. There is a lack of interest by people in the importance of transferring their experiences to others. Weak qualification of the company and ineffective competitive advantage. 	<ul style="list-style-type: none"> Clarify the needs to capture knowledge. The concept of knowledge management must be a clear concept for different departments in order to optimize knowledge acquisition. Senior management should encourage their employees to recognize the importance of acquiring knowledge. Senior management should believe in the importance of acquiring different sources of knowledge. Qualifying project managers to encourage other team members to the importance of acquiring different knowledge. Identify flexible processes and practices as knowledge acquisition can be developed through business documentation and effective systems. Providing training and qualification programs for employees on how to acquire important knowledge. 	<ul style="list-style-type: none"> Loss of valuable knowledge: Professional knowledge from specialists in different areas not acquired correctly. Most staff from American and European countries when they left, organization encountered great difficulties and losing important knowledge. Essay to access by competitors. There are no specific initiatives to acquire daily knowledge and then classify it to make it difficult to imitate by competitors. 	<ul style="list-style-type: none"> Provide appropriate communication. Transfer of knowledge must be done from anywhere in the company and be used to transfer all experiences, either failed, or successful. Encourage cooperative collective action. The transfer of knowledge is done by creating the company's culture of cooperation and linking the different entities of the company to effective communicators. Prepare healthy environment and culture: It is necessary to provide the appropriate means, find common formulas, and training in continuous development and linking them to promotions. 	<ul style="list-style-type: none"> Personal judgement: Much of the knowledge is published only by personal judgment or not properly conveyed to decision makers because of the lack of incentives and initiatives to transfer knowledge. Effect the speedy and availability of knowledge: Take a long time to find the people concerned and then transferred to the beneficiary or the transfer of knowledge is only when needed. 	<ul style="list-style-type: none"> Compare the current success with previous experiment. The application of knowledge is achieved by activating the role of previous operations. The level of change: Application of knowledge is linked to the level of change that acquired in the company. Identify specific people or department: The existence of a body that can ascertain what knowledge is important to the company and then reformulate it to suit the company's general strategies. The application of best practices: Configure that the company beginning to apply best practices. 	<ul style="list-style-type: none"> Lessons learnt missing: After the completion of the projects, not all activities are documented. The maturity of the organisation not developing: there are not many initiatives to apply knowledge or using valuable knowledge for the change of existing policies.
Perspectives necessary for facilitating KM implementation									
		Organisational structure and Knowledge Creation		Competitive advantage and capturing knowledge		Organisational culture and knowledge sharing		HR Management and knowledge application	
		<ul style="list-style-type: none"> There is no specific department or group of people are responsible for managing and collecting best practices. A responsible entity should be identified for the knowledge lifecycle, both in the projects being implemented and in the administrative work in the head office. A clear structure to create knowledge does not exist and the activation of the role of senior management should be defined in promoting the creation of knowledge. The role of project manager should contribute to motivate team members to share their experiences, maximize knowledge and have beneficial returns for everyone. 	<ul style="list-style-type: none"> Attracting competencies not effective. The optimal acquisition of knowledge is the acquisition of competencies as the long-term survival of the employees with the company, this gave an indication that the company's environment is valid and that it remains committed to the rules of competition. Provide training programs missing. Organisation needs to provide training programs and support the rehabilitation of current employees. Closely knowledge not exist. Knowledge should be classified for optimal acquisition. Protection of knowledge. Effective modern systems, processes and practices must be in place to help make it difficult to transport them outside the company. Governance. Competitive advantage is based on the presence of strong governance in the company, which enabling the organisation to know the relationships and tasks between the departments and projects and how to successfully manage internal and external operations. 	<ul style="list-style-type: none"> Common language not effective. The majority of staff in construction have different language of communication according to their nationalities and cultures. Communication and coordination missing. Organisation needs to have a unified methodology or effective management of communication and coordination. Different nationalities and cultures not considered. The majority of staff in construction come from different nationalities and their cultures, attitudes, and behaviors are different than the local employees. Not properly supported the awareness of people to share their knowledge. Many of the employees in the project are not developing their performance and activating their role and importance in the constructive cooperation that serves the entire of the company. 	<ul style="list-style-type: none"> Communication between projects and HR missing. Without a clear presence of a department or group to support knowledge management, human resources management should be involved and must be able to make use of knowledge. Knowledge not organised and supported. The large number of responsibilities and the lack of support for human resources management limit the appropriate sharing of valuable knowledge. Knowledge practices not documented: Availability, empowerment, time factor, people's ability, awareness, loyalty and dedication to work are of paramount importance in defining the role of human resources management in the application and reuse of valuable knowledge, information and experiences. There is no formal initiatives. Organisation must ensure valuable knowledge are in place by provide training, launch initiatives and develop incentives. 				

Figure 7.9: The effective roles of KM to organisational learning (OL)

Maturity Levels of PMO		Key Factors of KM Implementation via PMO							
Level 1		KM processes and their implementation via PMO Center of Excellence							
Center of Excellence PMOs Supportive PMO Defined/Developed Project/Organization Level		Knowledge Creation		Knowledge Capturing		Knowledge Sharing		Knowledge Application	
		Practices for knowledge creation	PMO roles for knowledge creation	Practices for knowledge capturing	PMO roles for knowledge capturing	Practices for knowledge sharing	PMO roles for knowledge transferring	Practices for knowledge application	PMO roles for knowledge re-using
<p>➤ Provide the organisation with methodologies, standards, and tools to enable project teams and PMOs to deliver project successfully</p> <p>➤ To provide training and coaching and supporting the improvement of PMs and project teams</p> <p>➤ To serve as a project repository and lessons learned</p> <p>➤ Provide project related services or to support specific purpose</p> <p>➤ To provide a consultative role to projects</p> <p>➤ To set up and develop PM function within the organization</p> <p>➤ Provides support and assistance when needed. Provide best practices and ideas to correct defects and achieve best results</p> <p>➤ A group of experts working as a support and linking between the top management and various projects</p>		<p>Appropriate solutions:</p> <ul style="list-style-type: none"> Knowledge creation is done through the participation of different working methods in identifying problems and trying to find appropriate solutions to them in an innovative and continuous manner. <p>Innovative ideas:</p> <ul style="list-style-type: none"> The selection of good alternatives, the identification of opportunities, the standardization of models and the optimal utilization of a valuable human, natural and artistic resources, with the aim of creating new knowledge and bringing about the desired change directly related to knowledge management. <p>Opportunities:</p> <ul style="list-style-type: none"> Creating knowledge is interested in research aspects and study recent developments. Also, through the presence of clear and informed processes on how to initiate innovation and the importance of generating creative ideas. 	<p>Internal processes:</p> <ul style="list-style-type: none"> Creating knowledge must receive the absolute support of the PMO group and can be done through internal processes such as market research and knowledge of previous experiences or by learning the experiences of others in the same field. The role of PMO team members in recruiting talent or retaining managerial competencies helps to create new knowledge and activate existing knowledge. The role of PMO contributes to the creation of a set of approved measures that can be directed to decisions. The role of PMO team members to increase the future success of the company. PMO group contributes to supporting knowledge management objectives and documenting individual and group activities. The role of PMO should consider previous knowledge and use it to help acquire new. Supporting the initiative with proposals and recommendations and presenting views and experiences that are important in the development of the organization's environment. <p>External processes:</p> <ul style="list-style-type: none"> The external processes in terms of developing the competence and skill of the staff and the request of experts and specialists and the work of meetings and workshops to maximize the creation of knowledge and activate its role. PMO group seeks to provide the necessary capabilities and capabilities to activate the efficiency of knowledge. 	<p>Responsibilities and authorities:</p> <ul style="list-style-type: none"> PMO must take responsibility and absolute authority to manage all knowledge processes. PMO group need to coordinate the acquisition of knowledge, which can take place in the administrative systems or the periodic procedures or through their presence in the heads of employees. <p>Value added:</p> <ul style="list-style-type: none"> The acquisition of PMO projects periodically can be converted into knowledge. A general framework for value added for knowledge management should also be developed. Knowledge classification must identify and compare existing knowledge assets. 	<p>Internal processes:</p> <ul style="list-style-type: none"> To determine the mechanism of acquisition of knowledge and who are the people concerned to take this responsibility, the rehabilitation of people and the identification of practices. Members of the PMO group have the authority to obtain any information about the status of the projects or to know what risks are likely to occur. PMO is a key to managing knowledge and defining the form of operations and their plan of action. Acquiring knowledge is through the PMO Group by raising awareness, providing means and clarifying the way to obtain information and knowledge. Acquire knowledge from different sources, internally such as repositories of knowledge, discussion and communication between departments and projects. PMO group should be responsible for the classification of knowledge types within the organization. For example, the knowledge of customers, the state of the market, the work carried out and then work to determine their importance to the organization. <p>External processes:</p> <ul style="list-style-type: none"> PMO group should be responsible for encouraging the participation of conferences and workshops, attracting qualified staff and qualifying existing staff by providing suitable training courses and coaching sessions. 	<p>Classification of knowledge:</p> <ul style="list-style-type: none"> Dissemination of knowledge helps to increase the abilities and skills of project managers and project teams and needs to be classified to access the right people and objective. <p>Delivery of knowledge:</p> <ul style="list-style-type: none"> Transfer of knowledge should be concerned with the delivery of important information to stakeholders or beneficiaries in time, form and cost appropriate. Knowledge transfer must be done quickly from the enterprise environment to the company's stores. Because there is a lot of knowledge that is generated daily. 	<p>Increase awareness among people:</p> <ul style="list-style-type: none"> Increasing awareness among people of the importance of sharing knowledge can maximize its important and success. <p>Appropriate rewards and incentives:</p> <ul style="list-style-type: none"> The spread of knowledge can be through developing appropriate rewards and incentives by PMO center of excellence. <p>Convert tacit into explicit knowledge:</p> <ul style="list-style-type: none"> Members of the PMO team must be qualified to transfer knowledge and create practices to participate as well as develop effective systems from time to time to keep abreast of the pace of transformation in the construction sector. The role of PMO in the transfer of implicit and explicit knowledge efficiently generates an important return for the company. <p>Flexibility (Formal & Informal):</p> <ul style="list-style-type: none"> There should be a high speed in the transfer of knowledge, especially between projects and senior management, in order to maintain the safe transfer of knowledge. Knowledge distribution channels are either formal such as training sessions, inter-departmental communication, projects and communication between the staff. Or be informal such as initiatives, debates and periodic meetings. The role of PMO must be effective in ensuring that knowledge is provided and accessible when needed as well as to ensure that such knowledge reaches as many people as possible. 	<p>Put beginners with experts:</p> <ul style="list-style-type: none"> Learning occurs through attempts, opportunities and completion of business which is reflected in improving the level of knowledge. Knowledge is a force if applied even with errors. An efficient knowledge system must understand errors and constantly review them. 	<p>Storing knowledge:</p> <ul style="list-style-type: none"> The role and contribution of PMO in applying some of the knowledge learned to increase the enthusiasm of staff that their expertise and information will be applied as a priority. <p>Best practices:</p> <ul style="list-style-type: none"> The knowledge application is increasing the validity of the PMO. If there are no absolute powers or overlap of responsibilities, there is difficulty in applying knowledge. <p>Knowledge access:</p> <ul style="list-style-type: none"> There is great importance in storing knowledge, using effective practices or using modern technology factors to make research and knowledge access easy. <p>Modern technology:</p> <ul style="list-style-type: none"> Link knowledge application with financial incentive systems and employee performance assessment. Knowledge is applied through the transformation of knowledge into operational processes.
		<p>PMO roles as a center of excellence for encouraging KM implementation</p> <p>➤ Build organisational memory: Storing best practices and maintain previous experiences to be used in future projects</p> <p>➤ Developing individuals' skills: PMO contributes to the development of skills in individuals by mixing experts with fresh graduates employees</p> <p>➤ Increase the outcome of creativity: Motivate employees to come up by new ideas and initiatives that can contribute for increasing business performance.</p> <p>➤ Managing KM processes: The dissemination of useful ideas, facilitate more effective cooperative processes, ensure continued knowledge acquisition and organizational learning.</p> <p>➤ Providing training and coaching: It is possible to activate the role of the Center of Excellence PMO in providing training courses.</p> <p>➤ Rising awareness among people: Contributing to raising awareness among people of the importance of the existence of this concept and that if implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general.</p> <p>➤ Sending employees to different workshop: The role of PMO is noticeable in providing great support in sending administrative competencies to develop them and to attract qualified competencies.</p> <p>➤ The development of standards, regulations, and practices: The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company.</p>		<p>Organisational structure and the creation-activation of knowledge</p> <p>The relation between Organisational structure and the creation of knowledge</p> <p>PMO structure to create knowledge</p> <p>Approval or rejection with appropriate recommendation:</p> <ul style="list-style-type: none"> The concept of PMO works to turn the life of the demand from one hand to another and then resubmit the application with approval or rejection with the appropriate recommendations. A large number of knowledges are created and organisation needs to have a mechanism or a detailed structure of knowledge rotation <p>Linking different projects and departments:</p> <ul style="list-style-type: none"> The PMO group should have a detailed structure for the performance of the work of the knowledge management process and who are the people concerned and what means will be used and what is the importance of managing this knowledge to the people and the interest of the company as an entity. <p>Knowledge rotation:</p> <ul style="list-style-type: none"> PMO's role is to create an organizational structure that promotes knowledge exchange among different units and that knowledge is not created in places and is blocked elsewhere. PMO Group in the structure of the company are supportive and advisory, which working to restructure the internal and external activities. 	<p>Competitive advantage and the capturing-classification of knowledge</p> <p>The relation between competitive advantage and knowledge capturing</p> <p>Spreading knowledge:</p> <ul style="list-style-type: none"> The acquisition of good knowledge both internally and externally and to add this knowledge correctly contributes to the achievement of competitive advantage. Managing knowledge processes is a competitive advantage if exploited quickly and rationally. <p>Retaining professionals:</p> <ul style="list-style-type: none"> The company's ability to continue winning tenders, retaining professionals, attracting qualified people, activating training and development programs, increasing cultural awareness, spreading knowledge, standardizing operations, and helping employees to know the future directions of the company are factors that achieve the competitive advantage. <p>Attracting qualified people:</p> <ul style="list-style-type: none"> Firm's ability to get the best cadres and competencies in the market to gain their valuable knowledge. <p>Providing competitive prices:</p> <ul style="list-style-type: none"> Providing competitive prices based on knowledge of competitors and the provision of good products through knowledge of the local market. 	<p>Organisational culture and the transferring-sharing of knowledge</p> <p>The relation between organisational culture and knowledge transfer/sharing</p> <p>Keep pace with knowledge:</p> <ul style="list-style-type: none"> The presence of innovative and effective systems to encourage the members of the project team to keep pace with knowledge management procedures. <p>Increase cooperation:</p> <ul style="list-style-type: none"> The culture of work varies according to the different nationalities, PMO group should find appropriate ways for better integration of nationalities to increase cooperation and provide a healthy working environment. <p>Clear vision:</p> <ul style="list-style-type: none"> There must be a clear vision of the tasks of the people in order to increase the Organization's culture of knowledge dissemination. Knowledge management practices both in senior management and in projects must be integrated with the company's overall levels. <p>Balancing resources:</p> <ul style="list-style-type: none"> The provision of appropriate means and the distribution of resources based on good knowledge in terms of the need for different organisation's projects. <p>Healthy environment:</p> <ul style="list-style-type: none"> Organizational culture is a healthy competitive environment, a good mechanism for knowledge transfer, effective means to obtain knowledge in a simple way. Managing knowledge transfer and dissemination processes requires an encouraging and stimulating organizational culture. 	<p>Organisational culture and the transferring-sharing of knowledge</p> <p>PMO roles for spreading knowledge culture</p> <p>Regulatory framework:</p> <ul style="list-style-type: none"> The role of PMO helps to spread a single regulatory framework, which reduces the resort to always more severe measures. <p>Standards and policies:</p> <ul style="list-style-type: none"> The role of PMO should consider 3 fundamentals in achieving organizational culture: values - standards - practices. <p>Teamwork and collaboration:</p> <ul style="list-style-type: none"> PMO team members and project managers should be aware of their role in promoting knowledge transfer. Understand the importance of the role of PMO team members in supporting best practices and promoting teamwork and collaboration. Understand the importance of knowledge sharing and how it helps to develop the maturity of the company and how it is reflected in ensuring individuals for their jobs and the possibility to develop their skills and achieve their goals. 	<p>HR Management and the re-using-application of knowledge</p> <p>The relation between HRM and knowledge application</p> <p>Human resources management is not involved in knowledge management with the presence of PMO group in the company</p> <p>PMO roles for assisting HRM to apply knowledge</p> <p>Guide HR to select the right training:</p> <ul style="list-style-type: none"> The PMO team should support human resources management and guide them on the quality of training programs that the company really needs. <p>Linking staff with firms' strategies:</p> <ul style="list-style-type: none"> The PMO's role is to educate, motivate and equip employees to take advantage of technology in acquired knowledge or through a good knowledge of practices. <p>Recommendation:</p> <ul style="list-style-type: none"> Informing leading employees to maximize the role of knowledge and loyalty of employees in the development of company strategies. PMO's role in prioritizing the company in acquiring business that meets the stakeholders' orientations. There is a direct relationship to the role of human resources and PMO, but the responsibilities of each party must be determined so that there is no duplication or overlapping of powers. Clarify what processes and practices should be changed or developed according to the market situation. 	

Figure 7.10: PMO Centre of Excellence possible solutions/options for encouraging KM implementation

Maturity Levels of PMO		Key Factors of KM Implementation via PMO					
Level 2		KM processes and their implementation via PMO Department					
PMO Department	Knowledge Creation		Knowledge Capturing		Knowledge Sharing	Knowledge Application	
	PMO roles to create/activate knowledge		PMO roles to capture/classify knowledge		PMO roles to transfer/share knowledge	PMO roles to apply/re-use knowledge	
	<p>Controlling PMO Managed/Monitor Organisational Unit PMO/Divisional PMO Departmental Level</p> <ul style="list-style-type: none"> Provide control for business services or units To integrate PM with the organisational goals and strategies To adopt PM framework or methodologies To apply specific templates, forms, and tools Link project management practices to trade Provides appropriate reports on the status of different projects 	<p>Externalisation:</p> <ul style="list-style-type: none"> Creating knowledge can be gained through the department's role in stimulating research and development, learning lessons and creative thinking This process focuses on linking implicit and explicit knowledge. The creation of knowledge takes place through the extraterrestrial realization of implicit knowledge to become collective knowledge. External factors such as interaction with customers, suppliers and stakeholders. <p>Internalisation:</p> <ul style="list-style-type: none"> The department also develops performance standards to evaluate and document all knowledge processes. <p>Nonaks' model:</p> <ul style="list-style-type: none"> Knowledge creation initiatives have been designed through the implementation of the SECI concept, which reflects processes and practices within and outside the company, as well as assessment of teamwork and knowledge of community coordination and outreach. <p>Socialisation:</p> <ul style="list-style-type: none"> The role of PMO should be effective in achieving the necessary support. Knowledge creation is built on innovation, invention, initiative and loyalty by employees to create new knowledge that helps develop the system. The PMO should focus on creating knowledge through practice, teamwork, communication and education. The role of PMO must work to achieve these goals. Knowledge is created through the use of certain practices such as business monitoring, discussion of activities, analysis of results. <p>Transformation:</p> <ul style="list-style-type: none"> Knowledge creation is done by transforming knowledge into practices and activities that can be used to maximize the spread of knowledge 	<p>Feedback:</p> <ul style="list-style-type: none"> Setting up a suggestions box, listening to views, stifling the role of people, developing good motivators. <p>Knowledge classification:</p> <ol style="list-style-type: none"> 1- Knowledge of trade: procurement and sales, resource management and strategic plan. 2- Knowledge of techniques: the importance of bringing tools and devices and processes that increase productivity and reduce the effort, time and cost. 3- Product knowledge: product quality, customer satisfaction and price competition. 4- Project management knowledge: Key processes in project management, time management, costs and resources. 5- Knowledge of administrative organizations: the role of communication, coordination and cooperation in the acquisition of knowledge. <p>Knowledge identification:</p> <ul style="list-style-type: none"> A good background on the company's strategies and the extent to which projects are completed, which can help to choose and identify the appropriate knowledge and how to share them with owners. <p>Knowledge selection:</p> <ul style="list-style-type: none"> The role of PMO in increasing knowledge readiness for each time and place helps to optimize acquisition of knowledge. 	<p>Communications channels:</p> <ul style="list-style-type: none"> The presence of such knowledge when needed or in future uses determines the role and importance of the PMO's performance in the company. Effective communication between departments and easy access to knowledge has a positive impact in knowledge transfer. PMO presence is an important factor in increasing the growth and maximization of knowledge by sharing, communication, exchange of ideas, skills and experiences. <p>Knowledge content:</p> <ul style="list-style-type: none"> Transferring knowledge can be done by one of the components of knowledge - people, technology or processes. Knowledge transfer can be done informally about the way people interact daily in work environments. The Department's work on the transfer of knowledge in a timely manner at the appropriate place helps to spread knowledge and increase its importance. <p>Rewards programs:</p> <ul style="list-style-type: none"> Making knowledge formal, training and continuous development, using effective systems, stimulating the role of consulting, creating opportunities and linking them with bonuses and rewards. <p>Transformation of knowledge types:</p> <ul style="list-style-type: none"> Overcoming the obstacles that limit the transfer of knowledge, especially in the enterprise environment, the competition is greater and therefore there is difficulty in transferring knowledge. The role of PMO in the control of administrative regulations and projects can transfer important knowledge to stakeholders and senior management. 	<p>Availability of knowledge:</p> <ul style="list-style-type: none"> The readiness and ease of use of knowledge is what determines the success of knowledge management. The role of PMO in applying knowledge should be concerned with these processes: <ul style="list-style-type: none"> 1. Optimal use. 2. Reuse when needed or in new project. 3. Maximize the use of content. <p>Life-cycle of knowledge:</p> <ul style="list-style-type: none"> PMO must stimulate good knowledge implementation, linking the knowledge management strategy with the corporate strategy as a whole. PMO department should be the main reference for applying the knowledge and confirming its role and then documenting it The knowledge map should be started and ends at the PMO department. <p>Quality of knowledge:</p> <ul style="list-style-type: none"> Urgent solutions to enterprise problems as well as low reliance on experts in the implementation of business, and easy access to accurate information and increase the contribution of people to know the importance of knowledge gives good impressions on the optimal use of knowledge. Knowledge that cannot be applied or used to solve problems or that do not help to grow and adapt factors is costly and redundant knowledge. PMO's knowledge of the company's corporate objectives, strategies and outlook and its knowledge of current business performance and strengths and weaknesses in the company, through which it can identify what knowledge can be reused and what knowledge is not needed in their application. 		
PMO department possible solutions/options for encouraging KM implementation		Perspectives necessary for facilitating KM implementation via PMO Department					
<p>> Spread KM culture: To maximize knowledge management and disseminate its culture and provide developmental and cultural programs to share experiences.</p> <p>> Rely more on human activity: PMO's contribution is to rely on human activity to generate more knowledge than to rely on computer usage and communication links may not be effective.</p> <p>> Link KM to specific system: The contribution of PMO is to develop an effective knowledge management system that not only involves the use of technology factors but also links the employees of the organization and connects them with experts in the same field.</p> <p>> Qualify project managers and project teams: Prepare a plan to send employees to gain knowledge and experience.</p> <p>> Provide healthy working environment: investing optimally in creating an appropriate working environment.</p>	Organisational structure and the creation-activation of knowledge		Competitive advantage and the capturing-classification of knowledge		Organisational culture and the transferring-sharing of knowledge		HR Management and the re-using-application of knowledge
	The relation between organisational structure and knowledge creation	PMO structure to create knowledge	The relation between competitive advantage and knowledge capturing	PMO contribution to achieve competitive advantage	The relation between organisational culture and knowledge transfer	PMO contribution to address organisational culture	PMO level of support to HRM
	<p>Formal:</p> <ul style="list-style-type: none"> Is presented as a map of the different sections of the company and determines the general relationship between them. <p>Informal:</p> <ul style="list-style-type: none"> Is the way people work with each other to evaluate the performance of the company and to benefit from different knowledge and experience. 	<p>Distribution of responsibility:</p> <ul style="list-style-type: none"> PMO's role is to create a coordination structure that improves the relationship of different organizations units and projects and links them together to achieve company's strategies. <p>Delegation of authority:</p> <ul style="list-style-type: none"> Organizational structure is the backbone of the organisation and reflects its success from its failure. <p>Scope of supervision:</p> <ul style="list-style-type: none"> The PMO Division falls under the Senior Management structure as a supporting section. 	<p>Optimal capturing of knowledge and sustainable advantage:</p> <ul style="list-style-type: none"> Competitive advantage is based on rapid response to market, financial and climatic changes and that the company's reaction is faster and better than competitors and those can be gained through the proper capturing of knowledge. <p>SWOT analysis:</p> <ul style="list-style-type: none"> Use of competitive advantage is how to be knowledgeable of the areas of threats, weakness, strengths, and opportunities. <p>Knowledge of competitors and the market:</p> <ul style="list-style-type: none"> Acquiring and dealing with knowledge of competitors and market and not allowing competitors to take advantage of the success factors of the company. 	<p>Categorizing the knowledge:</p> <ul style="list-style-type: none"> Categorizing the knowledge correctly by PMO and determining its type can increase the company position in the market. <p>The ease, speed, and relevance of knowledge:</p> <ul style="list-style-type: none"> The ease, speed, and relevance of different knowledge to the right people can be used as a competitive advantage. 	<p>Open or closed culture:</p> <ul style="list-style-type: none"> Open culture is the most organized and helps to ease the transfer of knowledge. <p>Mixing different cultures:</p> <ul style="list-style-type: none"> Mixing different cultures together makes it easier to transfer knowledge. 	<p>Integrated organizational culture:</p> <ul style="list-style-type: none"> A deep understanding by all departments and projects of the culture of the organisation and markets has a good reflection in the transfer of knowledge. <p>Reward system:</p> <ul style="list-style-type: none"> PMO should increase awareness and educate the staff on the importance of sharing knowledge and linking it to reward programs. <p>Staff awareness:</p> <ul style="list-style-type: none"> Before attempting to disseminate a culture of knowledge management and its importance, focus on ensuring that the culture of the PMO concept is well known. Because the role of the PMO department cannot be done if we neglect to spread the culture and importance of this concept. <p>Exchange of experience:</p> <ul style="list-style-type: none"> The role of the department is now positive in supporting the work as one system working according to specific plans. 	<p>Storage of previous experiences:</p> <ul style="list-style-type: none"> With the creation of the PMO, there is an overlap of responsibilities and functions with HRM. PMO is beginning to take the lion's share in the application, storage and reuse of knowledge. <p>Overcoming some of the HR tasks:</p> <ul style="list-style-type: none"> The presence of PMO helps in supporting human resources and focuses its work on monitoring the employees of the company. PMO is currently a key player in supporting human resources management and reducing tasks. <p>Responsible for all Project Managers:</p> <ul style="list-style-type: none"> Periodic reports that reach the office carry a lot of knowledge and experience, the role of PMO must be documented and the development of an appropriate mechanism for reuse either in training programs or activate the role of project managers in the transfer of new knowledge. <p>PMO Vs. HRM:</p> <ul style="list-style-type: none"> The Human Resources Department is not concerned with training and development and the coordination and application of different knowledge as the PMO department now covering those aspects. The role of human resources is fully competent financial matters for staff and the registration of attendance and absence. <p>Use latest technology:</p> <ul style="list-style-type: none"> The mechanism of PMO department is to keep pace with advances in technology, keeping pace with temporal and spatial variables and optimizing the use of the latest practices.

Figure 7.11: PMO department possible solutions/options for encouraging KM implementation

Maturity Levels of PMO		Key Factors of KM Implementation via PMO								
Level 3		KM processes and their implementation via PMO Office								
PMO Office Directive PMO Optimised Strategic Regional or Centralised Enterprise Level ➤ To provide directive roles to align projects and organization units to corporate strategy and ensuring appropriate enterprise governance ➤ To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organization ➤ To ensure all PM practices are applied across the entire organization ➤ Effective strategies and continuous development of practices that suit the way the firm works ➤ An effective leadership role in guiding projects with unlimited powers and responsibilities	Knowledge Creation		Knowledge Capturing		Knowledge Sharing		Knowledge Application			
	Main challenges of knowledge creation	PMO roles to create/activate knowledge	Main challenges of knowledge capturing	PMO roles to capture/classify knowledge	Main challenges of knowledge sharing	PMO roles to share/transfer knowledge	Main challenges of knowledge application	PMO roles to apply/re-use knowledge		
		Collective processes: <ul style="list-style-type: none"> PMO office by documenting periodic meetings of the work and paying attention to the application of best practices are important factors for creating a suitable environment for knowledge. External processes: <ul style="list-style-type: none"> The provision of training programs, workshops and the introduction of experts have a positive impact on knowledge creation. Knowledge about subcontractors is important for the reputation of the organization, which can be adopted by the PMO office by knowing and evaluating the market situation. Internal processes: <ul style="list-style-type: none"> The work of permanent research, testing and examination of services as all practices that help to create knowledge as well as create new knowledge by drawing on current knowledge. PMO should work to document the usefulness of the end of the work, as well as try to reflect these experiences on the creation of new information to be applied in future work. Social process: <ul style="list-style-type: none"> Official and informal events, recording the experiences and practices of competitors in the same field lead to the emergence of new knowledge. Periodic initiatives being launched, all aimed at creating the right knowledge at the right time and place. 	Organizing KM processes: <ul style="list-style-type: none"> The organization and the PMO office needs to use a specific system known in knowledge management. Using specific system: <ul style="list-style-type: none"> The organization and the PMO office needs to use a specific system known in knowledge management. 	Classification of knowledge: <ul style="list-style-type: none"> By specifying the file management system from the identification of the sender and recipient and the type of knowledge. The acquisition of knowledge must be built on both internal and external factors to achieve maximum benefit. The classification of knowledge of what suits and fits the direction of the company gives a positive impact to the acquisition of knowledge. Identification of knowledge: <ul style="list-style-type: none"> By identifying experts and giving them the necessary powers. As well as ways of identifying tools for the detection of knowledge or the optimal use of information technology. There must be specific procedures through which knowledge is specified identified and to best acquire the knowledge of qualified personnel before leaving the company walls. Storage of knowledge: <ul style="list-style-type: none"> By defining the system of controlling and arranging policies and procedures to stored acquired knowledge and help prevent it and make it more difficult to be transferred to competitors. Selection of knowledge: <ul style="list-style-type: none"> By defining the system of querying knowledge and repeating questions. The role of PMO office is should focus on trying to bring or acquire foreign knowledge from other companies in the same field or by taking advantage of the company's current knowledge and turn it into an added value through which the company can increase the success rates. 	Dissemination and sharing of knowledge: <ul style="list-style-type: none"> This can be done through a comprehensive map of knowledge and the dissemination of its culture and its importance among all departments of management and projects. Organising and coordinating knowledge: <ul style="list-style-type: none"> The role of the Office should not only be to encourage the dissemination and transfer of knowledge but also to identify appropriate processes in organizing and coordinating knowledge priorities. There is a huge amount of information, many of which can be classified as valuable knowledge or excessive knowledge of the need of the organization. Transfer and submission of knowledge: <ul style="list-style-type: none"> This is through the creation of channels of direct and indirect communication between projects. Identify a list of important knowledge. It is also possible for the office to register some public meetings or courses and then publish them using modern means of communication. Build KM infrastructure: <ul style="list-style-type: none"> PMO needs to determine its contribution to the promotion of knowledge. Evaluate KM contribution: <ul style="list-style-type: none"> PMO needs to determine its contribution to the promotion of knowledge. 	The accuracy of knowledge: <ul style="list-style-type: none"> The support and contribution of the Office is to change management according to information and knowledge that reaches the office by project managers. Building common vision: <ul style="list-style-type: none"> The Office should work to build a common vision that reflects the company's overall direction. The role of the Office should not only work in the application of its knowledge based on the information received. Rather, it should be ensured that all information sent to individuals or department and project managers reflects true information and knowledge rather than personal conclusions or misinformation. Flexible processes and policies: <ul style="list-style-type: none"> The role of the office must be effective in bringing about continuous change and finding flexible, interactive and not fixed processes. The continuous change of procedures and policies reflects the amount of knowledge applied and used within the company. Also, the speed of response to difficulties and problems and increase the efficiency of the company must build on the sources of knowledge gained. 	Adoption and support of knowledge: <ul style="list-style-type: none"> This is done through the management of documents such as periodic reports. PMO should always tried to apply best practices, whether in project management or knowledge, and to encourage its use in accordance with business needs. Application and activation of knowledge: <ul style="list-style-type: none"> Through the development of effective systems to control and disseminate knowledge. Documenting and building databases: <ul style="list-style-type: none"> Documenting and building a database through the office and a static reference helps to increase the success of this process. Identification of people, tools, and knowledge map: <ul style="list-style-type: none"> The oversight, coordination and operational role of the PMO Office is a key factor in managing the application and reuse of knowledge. Identifying persons responsible for collecting knowledge and information, identifying appropriate tools and systems to ensure the implementation of initiatives, identifying an operational knowledge map that details the details, processes and types of knowledge accurately. Integration and classification of knowledge: <ul style="list-style-type: none"> This is through the development of a comprehensive map of knowledge and identify similarities and differences through the classification of knowledge by type and use. 			
PMO office possible solutions/options for encouraging KM implementation		Perspectives necessary for facilitating KM implementation via PMO Office								
➤ Send employees to acquire knowledge: Employees are sent to many workshops and conferences, both internally and externally according to the needs of the work. ➤ Provide effective programs: Providing effective internal programs and courses offered by specialists in many fields. ➤ Center of excellence: Working as a learning center where the company can achieve best practices, transfer experiences and provide full support. ➤ Support project managers: Develop their abilities and skills and work on them to be used optimally in the management and development of the projects they are working on. ➤ Develop strategic plan: Increase the office's tasks and prepare it for ongoing training sessions. ➤ Optimizing the working environment: To find a suitable environment through which all members of the team and department managers can participate in achieving the objectives of the company. ➤ Apply new policies and roles: To enforce the policies of the office to maintain valuable knowledge.	Organisational structure and the creation-activation of knowledge		Competitive advantage and the capturing-classification of knowledge			Organisational culture and the transferring-sharing of knowledge		HR Management and the re-using-application of knowledge		
	The relation between organisational structure and knowledge creation	PMO structure to create and activate knowledge	The relation between competitive advantage and knowledge capturing	PMO contribution to achieve competitive advantage	Main practices of competitive advantage	The relation between organisational culture and knowledge transfer	PMO contribution to address organisational culture	The roles of senior management and PMs to spread knowledge culture	Main practices of HRM within PMO office	PMO level of support to HRM
		Employees are knowledgeable about their tasks: <ul style="list-style-type: none"> The project-teams are completely aware of their assignments, which given to them in details by the PMO office. Standardizing reports system: <ul style="list-style-type: none"> Creating the knowledge can be done by receiving periodic or monthly reports from project managers or by sending the assignees by the office to provide the necessary support. Incentives and bonuses: <ul style="list-style-type: none"> There must be incentives and bonuses to motivate employees to create new knowledge. Initiatives and contributions: <ul style="list-style-type: none"> Putting in good physical incentives or dividing the knowledge for achieving their needs and improving business performance can then participate in its achievement. Clearly explained structure to facilitate knowledge creation: <ul style="list-style-type: none"> The identification of knowledge management processes should be clearly explained in the organizational structure of the company and this makes it easy to exchange them correctly. 	Support the organization strategy: <ul style="list-style-type: none"> The company should invest in creating a good relationship of cooperation in both knowledge management and competitive advantage in order to support the enterprise strategies. Increase the firm's reputation: <ul style="list-style-type: none"> Knowledge-based investment and the optimal utilization of knowledge, whether positive or negative, increases the competitive advantage of the company. Evaluate marketing opportunities: <ul style="list-style-type: none"> The role of the office is to evaluate and develop the marketing efficiency of the company or to increase competitive advantages and to create knowledge that will contribute to reduce costs and increase product differentiation, shorten the time factors and distribute the facility effectively. Reduce negative impact: <ul style="list-style-type: none"> Each company has to maintain its traditional knowledge from acquisition by other companies by maintaining competent employees and not moving them to competitors or by taking advantage of their expertise before taking any other action. 	Increase product differentiations: <ul style="list-style-type: none"> The work of the Office mainly to find and apply best practices in project management, create an organized work environment and benefit from investment in knowledge is a key component in achieving competitive advantage. Applying best practice: <ul style="list-style-type: none"> Competitive advantage is the ability of the company to formulate and implement strategies that help to generate profits and achieve success. Responding quickly to market change: <ul style="list-style-type: none"> With the development of the construction sector, each new project reflects a unique situation in itself, considering the variables of the local or international economy and the different laws and regulations of the work. Competitive advantage is a key requirement for companies to grow and compete with other companies in the markets. Identify the scope of projects: <ul style="list-style-type: none"> The company's interest in expanding the scope of projects and spreading in different regions and using the latest elements of technology and the use of best practices in project management all give the company a great competitive advantage. 	Guarantees the success of KM: <ul style="list-style-type: none"> The organization must work to create all its procedures and stimulate and activate initiatives and policies across on the importance of knowledge rotation. This essentially guarantees the success of knowledge management and the role of the Office in promoting and maximizing its use. Spread knowledge across the organization: <ul style="list-style-type: none"> Organizational culture one of the most important factors in the transmission of knowledge and its spread. Joint contribution: <ul style="list-style-type: none"> There are similar and different roles between the Office and project managers. Therefore, the joint contribution and knowledge of the role of each party helps to achieve the best results. 	Link projects together: <ul style="list-style-type: none"> The whole enterprise must function as one system based to specific objectives. Projects should not operate independently of PMO's office or independent of other projects under the umbrella of the company. Standardizing of policies and practices: <ul style="list-style-type: none"> The role of the work of the Office is an alternative to the concept of senior management in a more professional and effective and its focuses on the standardization of policies and various practices. Increasing the awareness of project managers: <ul style="list-style-type: none"> PMO Office is the one who communicates directly with project managers on a permanent and continuous basis. The incentives and rewards of knowledge transfer should be introduced in the company's culture via the PMO. 	Facilitating effective communications: <ul style="list-style-type: none"> Project managers must cultivate among their work team the initiative to provide knowledge and transfer their expertise to their co-workers. Organizational culture must be built on teamwork and effective communication. <ul style="list-style-type: none"> Organizational culture must focus first of all on activating the role of project managers and their enthusiasm and confidence in the importance of transferring and disseminating knowledge. Project managers after their good knowledge can reverse that concept to the culture of the rest of the team. Create a stimulating work environment: <ul style="list-style-type: none"> The knowledge management culture must be understood by employees because it helps to improve the performance of the organization and create a more effective and viable environment for achieving positive results. 	Employees' salaries: <ul style="list-style-type: none"> Evaluating the performance of employees, evaluating the company's need to fill positions and jobs, or resolving or increasing salaries. Maintaining professional staff: <ul style="list-style-type: none"> Human resources management is one of the sections under the PMO structure. As it has sub-sections in different projects, the performance of project managers is carried out through the main human resources department, evaluation of the performance of engineers and project workers is carried out through sub-departments and project managers and then sent to the office to take the necessary action. Hiring cadres: <ul style="list-style-type: none"> The HR department is located within the PMO office and represents one of the largest and the main sections of the Office and is responsible for hiring cadres in different fields. Invest in people: <ul style="list-style-type: none"> The optimal investment of knowledge must go up and reach people, because the origin of knowledge is based on people. 	Developing the HR system: <ul style="list-style-type: none"> Contribution of knowledge in the development of human resources management work system, both within the PMO office or through its presence in the enterprise environment. The PMO office can help to develop and expand the Human Resources Department, such as the creation of a training and development unit that is concerned with assessing the need for staff to develop their skills and capabilities. <ul style="list-style-type: none"> The PMO concept not only relies on human resources management in knowledge management but relies on all other management departments as well as the knowledge gained from implementing different projects. 	

Figure 7.12: PMO office possible solutions/options for encouraging KM implementation

7.6 Conclusion of chapter seven

The interviews were divided into two main groups. The first groups included the PMO division with PMO leaders, teams, and the managers of different departments in senior management. The second group was the various project managers who work away from the PMO in the execution of projects and the nature of whose work is related to the head office. By applying those procedures, the research was trying to achieve more accurate results, with the possibility of comparing them with a similar example at the same level to ensure the optimal selection of the sample of the study. The target population of members is selected upon meeting certain practical criteria as discussed early in this chapter. Sixteen personal interviews were conducted and distributed to four main levels that represented different maturity levels of the PMO. Four interviews were conducted at each level independently.

Based on the analysis of this chapter several ways have been used to achieve different research objectives. The descriptive analysis was used as first approach and concluded by developing four concept maps that representing the analysis of each maturity level of the PMO in order to summarise the main themes and identifying the relation among them. In this case the thematic map was used to identify the key themes and sub-themes in each level of the PMO. These maps were started by creating an initial thematic map with a large number of themes in each level and then these maps were developed over time and then followed by the final thematic maps to illustrate the final main themes and sub-themes of different maturity levels of the PMO.

Whereas the second approach focused on the cross analysis between the different maturity levels, which indicated firstly the analysis of similarities and characteristics common among these levels and secondly the analysis and identification of factors of difference, which contributed to the existence of different maturity levels. Many similarities and characteristics common to all were identified based on the analysis of each maturity levels of PMOs. This means that certain factors are applicable to different maturity levels. Analysing the respondents understanding of the PMO concept and analysing the respondents understanding of the KM concept reveal some important similarities such as the desire to improve business performance and increase the maturity levels of organisations. Although, analysing the respondent's views of the ways to convert tacit into explicit knowledge were representing common steps and procedures, which can be implemented no matter what PMO levels does exist. The literature

review revealed that PMOs are not always the same and that some of their characteristics were not common to all. This clarifies the need to investigate the respondent's views on what differentiates levels of maturity. Three aspects were identified to illustrate the main differentiation. Firstly, it was important to analyse the respondent's views of the PMO maturity levels. Secondly, it was necessary to analyse the respondent's views of the steps and procedures to establish the PMO. Thirdly, the research analysed the respondent's views of the steps and procedures to evaluate/update the PMO.

The discussion on the most important results in terms of the purpose of the study was used as the third approach. The literature review revealed that few efforts have been reported on using appropriate PMO maturity models to assess the needs of organisations and to maximise the benefits of applying this concept. This gap of knowledge is clearly identified by conducting the qualitative analysis as different construction firms had different maturity levels of PMOs and their functionality was accordingly different. As a result, three maturity levels have been identified namely: First, Center of Excellence PMOs, which can support and encourage the implementation of KM by building organisational memory, developing individuals' skills, increasing the outcome of creativity, managing KM processes, providing training and coaching, rising awareness among people, sending employees to different workshop, and by developing standards, regulations, and practices. Second, the PMO department can contribute to achieve the following success factors: spread KM culture, rely more on human activity, link KM to specific systems, qualify project managers and project teams, and provide healthy working environments. Third, the existence of the PMO as an office can help the implementation of KM by encouraging the following aspects: enabling employees to acquire adequate knowledge, provide effective programs, create centers of excellence, support project managers, develop strategic plans, optimise the working environment, and apply new policies and roles. These factors enable the PMO to maintain valuable knowledge.

Chapter Eight:

Discussion and Results

8.1 Introduction

Literature review revealed that Project Management (PM) and Knowledge Management (KM) are crucial in developing business performance. The application of PM is used to employ appropriate knowledge, techniques, skills, and processes to meet the organisation's requirement (PMI, 2008; Kerzner, 2012; APM, 2012; Alsahli, 2013). The application of KM helps to improve project activities and to secure the project success by exploring the proper knowledge at the right time (Egbu et al; 2001, Carrillo et al, 2004; Ahmad and An, 2008; Hislop, 2009). However, the complexity of today's construction projects and the increasing competition between construction firms, as well as the larger involvement of multidisciplinary and multinational workers in the organisations within the construction sector, are convincing construction firms to be more innovative, project oriented, and knowledge driven (PMI, 2008; Kerzner, 2012). Kontnour (2011) conforming the needs of organisations to invest in improving management tools, techniques, and market changes.

Nowadays, it is important for organisations to improve business performance and overcome their various challenges and difficulties, trying to create value by utilising their resources properly. To stay competitive within the construction sector, the availability of knowledge needs to be managed. In this context, the PMO is an effective tool that allows organisations to enforce PM, encourage knowledge transfer and translate knowledge into action. The relationship between using the PMO as an effective tool and applying KM as an important function of PM practices has been discussed in academia for several years to improve organisational performance (see section 3.5.1). Walker and Christenson (2005) have proposed that the PMO works as a centre of excellence to provide leadership, best practices, and knowledge. Yet others, including Pemsel and Wiewiora (2013), advocate the PMO as a knowledge broker, suggesting that the staff of the PMO will seek to develop knowledge sources, relationships, and networks among different department and projects. This point is reinforced by Chunha et al. (2010) who opine that knowledge can be an effective function that can be ultimately distributed via a PMO.

Therefore, through the analysis of mixed methods representing by both questionnaires and interviews, Knowledge Management and PMO can be very closely related to each other by considering their functions and interactions as well as work to achieve overall business needs. The PMO can create and formalise the KM model, processes, and concepts among various departments within the organisation. Since the existence of PMOs in project based organisations, the priority of considering KM as a function has become more important to the office. As the team members of some projects are leaving or disband from the organisation, this may give rise to issues such as the leaking of project knowledge, which could affect the reuse of important knowledge. However, Desouza and Evaristo (2006) and later Shahram *et al.* (2014) advocate that there is a significant gap in the existing literature that addresses KM wide practices from a PMO perspective, which will be discussed largely in this chapter in the hope to address research objectives.

8.2 Research Result

The findings from the literature reviews as presented in the theoretical framework that introduced in earlier chapter four of the literature review were investigated by using a mixed method approach. The questionnaire's chapter outlines the analysis of collected data that obtained from different organisations in the KSA to describe, explore what is happening in the KSA's construction market and explain its contribution to the research aim and objectives. Such as, evaluating the difficulties and challenges of KSA construction market, evaluating the use and success factors of PMO in improving business performance, and the evaluation of KM components, processes, and perspectives necessary for its implementation. Whereas the interview's chapter were focused on analysing and discussing the most important results in achieving the purpose of the study, which is divided into three main sections: First, investigation of the PMO value and its implementation. Second, investigation of the need of KM and its implementation. Third, investigation of the contribution of PMOs to both KM and PM practices at various maturity levels of PMOs. The purpose of these different methods is to reach the proposed conceptual maturity framework as it will be provided later in this chapter. The flowing chart 8.1 illustrated the structure of discussion chapter; as follows:

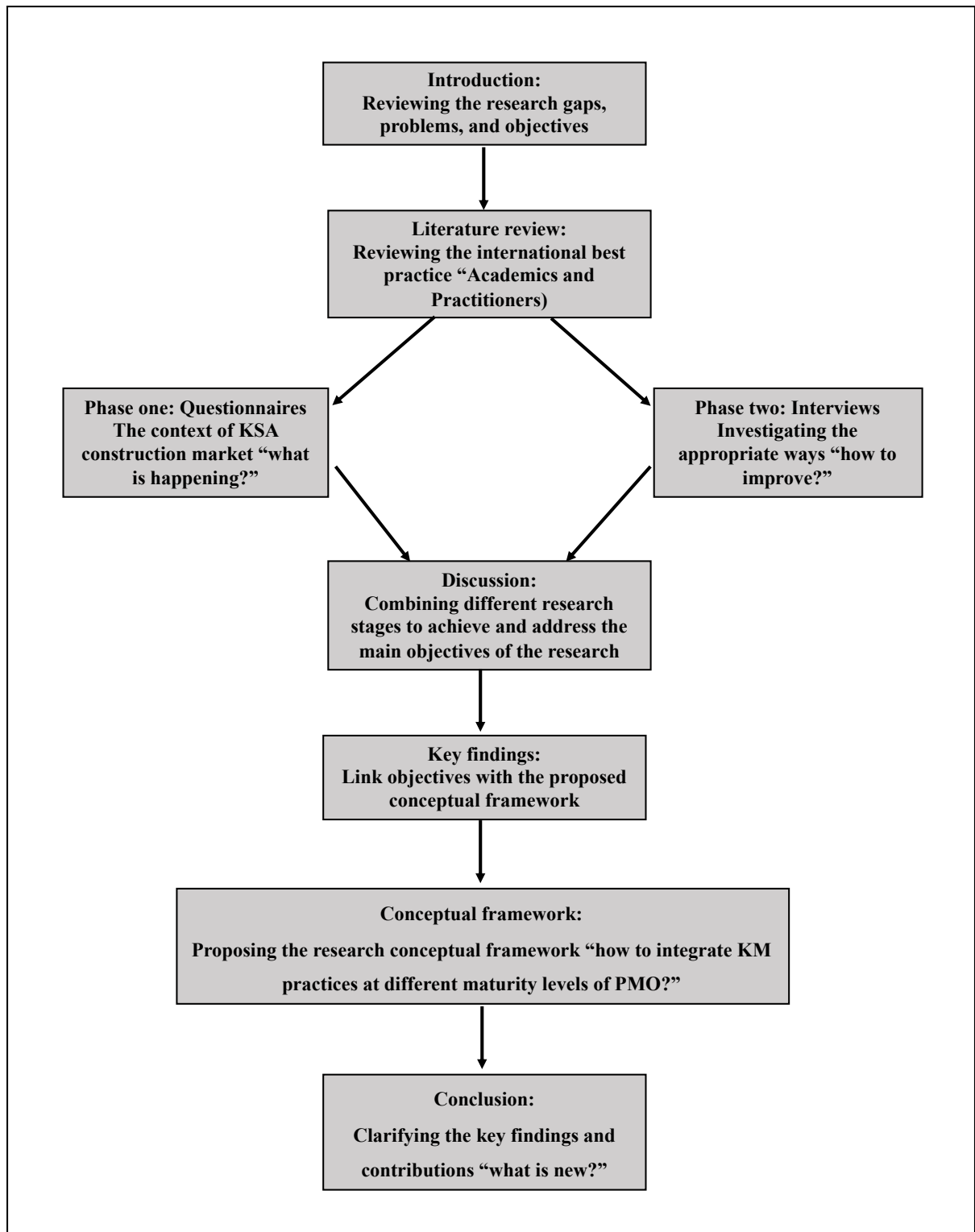


Figure 8.1: Flow chart of chapter 8

8.3.1 The first objective

- **To generate an understanding of the reasons project falter and/or are abandoned in the KSA in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance.**

The literature revealed that the KSA government has set out to support the execution of a large number of projects over the coming years in order to deal with the large population increase, with an estimated annual increase of 2.7 percent (Ccdos, 2013). The KSA construction market will therefore become one of the largest emerging markets in the Middle East, with the KSA government set to increase its spending to \$385 billion in the next ten years (Khatib, 2016; Bakkah, 2016). In order to benefit from this, KSA construction firms are beginning to execute more than one project at the same time. As a result, companies are engaging in more types of projects than is usual for their size, or with insufficient experienced professionals to lead their specific types of projects. Organisations are finding that PMOs should be applied to meet these challenges (Alnahj, 2012; Halawah, 2013; Alsahli, 2013). However, the majority of government projects in the KSA are suffering from the problem of faltering and delayed projects (Magdad, 2011; Deemah, 2014).

It can be seen that this trend of huge spending by KSA government has great potential to improve this situation, but there are still many projects that are stalling. This does not give a good impression about how these projects are being managed and supervised; it suggests the poor PM of rehabilitation workers, as well as the existence of many limitations in the capacity of technical, regulatory and administrative obstacles. The contribution of this research is that it aims to identify the major causes of project failure in the KSA, in order to come up with a new model based on creating the effective relationship between PMO as a tool and KM as a concept to deal with these issues. It is possible to identify the similar factors that affect the implementation of construction projects in KSA, as illustrated in table 8.1:

References	The reasons and challenges behind failing and abandoned projects in the KSA
(Majmah, 2013; Thiqah, 2012; Alnahj, 2012; Magdad, 2011)	Best practices of PM do not work as desired.
(Halawah, 2013; Amanah, 2013; Thiqah, 2012; Magdad, 2011)	Lack of access to the database and not benefit from the successful experiences and the experiences of others.
(Halawah, 2013; Amanah, 2013; Alsahli, 2013; Thiqah, 2012)	Entry in the competition without knowing how they are compatible with the possibilities.
(Majmah, 2013; Alnahj, 2012; Magdad, 2011; Emcanat, 2011)	Knowledge gained from previous projects is missing.
(Amanah, 2013; Halawah, 2013; Alnahj, 2012)	Poor communication system and coordination among various projects to link them as one whole project unit to deliver the entire organisation' needs.
(Majmah, 2013; Kacst, 2012; Magdad, 2011)	Modest performance of PMs as to make decision individually and teamwork's are not directed correctly.
(Amanah, 2013; Alnahj, 2012; Magdad, 2011; Emcanat, 2011)	Communication system and Knowledge sharing among projects is missing.
(Halawah, 2013; Majmah, 2013; Alsahli, 2013; Kacst, 2012)	Failure to provide senior management with the required project status reports.

Table 8.1: Current challenges and difficulties in KSA based on the outcome of literature

In response to these issues, literature refers to the PMO as a strategic, management orientated concept designed to manage business processes orientated towards construction rather than being designed to manage construction projects (Obrochta et al., 2011; ESI International, 2013). The PMO maintains a list of PM best practices and provides effective guidance for instruments and expertise in PM. This can lead to the improvement of using a formalised PM process (Hobbs and Aubry, 2007; Kendrick, 2009). The PMO provides support, mentoring, and direction for different project participants across the entire organisation when it can achieve its objective of consistent PM process, methodologies, and metrics (Hobbs, 2007). The

involvement of PMOs in construction projects may provide consultation services to promote better knowledge to be shared across the whole organisation (Desouza & Evaristo, 2006; Koskinen & Pihlanto, 2008). In brief, it can be claimed that the PMO provides the bridge between defining PM practices and implementing them within the organisation. Alternatively, the PMO can be considered the reform of management issues and/or a real supporter of increased coordination and communication among all parties and/or projects. Because the PMO plays many roles in improving project management, it is important for organisations that have not establish a PMO to reconsider the importance of its presence, especially at this time. Literature pointed out that these are clear indications that investment in this area will have a positive impact on the business' performance. The following table 8.2 summarises the application of PMO in improving business performance based on, but not limited to, the previous literature:

References	The Value Added by the PMO And Its Principles to Improve Organisational Performance and Increasing Project Success
(Godbole, 2014; ESI International, 2013; Almaghrabi, 2011; Kendrick, 2009; NHS, 2008)	The clarity of decision making process.
Godbole, 2014; Majmah, 2013; Pwc, 2012; Kacst, 2012; Obrochta & Finch, 2011; Rouse, 2011)	An effective tool to adopt PM practices.
(Alsahli, 2013; Amanah, 2013; Dawson, 2012; Sheaff, 2011; Kendrick, 2009; PM Solution, 2009)	Effective management of human resources, technical and financial aspects.
(Shahram et al, 2014; Mysliviec, 2013; Muller et al, 2013; Villa, 2010; Hill, 2008; Julian et al, 2008; Desouza et al, 2006)	The source of knowledge (center of excellence)
(Scott, 2016; Keyedin, 2012; Dawson, 2012; PMI, 2012; Obrochta & Finch, 2011 Emcanat, 2011; NHS, 2008)	Support and providing current project information (regular and accurate reports)
(Alsahli, 2013; TenStep, 2013; Alnahj, 2012; PMI, 2012; Kacst, 2012; Sheaff, 2011; Almaghrabi, 2011; Kendrick, 2009; Hobbs, 2007)	Minimizing the expenses, costs, time, and reducing risk factors.
(PM Solutions, 2013; Majmah, 2013; Halwah, 2013; Alnahj, 2012; Obrochta, 2011; Visitacion, 2009)	Increasing the performance of individuals, teamwork and the implementation of future projects.
(Jordan, 2015; Dawson et al., 2012; Keyedin, 2012; Pwc, 2012; Emcanat, 2011; Hobbs, 2007)	More transparency and clarity to various projects policies, standards and procedures.

Table 8.2: Success factors of PMO based on the outcome of literature

The literature review explored how the majority of government projects in the KSA are suffering from the problem of faltering and delayed projects. The reasons for projects to be abandoned in the KSA can vary. The theoretical framework outlined eight major factors that caused delay and failure in many projects, namely; best practices of PM do not work as desired; lack of access to the database and not benefitting from the successful experiences and the experiences of others; entry in the competition without knowing if they are ready and compatible with this type of project; knowledge gained from previous projects is missing; poor coordination among various projects to link them as one whole project unit to deliver the entire organisation's needs; modest performance of PMs making decision individually and not maximizing the benefits of teamwork; communication system and knowledge sharing among projects is missing; and failure to provide senior management with the required project status reports. While the format of the questionnaire questions has been developed, some of the factors that have the same meaning as communication and coordination might be combined together.

These factors have been evaluated by asking respondents to evaluate the most-important and least-important practices in the management of construction projects in the KSA. From the chart, it can be seen that by far the greatest demand is for communication and coordination among various parties and projects, with a percentage of around 36%. The second was the knowledge gained from previous projects by 22%. The places of three, four, and five were the availability of PM practices (17%), benefit from the company's database and experiences (13%), and the possibilities and compatibility of the organisation to enter the competition of new projects (11%). The involvement of Senior Management and Project Managers scored only 1%, which indicates that this research will not considering this as an important factor based on the greater difference between the remaining factors and this one.

Otherwise, as mentioned in the literature review, the PMO can be defined as the real helm for various organisations that pursue different types of management across projects. Regardless of the way in which researchers and experts emphasise different factors in how the PMO successfully improves business performance, its importance to the improvement of management in today's construction market is undoubtable. This research identifies eight of the key success factors of today's PMOs, as follows: the clarity of decision making processes; an effective tool to adopt PM practices; effective management of human resources, technical

and financial aspects; the source of knowledge (center of excellence); supporting and providing current project information (regular and accurate reports); minimizing the expenses, costs, time, and reducing risk factors; increasing the performance of individuals, teamwork and the implementation of future projects; and more transparency and clarity to various project policies, standards and procedures.

Those factors have been evaluated by asking respondents to rank success factors in order of their importance based on the current or last project, where 1 is most important and 8 is least important. From the table 8.3, it can be seen that the greatest demand is for clarity in the decision-making process, with a percentage of around 29%. The second was for an effective tool to adopt PM practices (24%), where more transparency and clarity to project policies, standards and procedures was a close third, with 22%. The places of four and five went for more transparency and clarity to various projects policies, standards and procedures (12%) and the source of knowledge (center of excellence) (10%). Far fewer respondents identified the following factors as key to the success of the PMO: effective management of human resources, technical and financial aspects (2%); support and providing current project information and regular and accurate reports (1%). However, increasing the performance of individuals, teamwork and the implementation of future projects had no scored value.

The value added by the PMO and its principles in improving organisational performance and increasing project success can be summarised in the proposed six factors that the majority of participants in questionnaires identified as the most important. The factors surrounding the difficulties and challenges of the KSA's construction market can be compared against the evaluation of the success factors of the PMO in improving business performance, by evaluating the mean ranking from highest to lowest. Table 8.3 shows that the factors in the left side can be addressed by the factors proposed in the right side, which will be mainly considered later on the second phase of this research (Personal Interviews), as follows:

R	Reasons behind Project to Failure in the KSA	R	Factors of PMOs in improving business performance
1	The involvement of Senior Management and Project Manager	2 3 6 8	Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects More transparency and clarity to various projects policies, standards and procedures The clarity of decision making process
2	Possibilities and compatibility with entering the competition of new projects	5	The source of knowledge (center of excellence)
3	Benefit from the company's database and experiences	5 6	The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures
4	Knowledge gained from previous projects	1 5 6	Increasing the performance of individuals, teamwork and the implementation of future projects The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures
5	The availability of PM practices	1 2 3 4 5 6 7 8	Increasing the performance of individuals, teamwork and the implementation of future projects Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects Minimizing the expenses, costs, time, and reducing risk factors The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures An effective tool to adopt PM practices The clarity of decision-making process
6	Communication and coordination among various parties and projects	1 2 3 5 6 8	Increasing the performance of individuals, teamwork and the implementation of future projects Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures The clarity of decision-making process

Table 8.3: Success factors of PMO Vs. Current challenges and difficulties in KSA based on quantitative analysis

Moreover, interviewees identified around 35 common problems and difficulties that cause delay and failure in many projects. However, different maturity levels of PMO had different number of success factors as presented in table 8.4. Equally importantly, respondents identified 37 of PMO roles and success factors in improving business performance and increasing project success rates. Similarly, to the common problems and difficulties, the success factors of PMO had different factors by considering their different maturity levels of PMO. It is noticeable that the lowest level of PMO represented by the Centre of Excellence PMOs have the highest number of factors to improve business performance and increasing project success rates.

However, organisations with no PMO were the most likely to suffer, struggling with a large number of factors that affected the completion and management of construction projects.

The interviewees mentioned some of the factors that could lead to failure, such as not benefiting from previous projects. For example: *“Not benefiting from the experience of the competition companies or previous projects of the company”* (R1). Dealing with new immigration controls represented the most significant cause of delay: *“The new laws developed by the Saudi government to keep up with the Saudi vision 2030 have had a significant impact on the proportion of our foreign employees. So many of them no longer see that Saudi Arabia is fulfilling its financial demands as before”* (R8). It was also suggested there were no obvious standards and policies that could be added in between similar projects under the same organisation: *“Operations, activities and policies always vary from project to project. The existence of regulatory bases and specific laws we do not have. Sometimes the company's possibilities do not allow it to enter into new projects”* (R15).

The research findings as presented in table 8.4 shows that new factors have been emerged based on the results obtained from both methods. Specifically, in the reasons behind Project to failure in the KSA construction sector: The slow in responding to market changes and new policies introduced by the government and increasing the cost of maintaining professional PM staff and the difficulty in managing and distributing resources between projects have been emerged. Whereas two other factors have been developed in the success factors of PMOs in improving business performance namely; First, identify project priorities to distribute resources efficiently and help to manage the sharing of resources between organisation's projects. Second, provide communications and coordination to bridge the gaps between different department and projects. This can be seen as an important participation of this research in advancing the current literatures and to be considered as a contribution for this research. As a result of analysing the mixed method, it is possible to relate the success factors of PMO versus the current challenges and difficulties in KSA as illustrated in figure 8.2, which shows that the factors in the left side can be addressed by the factors proposed in the right side; as follows:

Methods	Questionnaires Findings		Interviews Findings		Research Findings (How qualitative findings helped to explain quantitative results)	
	Reasons behind Project to Failure in the KSA Construction Market	Factors of PMOs in improving business performance	Reasons behind Project to Failure in the KSA Construction Market	Factors of PMOs in improving business performance	Reasons behind Project to Failure in the KSA Construction Market	Factors of PMOs in improving business performance
First	<ul style="list-style-type: none"> Poor communication and coordination among various parties and projects. 	<ul style="list-style-type: none"> Increasing the performance of individuals, teamwork and the implementation of future projects <ul style="list-style-type: none"> Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects <ul style="list-style-type: none"> The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures <ul style="list-style-type: none"> The clarity of decision making process 	<ul style="list-style-type: none"> The difficulty of communications and coordination Absence of coordination among department and projects Ineffective communication channels 	<ul style="list-style-type: none"> Making decisions based on accurate databases Possibility of taken appropriate decisions Share with employees the goals and plans that need to be accomplished 	<ul style="list-style-type: none"> Ineffective communication channels and poor coordination among various parties and projects. 	<ul style="list-style-type: none"> Making the decision collectively based on the periodic information that reaches the PMO
Second	<ul style="list-style-type: none"> Knowledge gained from previous projects missing. 	<ul style="list-style-type: none"> Increasing the performance of individuals, teamwork and the implementation of future projects <ul style="list-style-type: none"> The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures 	<ul style="list-style-type: none"> Lack of knowledge about the domestic market and government rules Subcontractors not qualified for the work Losing a large number of knowledge and lessons learnt not effective 	<ul style="list-style-type: none"> Support the application of PM practices Rising the maturity levels of the company with latest and best practice Develop a methodology to achieve best PM practice and standards that fit company Encouraging PM initiatives and practices 	<ul style="list-style-type: none"> Lack of knowledge about the domestic market, government rules, subcontractors and lessons learnt not effective. 	<ul style="list-style-type: none"> An effective tool to adopt PM best practice and Rising the maturity levels of the organisation.
Third	<ul style="list-style-type: none"> The availability of PM practices not activated and applied efficiently. 	<ul style="list-style-type: none"> Increasing the performance of individuals, teamwork and the implementation of future projects <ul style="list-style-type: none"> Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects <ul style="list-style-type: none"> Minimizing the expenses, costs, time, and reducing risk factors <ul style="list-style-type: none"> The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures <ul style="list-style-type: none"> An effective tool to adopt PM practices The clarity of decision making process 	<ul style="list-style-type: none"> Change is very slow to follow evaluation and modern ages Unforeseen the risks that may affect the execution and management of projects Weakness in using modern management tools and practices Lack of project managers and project management teams Lack of local competencies and weak qualifications of project managers 	<ul style="list-style-type: none"> Implement common strategies and methodologies Provide unified administrative organisations Support the unification of policies and procedures Increase transparency about company policies and standards 	<ul style="list-style-type: none"> The availability of PM practices not activated and applied efficiently and the lack of local competencies and weak qualifications of project managers. 	<ul style="list-style-type: none"> Implement common strategies, methodologies and support the unification of policies and procedures to increase transparency and clarity.
Fourth	<ul style="list-style-type: none"> Benefit from the company's database and experiences (unorganized and based only on individual initiatives). 	<ul style="list-style-type: none"> The source of knowledge (center of excellence) More transparency and clarity to various projects policies, standards and procedures 	<ul style="list-style-type: none"> Not benefiting from previous experience in an ideal and informed ways Lack to benefit from previous experiences or of others' experiences 	<ul style="list-style-type: none"> Monitoring the cost, time, and expenses Dealing with the shortage of cash and delayed payment Reducing the cost and general expenses 	<ul style="list-style-type: none"> Lack to benefit from previous experiences and of others' experiences. 	<ul style="list-style-type: none"> Monitoring and minimizing the risk, time, expenses and dealing with the shortage of cash and delayed payment.
Fifth	<ul style="list-style-type: none"> Low possibilities and compatibility with entering the competition of new projects. 	<ul style="list-style-type: none"> The source of knowledge (center of excellence) 	<ul style="list-style-type: none"> Sometimes the firm's possibilities do not allow to enter into new projects Delay in receiving payments from clients Weak understanding of terms and contractual formats between the contracting parties Speeding up the work to address delays without previous notice Inability to enter into large or complex project Focusing only on the financial return 	<ul style="list-style-type: none"> Provide training and incentive programs A grate regulatory tool to observe and find ideal solutions Attract expert and qualified current and new employees Center of excellence to provide training, guidance, and supervision Train appropriate national talent to cope with company new strategy Center of excellence to increase staff efficiency and capabilities Develop plan to employee national cadres New employees can understand their tasks before transferring to the projects Develop, qualify, and train employees 	<ul style="list-style-type: none"> Inability to enter into large or complex project and weak understanding of terms and contractual formats between the contracting parties 	<ul style="list-style-type: none"> Center of excellence to provide training, guidance, and supervision to increase staff efficiency, capabilities, and knowledge transfer initiatives.
Sixth	<ul style="list-style-type: none"> The involvement of Senior Management and Project Manager 	<ul style="list-style-type: none"> Support and providing current project information (regular and accurate reports) Effective management of human resources, technical and financial aspects More transparency and clarity to various projects policies, standards and procedures <ul style="list-style-type: none"> The clarity of decision making process 	<ul style="list-style-type: none"> Not having unified management regulations or well known practices Operations, activities, and policies always vary from project to another Random administrative organisations Lack of transparency and clarity of current and future strategies Lack of accurate measurement indicators Employees do not know the company's objectives and their strategies 	<ul style="list-style-type: none"> Create databases and gathering information about projects Develop specific and consistent operations to achieve KM Store information and valuable knowledge with easy and save access Maintain knowledge and experience to deal with new immigration control changes Archiving appropriate administrative regulations Provide tangible and repeatable benefits to the company's long term Taken advantage of foreign cadres before leaving 	<ul style="list-style-type: none"> Operations, activities, and policies always vary from project to another and lack of transparency and clarity of current and future strategies 	<ul style="list-style-type: none"> Maintain knowledge, experience, create databases, gathering information about projects, and store valuable knowledge and lessons learnt with an easy and save access.
Seventh			<ul style="list-style-type: none"> Low capabilities of project managers and project teams Find difficulties in dealing with the new immigration control changes High cost for maintaining professional PM staff <ul style="list-style-type: none"> Increasing the cost of foreign staff in regards with new immigration changes Shortage of experts after the introducing of immigration controls and new changes Slow in responding to market changes and new policies introduced by the government 	<ul style="list-style-type: none"> Identify project priorities to share resources Distribution of various resources equally and as needed Helps to manage the sharing of resources, experiences, and risks Distribute resources efficiently Distributed resources appropriately to different projects 	<ul style="list-style-type: none"> Slow in responding to market changes and new policies introduced by the government and increasing the cost of maintaining professional PM staff 	<ul style="list-style-type: none"> Identify project priorities to distribute resources efficiently and help to manage the sharing of resources between organisation's projects.
Eight			<ul style="list-style-type: none"> Difficulty in managing and distributing resources between projects The availability of resources and the rising cost of professional staff 	<ul style="list-style-type: none"> Provide Communications and coordination Closing the gaps between different department and projects 	<ul style="list-style-type: none"> Difficulty in managing and distributing resources between projects 	<ul style="list-style-type: none"> Provide Communications and coordination to bridge the gaps between different department and projects.

Table 8.4: Success factors of PMO Vs. Current challenges and difficulties in KSA

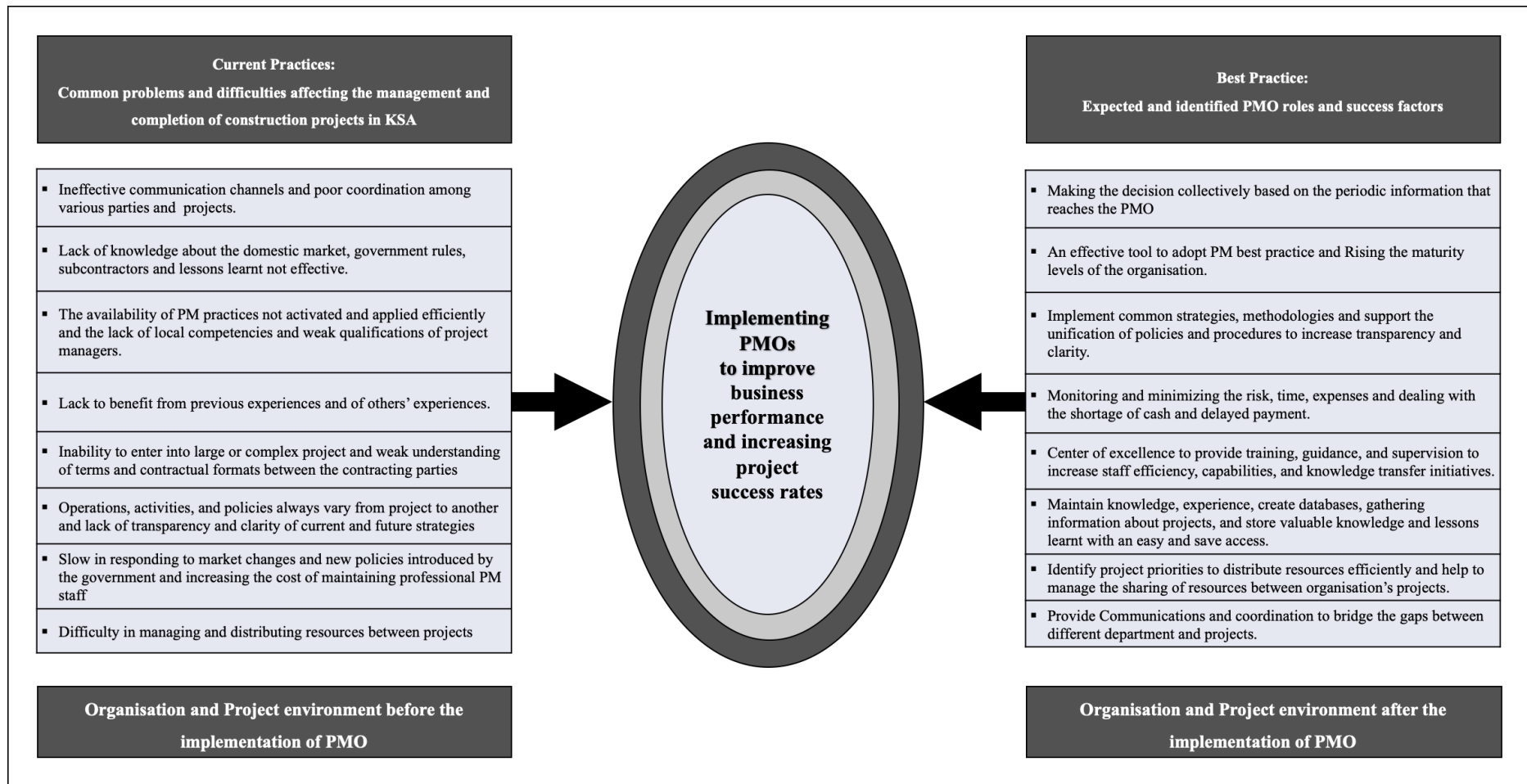


Figure 8.2: Addressing the first objective: Success factors of PMO Vs. Current challenges and difficulties in KSA

8.3.2 The second objective

- **To critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice.**

Literature has revealed that the complexity of today's construction projects and the increasing competition between construction firms, as well as the larger involvement of multidisciplinary and multinational organisations within the construction industry, are convincing construction firms to be more innovative, project oriented, and knowledge driven (PMI, 2008; Kerzner, 2012). The application of various management practices, techniques, knowledge, and tools to achieve the organisation's objectives represents the PM approach. Implementing PM practices is still in its early phases in less developed countries. Some professional organisations and institutions such as PMI and APM made attempts to increase the adoption of PM tools and techniques by proposing a modern methodology to achieve best PM practice. While using PM tools and techniques, organisations often face numerous barriers and challenges. The adoption of PM processes can be increased or decreased as a result of these challenges.

A large number of studies (Obrochta & Finch, 2011; Sheaff, 2011; Godbole, 2014) indicate that when organisations start to adopt best practices in their management, it becomes easier to define the appropriate types and sizes of projects they can undertake. Quite recently, considerable attention has been given to PMOs in order to deliver the best PM practices and winning the highest levels of project successes (Kendrick, 2009; Rouse, 2011; Almaghrabi, 2011; Dawson, 2012). As a result, the following table as discussed in literature 8.5, which used to summarise the most important functions by identifying the common functions of PMOs that carry the same meaning:

References	The effect of PMOs functions on the availability of PM practice
(Mochal, 2013; Practical PMO, 2011; PMI, 2009; APM, 2006; Peansupap & Walker, 2005; Egbu et al., 2001)	Supporting the Project Communication Management.
(Salameh, 2014; Shahram et al, 2014; APM, 2013; Anantatmula, 2012; Rania, 2011; Ajmal & Kekale, 2010; PMI, 2009; Koskinen & Pihlanto, 2008; Desouza & Evaristo, 2006; Martinsuo & Arto, 2003)	Encouraging the Project Knowledge Management.
(Wasseluk, 2014; PA&E Global, 2010; PM Solutions, 2010; Motawa et al, 2007; Sun et al., 2004)	Improving the Project Change Management: (Training for PMs and Project Teams)
(Hoffine, 2013; Planning Group, 2012; PMI, 2009; Hobbs and Aubry, 2007; APM, 2006; Doughty, 2005)	Balancing the Project Resources Management.
(Marttonen, 2014; Zayed, 2014; PMI, 2010; Almaghrabi, 2011; Wolthenholme, 2009; Elizabeth, 2008; APM, 2006)	Promoting the Project Finance Management.
(PA&E Global, 2010; Malhotra et al., 2009; APM, 2006; Levine et al., 2005; Callahan et al., 2004)	Identifying the Project Risk Management.

Table 8.5: PMO functions based on the outcome of literature

Those factors have been evaluated by asking respondents to rank the previous practices in order of importance based on the current or the last project completed, where 1 is most important and 6 is least important. From chart 6.11, it can be seen that the greatest demand was by far for Knowledge Management, with a percentage of around 46%. The second was for Communication Management (21%), followed closely by Resource Management at 18%. Other factors such as Change Management (3%) scored much lower. The functions of PMOs can be presented at different levels: for example, in large companies that have in place a number of projects, the existence of PMOs at this level might have more responsibilities, which may include unifying practices, sharing resources, activating the roles of communication and cooperation to implement best PM practices. By contrast, in small companies that only deal with one project, the PMO's functions may be limited to controlling the project from inception to completion. This suggests the importance of using different maturity levels of PMOs to suits specific organisational needs. The qualitative analysis as it will be discussed in chapter 8 should consider the previous statement and focusing on the Knowledge Management as a key function of the PMO.

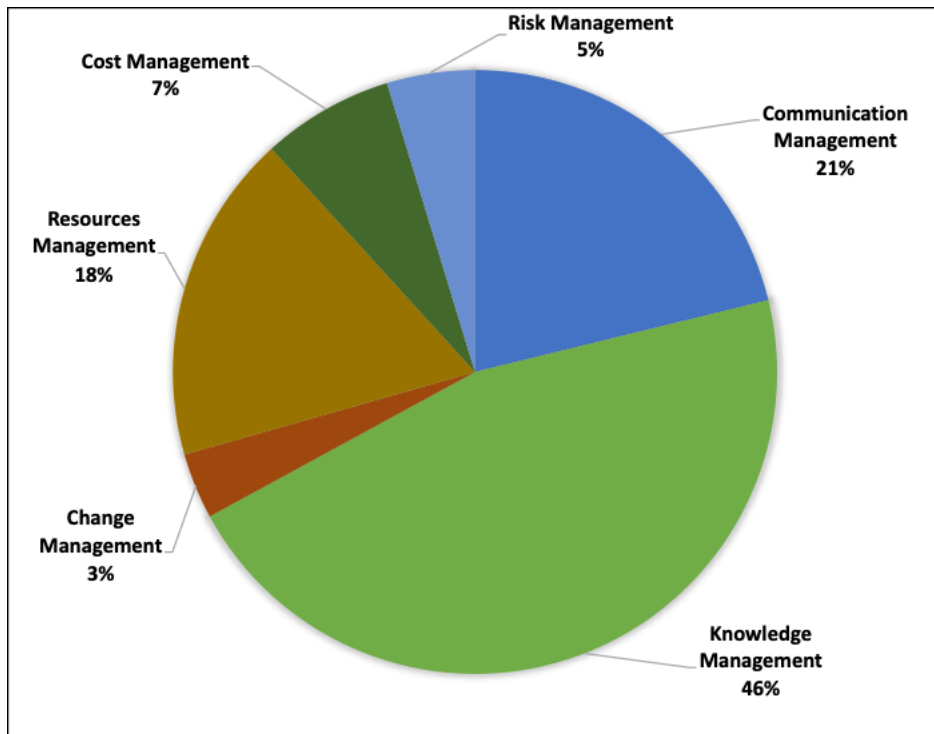


Figure 8.3: Most and least-important functions of PMO in adopting and maintaining PM practices

There was general agreement based on the interview’s analysis that the main office function is to support project management practices and apply best practices: *“The effective role of the Office improves project management practices and promotes knowledge and consistency among different task forces”* (R1). Respondent 2 defined the role of the Office in supporting enterprise management practices, thus: *“As for its role in achieving modern enterprise practices, it is the primary engine that is followed up and supported from time to time in accordance with the company's capabilities”*. (R4) tried to simplify this concept in in the following way: *“PMO is a real tool to apply as much modern practice as possible”*. Furthermore, it was suggested that the PMO often resulted in internal and external benefits: *“First, internally, it works to close the gap between the different departments of the administration and the projects that are implemented at the same time. Second: Externally works to create effective communication channels with stakeholders and clients and work on developing company strategies. PMO provides tangible and repeatable benefits to the company's long term. It also develops a methodology for achieving best practices in project management and defining standards that fit the company's brand”* (R8).

All respondents saw a strong connection between the role of PMO as a centre of excellence and the ability to achieve best practices: *“PMO's mechanism to provide unified systems and*

processes that give more time for project managers to carry out their necessary work. The planning, reporting, documentation, dispute resolution and selection of subcontractors should also be the responsibility of the PMO team members” (R10). Respondent 16 suggested that the PMO could assist in gathering information and identifying the data needed for project management through the creation of “databases, processes and various workflow tasks, provide appropriate support for different projects according to the company's priorities and strategies”.

As shown in figure 8.4, different types of PMO can offer different functions for the organisation. There is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. The implementation of PMO as PM methodologies has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before going into the establishment processes as (APM, 2008; PMI, 2012; Andrew, 2013). Each type has different roles and functions and can be suitable for particular organisational structure. By conducting the interviews, PMO functions can be mainly divided into: First, the effect of PMO functions on PM Practice in the Office Based. Second, the effect of PMO functions on PM Practice in the Project Based.

The following chart also used to compare the interviews findings with the questionnaires outcome. It is evident that the advanced level of PMO that representing by the PMO Office have more functions. Duo to this level might have more directive roles in developing, managing, and optimising the PM best practice as well as to insure all PM practices are applied across the entire organisation. Such as its functionality in the Office based ranged from providing direct effect to distribute resources for projects appropriately and provide project managers with the necessary support in terms of providing well-informed advice, such as financial balance, resource management and decision-making. Secondly, encouraging PM initiatives and practices in line with company’s policies and promotes knowledge and consistency among different project teams.

Thirdly, benefiting from the experience of the competition companies or previous projects of the company. Fourthly, reducing costs, risks, general expenses, and setting specific terms of reference for project managers and making irresponsible decisions and develop, qualify and

train employees by what the organisation demands. Fifthly, finding the appropriate processes that control the elements of knowledge and how to disseminate knowledge through the use of technology or their own initiatives. Sixthly, directing KM processes such as knowledge of labour laws, contractual conditions, administrative regulations, administrative structure, working environment, responding to events, good expectation of hazards. Whilst the effect of its functionality is included: First, help to increase the transparency about company policies and directing the coordination and communication. Second, new employees are transferred to the project by the office with a full description of their work and the tasks they are asked to do. Third, directing and optimising the management and resources of each project by priorities and its linkage to the objectives of the strategic goals of the entire company. Fourth, directing the selection of a suitable and qualified team for the potential of the project and taking advantage of the company's method and methodology in project management. Fifth, maintaining and directing the access to previous project documents and train the team members and develop their knowledge background and skills in accordance with the rules and requirements of the specific work nature. Six, develop and manage project activities, expertise, knowledge, abilities and management skills, follow-up, supervision, support, consultation, standardization of practices, guidance and use best methodologies in PM.

However, it has been asserted that the developing level when there is no PMO does exist represented the most level that struggling to have formal PM processes to be applied across the organisation as: There is a difficulty of communication and coordination between departments. The limitation of unified management regulations and processes. Random in operations, activities and policies. Although poor respond to provide urgent solutions and deal with the difficulties that limit the completion of work on time. Otherwise, making decisions personally presents some problems between senior management and head of departments or others. Similarly, the project based represented other difficulties as: The evolution is very slow in giving opportunity for change and not benefiting from the knowledge of previous projects. There is independence in the implementation of projects under the same company that represent the need of well communication and coordination. Poor reporting lines and slow assist of gathering information about the status of project. There is a limitation for providing training programs from human resources and/or the development management.

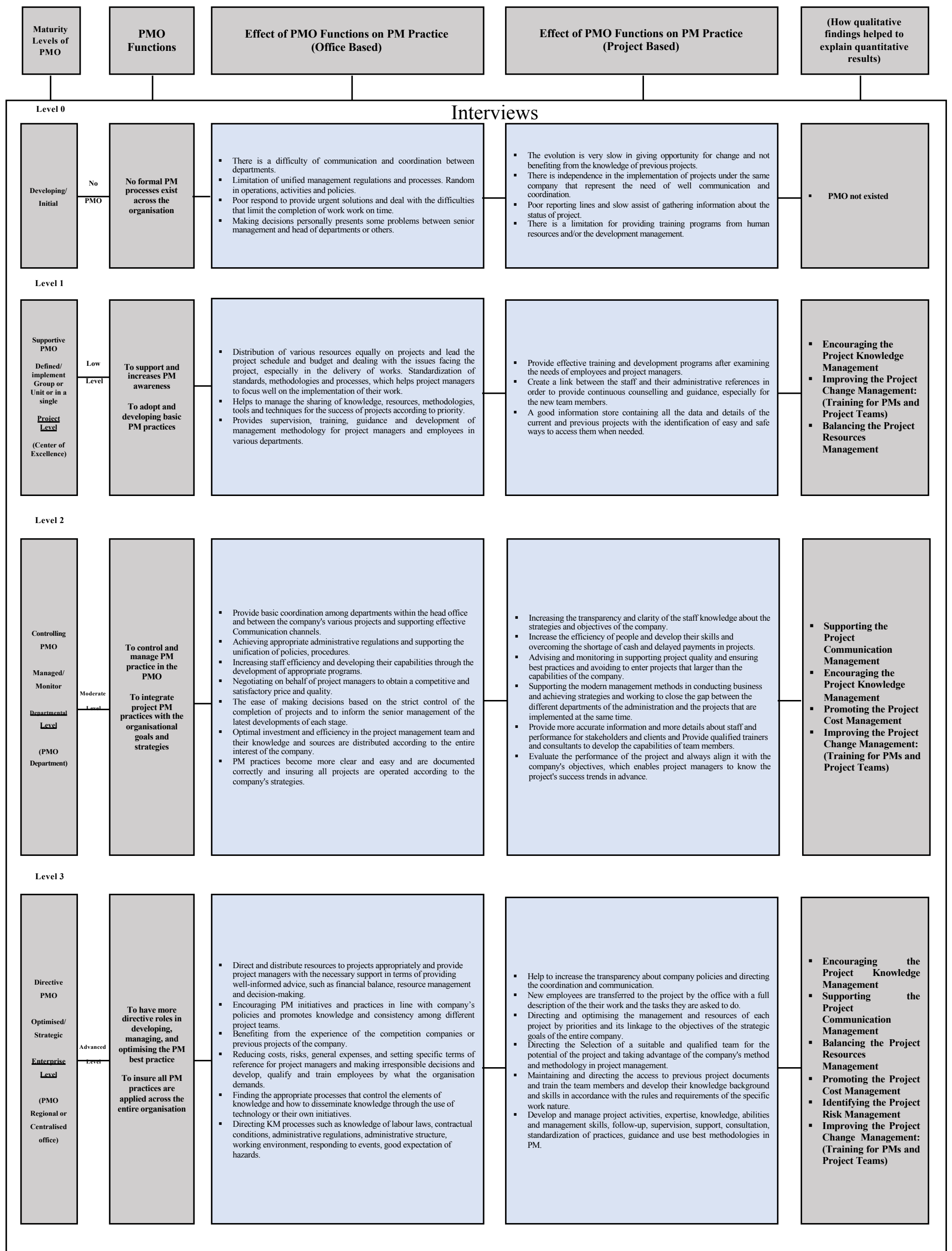


Figure 8.4: Addressing the second objective: PMO functions for the implementation of PM best practice

8.3.3 The third objective

- **To find out the basic steps and procedures used for establishing and evaluating PMOs to facilitate and addresses the barriers and challenges that face its implementation.**

Literature review revealed that there is an urgent demand for organisations to understand the right procedures for establishing or developing the office. It can be argued that certain factors are essential in raising awareness in order to avoid failure. Researchers have found that setting up the PMO correctly will protect it from closing. Over the past years, there has been a wide range of approaches towards establishing the PMO (PMI, 2005; Alsadeq, 2011). Nowadays, setting up, or restructuring and running a PMO has become the main objective of both governmental and private sectors. Researchers such as Alsadeq (2011) suggest the importance of establishing PMOs need to be identified because the PMO cannot be worked as the answer to all project problems or as other companies have one in place. To address how construction companies can set up PMOs in their Projects? Table 8.6 below based on the outcome of literature review outlines the various procedures and steps needed for the establishment of a PMO; as follows:

References	Steps and procedures to establish PMOs
(NHS, 2013; CIO,2012; Hizamul, 2010; PMI, 2009)	Identify PMOs Objectives
(Wilkinson, 2013; ASPE, 2012; PMI, 2009)	Obtain the Necessary Support
(ASPE, 2012; CIO,2012; PMI, 2009)	Provide Training & Coaching
(Wilkinson, 2013; NHS, 2013; ASPE, 2012; Hizamul, 2010)	Define PMOs Process, Team, Tools
(ASPE, 2012; PMI, 2009)	Provide Regular Meetings and Reports
(Wilkinson, 2013; ASPE, 2012; CIO,2012; Hizamul, 2010; PMI, 2009)	Evaluate & Update PMOs

Table 8.6: Steps and procedures to establish PMOs based on the outcome of literature

As discussed in the literature review, it is significantly important to provide a number of steps and tools to evaluate PMO performance as well maintain its development (PMI, 2009; Hizamul, 2010; Almaghrabi, 2011; CIO, 2012; ASPE, 2012; Wilkinson, 2013). Organisations are advised to have a look at its achievement and noticing the great benefits out of it. The process of keeping this new orientation more accountable and showing its value can be achieved through certain methods to ensure that it is directly connecting to its objectives and strategies? According to Eckerson (2006:11), “*you cannot manage what you cannot measure*”. Some practitioners of PMOs feel that while its establishment seems to be easy in theory, it is difficult in practice and not an easy task because it has to deal with multiple tasks and procedures, many of them in different locations (PMI, 2009; Hizamul, 2010). The most crucial point made so far is that companies are advised to take a look at the factors and reasons affecting the spread of this concept. PMOs cannot be the answer to all an organisation’s problems or take the place of the work of other departments or sister companies that are already in place (Alsadeg, 2011; Mastering PM, 2012; Daptiv, 2013). To address how construction firms can evaluate the performance of the PMO? The following table 8.7 based on the outcome of literature review outlines certain considerations that need accounting for before the establishment of the PMO:

References	Metrics to Evaluate PMOs Performance
(KPI, 2014; Daptiv, 2013; Mastering PM, 2012; Hizamul, 2010)	The success percentages of a company's projects that are delivered over time.
(Daptiv, 2013; Mastering PM, 2012 and Hizamul, 2010)	The availability of PM practices on site are implemented and work across various projects.
KPI (2014) and CIO (2012) and Gurta (2010)	Providing a check list form and regular reporting.
(KPI, 2014; CIO, 2012; Mastering PM, 2012; Millhollum, 2009)	The evaluation of staff attitudes, improvement and knowledge gained.
(PMI, 2009; Wilkinson, 2013; Almaghrabi, 2011)	Provide Regular Meetings and Reports.

Table 8.7: Metrics to Evaluate PMOs Performance based on the outcome of literature

As a result of the discussion in section 3.2.4 of the literature review, six steps were identified as important for implementing a new PMO in construction firms, namely; identify PMOs mission, objectives, and strategies; define PMO processes, teams, and tools; obtain the necessary support (fully acknowledging the needs of involving top management and/or stakeholders); provide training and coaching programs to improve people skills and knowledge; and evaluate the PMOs; and provide regular meetings. Figure 8.5 shows that obtaining the necessary support and identifying PMO missions, objectives, and strategies scored the highest with 33% and 30% respectively. Providing training and coaching programs to improve people skills and knowledge and defining PMO processes, teams, and tools came next, scoring percentages of 22 and 13 respectively. Only 76 of respondents saw evaluating and updating PMOs as important with 90%. This suggests that the establishment and evaluation processes need to be isolated and divided into four main phases, which could result in the successful implementation and running of the PMO.

As mentioned in the literature review, according to the PMI's survey, focusing on the years from 2005 to 2010 and sampling 291 organisations to evaluate the state of PMOs and found that the percentages of failed PMOs are quite high. Around 50% of PMOs stopped working within the second year of their introduction. However, this research proposes that in order for PMOs to work to their full potential, certain steps of evaluating PMOs need to be in place (see section 3.2.5.2). The rankings as presented in figure 8.5 identified that the availability of PM practices on site and worked across various projects and the evaluation of staff attitudes, improvements and knowledge gained scored the highest and were seen as the most important, scoring 35% and 32% respectively. The success percentages of a company's projects delivered on time and the application of regular meetings and check lists were getting average scores with percentages of 24. However, 84 of respondents measured the availability of effective reporting as least important. This suggests that there is no obvious demand for construction firms to use this factor when evaluating the performance of the PMO.

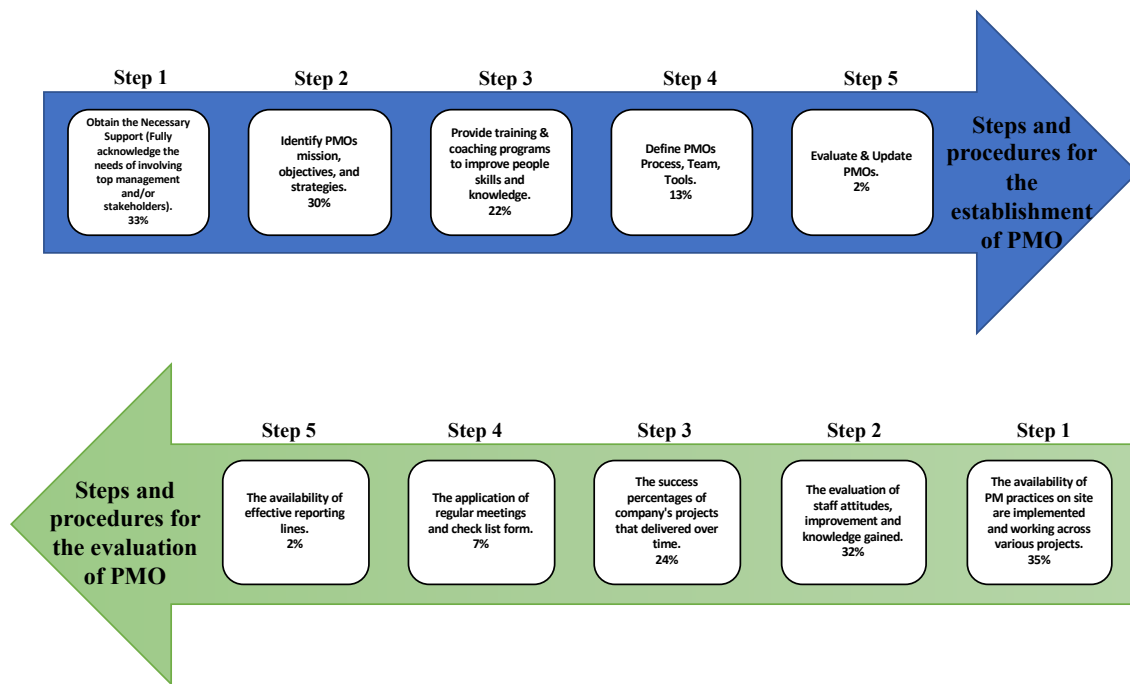


Figure 8.5: Steps and procedures to establish and evaluate PMOs based on quantitative analysis

Setting up or restructuring and running a PMO has become the main objective of both governmental and private sectors. The establishment of the office does not mean that there are no more steps to assess the performance and maintain the development of the PMO and to achieve the greatest benefit out of it. The organisation needs to continuously identify the organisation's maturity level, strategic goals, and business objectives; to: *“Understand the internal and external requirements of the company before starting the establishment of the office. Identify a list of recommendations and responsibilities that PMO will address. Develop an appropriate implementation plan in stages, ensuring that each stage is working separately. Communicate with stakeholders to obtain appropriate support. The performance of the Office should be assessed on an ongoing basis”* (R6). It was also suggested that developing or establishing PMOs must be built on the public interest of the entire firm. It is important to: *“Identify supporters and inform them of the importance of the department. Develop a clear plan and structure. Link PMO concepts to bridge company gaps. Identify the department's employees as well as the department's relationship with other departments. Develop methodologies, processes, standards and an appropriate working mechanism. Checking PMO will increase the maturity and knowledge of the company and make a quantum leap in achieving the company's successes”* (R7).

The evaluation of PMOs can be provided to support the reasons behind establishing this office. The analysis of the interviews shows that there are various metrics to evaluate PMO

performance. The interviews clarified the needs of organisations to assess the evaluation of PMOs must go through different stages in order to see how the office can deal with the various procedures of the project. Understanding the right processes for evaluating PMOs is a key part of getting more accurate results. For instance, the improvement of PMs and PMO staff can test the PMO status. Factors such as evaluating success rates and how best the office can strongly deal with PM practices can give a good indication that the office has started to show positive features.

Respondents agreed that the PMO performance can be assessed by assessing the performance and success of the following activities and practices. Firstly, formal evaluations of project managers and PMO staff can be conducted: *“First: Evaluation of the development of standards and methods of project management and how to maintain them. Second: Evaluation of the development of knowledge gained and the transfer of past experiences and how to maintain them. Third: Evaluate the development of the administrative functions of the company and its work effectively. Fourth: Evaluate the performance of the work of the Office in the development of human resources and help the project team. Fifth: Evaluation of the performance of the Office as a consultant and control in the management of various projects of the company. Sixth: Evaluation of the performance of the Office in providing and preparing training programs to apply modern and effective concepts in project management”* (R1). Respondent 8 believed that the development of staff competencies and increases loyalty can have a positive impact: *“Success rate of projects with and without PMO. Develop staff competencies and increase their loyalty. Achieve unified management policies, practices and regulations. Increased stakeholder interest in this concept. Move over time to greater tasks and powers”*.

The research findings as presented in table 8.8 shows that new factors have been emerged based on the results obtained from both methods. Specifically, in the establishment processes, the identification of the organisation’s maturity levels, strategic goals, and business objectives have been emerged. Whereas two factors have been developed in the evaluation processes namely; First, the achievement of unified management policies, practices, and regulations. Second, formal evaluations of project managers and PMO staff. This can be seen as an important participation of this research in advancing the current literatures and to be considered as a contribution for this research.

Methods	Questionnaires Findings		Interviews Findings		Research Findings (How qualitative findings helped to explain quantitative results)	
	Establishment	Evaluation	Establishment	Evaluation	Establishment	Evaluation
First	Obtain the Necessary Support (Fully acknowledge the needs of involving top management and/or stakeholder).	The availability of PM practices on site are implemented and working across various projects.	Ensure commitment and senior management support and involvement from project managers.	The evaluation of project management practices and their effectiveness.	Obtain the necessary support from senior management with an effective contribution by project managers in disseminating the culture of PMO.	Effective presence of project management practices and their development and use to achieve the organization's aspirations.
Second	Identify PMOs mission, objectives, and strategies.	The evaluation of staff attitudes, improvement and knowledge gained.	Select the appropriate PMO types by defining its vision and mission.	The development of organizational maturity level based on the knowledge gained.	Identify PMOs mission, vision, and strategies to select the appropriate types of PMO.	Development of the maturity of the organisation and its employees based on the acquired knowledge.
Third	Provide training & coaching programs to improve people skills and knowledge.	The success percentages of company's projects that delivered over time.	Specify the PMO functions, structure, tools, and number of staff.	The success rate of project completion with and without PMO existence.	Rehabilitation and training of the PMO team and project managers and specify its relation with other parties.	Evaluate the contribution of PMO in increasing project delivery success rates.
Fourth	Define PMOs Process, Team, and Tools.	The application of check list form and regular meetings.	Build the PMO methodology, processes, policies, and its relation with other parties.	Customer and stakeholders feedback evaluations.	Define the PMO methodologies, processes, policies, and tools.	The availability of check list forms and regular meetings to evaluate business performance and review the customer feedback.
Fifth	Evaluate & Update PMOs.	The availability of effective reporting lines.	Track the PMO success factors and determine metrics to evaluate its performance.	The reduction of cost, time, and scope of works.	Track the PMO performance and how to increase its maturity level	Achieving a reduction in project elements based on reports reaching members of the PMO.
Sixth	-	-	Identify the organisation's maturity levels, strategic goals, and business objectives.	The achievement of unified management policies, practices, and regulations.	Identify the organisation's maturity levels, strategic goals, and business objectives.	The achievement of unified management policies, practices, and regulations.
Seventh	-	-		Formal evaluations of project managers and PMO staff.		Formal evaluations of project managers and PMO staff.

Table 8.8: Steps and procedures to establish and evaluate PMOs

As a result of analysing the mixed method, it is possible to relate the establishment and evaluation processes of PMOs as road-map structure as. Figure 8.6 indicates that the journey of PMO should be going step by step and the successful implementation of PMO does not mean it will be the answer to all an organisation's problems or take the place of the work of other departments. It needs to be followed by a successful evaluation to increase its importance and protecting this concept from failures.

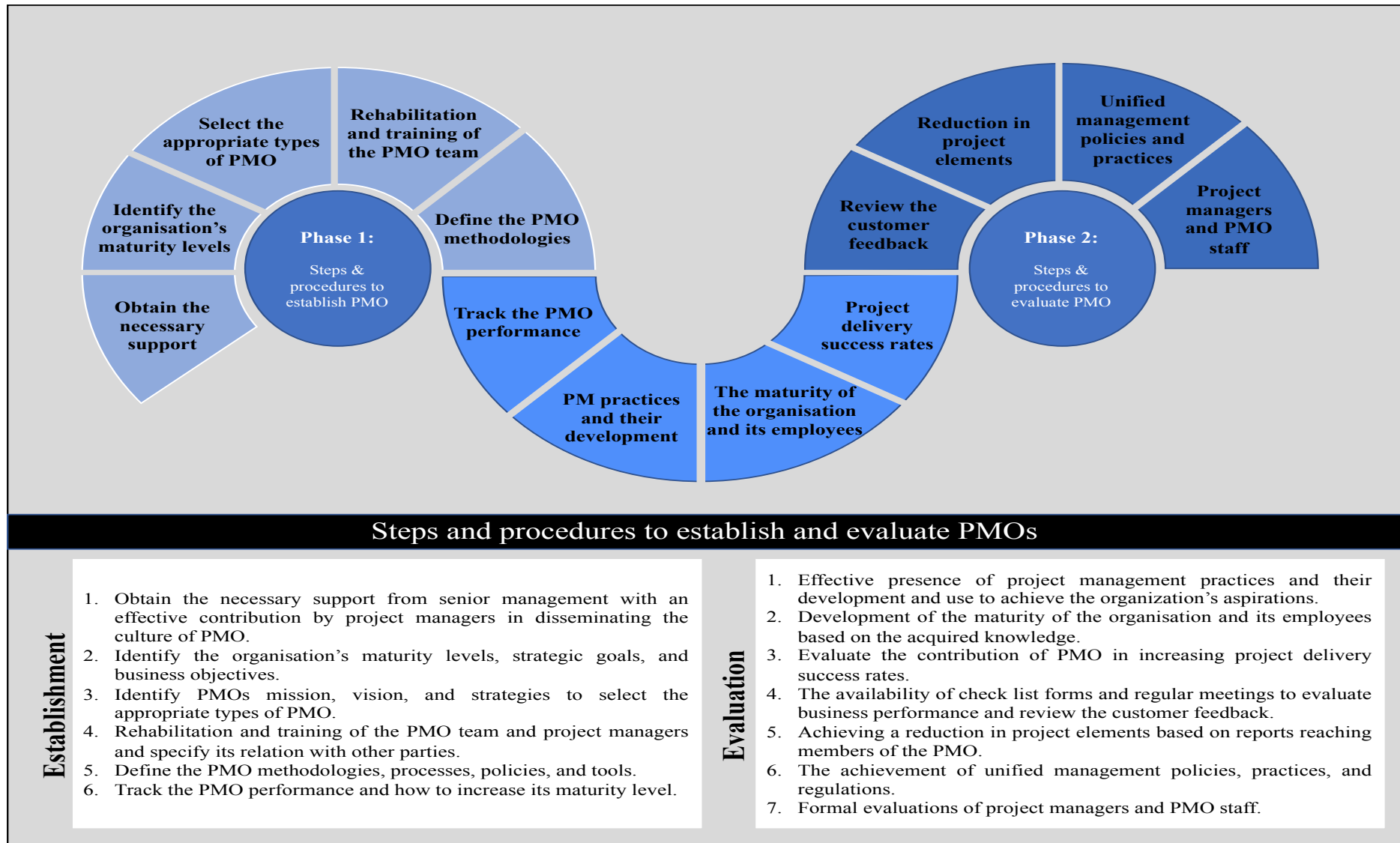


Figure 8.6: Addressing the third objective: Steps and procedures to establish and evaluate/develop PMOs

8.3.4 The fourth objective

- **To critically assess the existing nature of KM components and types to identify the barriers and challenges that face its implementation in the KSA.**

Literature review discussed the barriers and challenges of knowledge management and illustrated that the KM content needs to constantly updated (Egbu et al., 2007; Madhoushi and Sadati, 2010). The efforts of KM cannot be effective if the work of other dimensions in the organisation are not working effectively. Investment in KM might be not necessarily making huge profits therefore KM must not be measured only in terms of financial gains. Nasimi et al., (2014) and Alhamoudi (2010) assert that the effectiveness of the employees' participation can be a big challenge in how the organisation can successfully implement KM. If employees can interact and understand their importance as a complementary aspect to KM, this challenge can be reduced. However, the proper establishment of KM requires the company to spend sufficient time to get results. In addition, there is a difficulty in determining knowledge value. Organisations should adopt criteria to evaluate its productivity rather than waiting for the final results. The focus on knowledge activity cannot figure out the accuracy, values, and efficiency contributed by the human factor. Modeling of KM is currently used to deal with implementation challenges as it helps to increase the creation of power. Egbu et al, (2007) and Nasimi et al, (2013) propose organisations to have a strong determination on their existing barriers of KM and to find suitable ways to increase its success. The belief in KM effectiveness by all practitioners whether employees, managers within the organisation can maximise its roles.

Types of KM were discussed in section 2.3.3 and confirmed that the majority of KM studies within the literature adopt Nonaka's definition of knowledge, separating it into two fundamental types namely: explicit and tacit knowledge (Egbu, 2004; Keong et. al, 2006). Explicit knowledge is knowledge that can be easily shared within the organisation. This type of knowledge typically takes the form of data, operational manuals, drawings, specifications and other procedural guidance. By contrast, tacit knowledge is both difficult to formalise and hard to share with others in the organisation. Tacit knowledge is considered to be highly personal knowledge that has been constructed from social interaction and experience. Such knowledge is thus rooted in actions, ideas, emotions, values, and experiences (Nonaka, 2000).

Yet Robinson et al (2001); Egbu et al (2003) and Pathirage (2007) argue that tacit knowledge needs to receive more attention in construction markets, as construction firms are experiencing low productivity levels and huge labour, material, and management energy waste.

Moreover, the important components to KM Implementation have been discussed by many researchers as (Desouza and Paquette, 2011; Omotayo, 2015), which they realised that to manage knowledge properly, consideration should be paid to three key components: People, Technology, and Processes. The focus of KM should be used to connect these three components for leveraging organisational knowledge. However, applying these components is critical for improving business performance and achieving effective results from KM. However, Bhajaraju (2005) suggests the difficulty of putting the people component into action. To enable people to participate fully in KM processes such as collaboration and knowledge sharing, the organisation is required to change the traditional culture from keeping knowledge hidden or private to encouraging the sharing of knowledge. Wang and Noe (2010) argued that to encourage people to share their knowledge effectively, organisations must pay attention to building strong atmospheres of trust. The combination of motivation and rewards system should leverage people's expertise into business success. Eplimhin and Ekundau (2011) define people as the sources of knowledge; therefore, the process of KM must begin and revolve around human interaction.

The effect of PMO functions on the KM components have been discussed largely in literature review (See section 3.5.6). The participation of Project Managers (PMs) and project teams enables the fastest implementation of the PMO concept. Some researchers (Taylor, 2011; Alsahli, 2014) argue that PMs should be the right person to deal with or run the PMOs. Although, it can be argued that not every PM is a suitable person to manage the office. However, the process of transforming tacit knowledge into explicit knowledge should understand the characteristics behind each one in order to establish effective practices (Reich & Wee, 2006; Goffin et al, 2010). Delving deeply into the practice of transforming these types of knowledge, Koenig *et al*, (2010) have conducted a research study to investigate the various stages and formats of explicit and tacit knowledge, which can be presented as in table 8.9:

Tacit Knowledge exists in	Explicit Knowledge resides in	Methods of transforming Tacit knowledge to explicit
Face to face communication	Publication and books	Formal & informal meetings, networking
Telephone conversations	Internal records	Developing community of practices
Virtual communication	Sound/ video recording	Interviews and videotaping
Presentation & video conferences	Map & graphical material	Subject matter expert directories and/or yellow page
Mentoring and Coaching	Data warehouses	Knowledge/ information repositories
Study tours	E-mails	Mentoring programs
Training	Internet	Knowledge maps
Client knowledge	Self-study materials	Requiring strategies
Best Practices	Newsletters	Retention strategies

Table 8.9: Knowledge types in project context (Srikantaiah et al, 2010)

The questionnaire's findings as in chapter 6 have been analysing the different components of KM and to identify their relation to organisational learning by considering several aspects. Firstly, knowledge components need to evaluate how people in the organisation can perform and understand their own and other people's tasks; to evaluate how people in the organisation can communicate easily with specialists in the field to gain knowledge; and to evaluate the need of the organisation to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation. Secondly, organisational learning should consider the availability of different workshops, seminars, and conferences to acquire knowledge; the availability of different internal training programs and coaching sessions for

staff, as well as the awareness of employees about the organisational goals and strategies and how these result in effective organisational learning.

As can be seen from the table 8.10, this study has found that most participants did not strongly agree with the statement provided for evaluating both KM components and organisational learning. Respondents when asked about the need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation were strongly agreed by 39%. One of the more significant findings to emerge from this study was that participants were quite unhappy and dissatisfied with the contribution and level of support they get from their organisations. For instance, around 48% were disagreed to evaluate that employees in their organisation are aware of the goals and strategies of the organisation. Many respondents said that organisations did not frequently provide internal training programs and coaching sessions for staff or send employees to workshops, seminars, and conferences to acquire knowledge. The present study provides additional evidence that people in the organisation do not feel that they can communicate easily with specialists in the field; 42% of participants were disappointed and disagreed that these learning supports were true of their organisation. As well as people evaluated that in the organisation they cannot perform and understand their own and other's tasks by 32 out of 86 were disagreed. It was also shown that, in many cases, employees were unaware of the goals and strategies of their organisation.

Otherwise as in the second phase of the study, through asking interviewees about the key components of KM at each maturity level of PMO, there was a strong agreement from all that people have an important impact on the success or failure of knowledge. (R2) confirms this need as: *"I believe that people are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge"*. However, (R1) added two more components of knowledge: *"The components of knowledge can be divided into three levels: processes, people and technology"*. It also became clear that the components of knowledge can be divided into different parts: *"The classification of knowledge is divided into many viewpoints, but it is possible to talk about one another: cognitive knowledge, causal knowledge, knowledge of purpose, knowledge of the administrator. Components of knowledge are human processes and how to develop appropriate mechanisms"* (R7).

In regard to this argument, (R10) suggested that: *“Components of KM can be gained through the interaction of people among themselves or through the management of processes or the creation of effective technology factors and practices to acquire knowledge”*. Otherwise, respondent 14 divided the components of KM into three different perspectives: *“Knowledge management can be viewed from several perspectives: First, from a technical perspective. Second, from the perspective of organizational culture. Third, from a financial perspective. The main component of knowledge is human power because it is the foundation that is conveyed through individual knowledge to organizational knowledge”*. People represented the most important component of KM: *“People are the primary drivers of knowledge, so effective processes must be identified to achieve the management objectives of this knowledge”* (R13). Table 8.10 described the important components to enable KM implementation via the PMO.

To categories the different types of project knowledge, interviewees were asked to enumerate its types. All respondents agreed that knowledge in general can be classified into tacit and explicit knowledge. For example, (R1) noted that: *“The type of knowledge can easily be divided into two groups: first explicit or virtual knowledge, which is characterized by external manifestations and can be expressed in writing and speaking and the possibility of conversion using simple technology. The second group is the implicit knowledge which is the most difficult and complex as it expresses the inner sense and the speed of intuition and good expectation of events. Is a subtle knowledge that describes the behavior and mentality of individuals and can only be transmitted through social interaction”*. In this line, (R3) agreed that: *“The implicit knowledge can represent 90% of the knowledge. Which is the most dangerous element of knowledge for its loss and the lack of optimal utilization of it”*. This requires the organisation to find some ways to invest more in the capturing of implicit knowledge as it seems much more difficult to obtain.

Based on the analysis of questionnaires and interviews, the main steps and procedures to convert tacit into explicit knowledge via PMO have been defined as; First, creating and supporting the effective strategies, policies, and processes. Second, setting up and activating appropriate system of incentive and rewards. Third, rising awareness and qualifying people via PMO center of excellence. Fourth, documenting various activities and periodic meeting. Fifth, encouraging the culture of innovation, cooperation, and trust. Sixth, creating communications channels, teamwork, and initiatives. However, this research based on the findings can confirm

that knowledge begins and ends with people. Educated organizations to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge as key drivers in the development of the company. People are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge.

Important components to enable KM implementation via PMO			
Knowledge Components	People	Processes	Technology
<p>In general: Little or no intention to formally manage organisational knowledge (Based on the questionnaire's findings)</p>	<ul style="list-style-type: none"> People cannot perform and understand their own and other's tasks. 	<ul style="list-style-type: none"> There is a need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation. 	<ul style="list-style-type: none"> People cannot communicate easily with specialists in the field to gain knowledge.
<p>Identified different components of KM: (Based on the interview's findings)</p> <p>How qualitative findings helped to explain quantitative results)</p>	<ul style="list-style-type: none"> Knowledge begins and ends with people. Educated organizations to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge as key drivers in the development of the company People are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge. The basic sources of knowledge based on the human being is interacting with its types and achieve its objectives. People are the primary drivers of knowledge, so effective processes must be identified to achieve the management objectives of this knowledge. Internal sources of knowledge: They can be acquired through implicit knowledge. Such as individuals working in the field and the activation of organisational culture. External sources: It can be gained by taking advantage of the recruitment of experts from outside the organisation or follow the competition companies and assess their areas of strength and weakness. Theoretical knowledge through the academic qualification or knowledge acquired through past experience and the working environment. 	<ul style="list-style-type: none"> External knowledge such as research, studies and previous experiences of competitors. Internal knowledge such as processes, procedures and internal activities of the company. From the process of lesson learnt Preparing unified policies and processes A clear system and reference for how to transfer and store information and experiences and how to reuse them later. 	<ul style="list-style-type: none"> Through the creation of effective technology factors and practices to acquire knowledge. Find appropriate technology to classify knowledge such as cognitive knowledge, causal knowledge, knowledge of purpose, knowledge of the administrator. Preparing unified technologies and techniques. The existence of well-known administrative and policy systems through the Office helps to make it faster.
Types of KM and their implementation via PMO			
Knowledge Types	Explicit knowledge	Tacit knowledge	
<p>In general: Little or no intention to formally manage organisational knowledge (Based on the questionnaire's findings)</p>	<ul style="list-style-type: none"> There is a limitation to often sends employees to different workshops, seminars, and conferences to acquire knowledge. 	<ul style="list-style-type: none"> There is a limitation to frequently providing internal training programs and coaching sessions for staff. There is a limitation to make employees aware of the important of disseminating knowledge to achieve the goals and strategies of the organisation. 	
<p>Identified different types of KM: (Based on the interview's findings)</p> <p>How qualitative findings helped to explain quantitative results)</p>	<ul style="list-style-type: none"> Described by external manifestations Expressed by discussion and writing Characterized by external manifestations and can be expressed in writing and speaking and the possibility of conversion using simple technology. Exists in the thinking and logic of people, which requires the planting of initiatives and the presence of a good desire to transfer them. In an enterprise environment, more explicit knowledge is obtained in the documents, reports and database and can be easily transferred. Knowledge is generated on a daily and continuous basis and all successful or failed experiences can be obtained as knowledge, for example: implementation methods, use of new materials for construction at lower costs and faster completion, better handling of disputes and satisfactory resolution of all the parties. 	<ul style="list-style-type: none"> Exist in the minds and behaviors Described by the internal sense and intuition Expressed by experience and responsiveness In the senior management of the company, knowledge is implicit, because of the large number of experts. The implicit knowledge that exists in the experiences, practices and values of the persons. The most difficult and complex as it expresses the inner sense and the speed of intuition and good expectation of events. A subtle knowledge that describes the behavior and mentality of individuals and can only be transmitted through social interaction. The implicit knowledge can represent 90% of the knowledge. Which is the most dangerous element of knowledge for its loss and the lack of optimal utilization. 	
<p>Steps and procedures to convert tacit into explicit knowledge via PMO</p>	<ul style="list-style-type: none"> Creating and supporting the effective strategies, policies, and processes Setting up and activating appropriate system of incentive and rewards Rising awareness and qualifying people via PMO center of excellence <ul style="list-style-type: none"> Documenting various activities and periodic meeting Encouraging the culture of innovation, cooperation, and trust Creating communications channels, teamwork, and initiatives 		

Table 8.10: Addressing the fourth objective: KM components and types and their implementation via PMO

8.3.5 The fifth objective

- **To critically assess the existing nature of PMOs maturity levels and how the PM maturity model assists its development during the different phases of the project.**

A good deal of scholarship has been written to define, propose, and assess its roles and functions, which is previously discussed in the literature review chapter three. However, there is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. The implementation of PMO as PM methodologies has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before going into the establishment processes as (APM, 2008; PMI, 2012; Andrew, 2013). Each type has different roles and functions and can be suitable for particular organisational structure; as illustrated in the table 8.11. Literature review revealed that researchers, including Tylor (2011), Al-Nahj (2012), Andrew (2013), Daptiv (2013) and Nehme (2014) suggest the PMO's core function can be divided into three maturity levels or operational functions, including: supportive, controlling, and directive. Each function has its own strategy and role in the delivery of the organisation's output. Literature also identifying that there is overlapping duties between these three phenomena. In the other words, as the supportive PMO is acting to identify templates and provide best practice, the controlling PMO is ensuring these templates and the different practices of PM are properly applied, while the directive PMO applies these important templates and best PM practices to the organisation's projects for improving business performance and ensuring successful completion.

Literature review also revealed that Almaghrabi (2011), Godbole (2014) and Scott (2016) describe the types of PMO that can be used in construction, as follows: First, PMO in a Single Project. Second, PMOs as a departmental level. Third, PMOs as a Centralised Office. Project Management (PM) is necessary to meet project objectives by applying effective knowledge, tools, techniques, and technologies (PMI, 2008). Similarly, the Project Management Office (PMO) is significant for applying many roles in developing and maintaining best practice of PM (Spalek, 2012). Therefore, the Project Management Maturity Model (PMMM) exists to develop and address the functioning of PMOs (Kerzner, 2005; Hsieh et al, 2009).

Maturity Model	Level 1	Level 2	Level 3	Level 4	Level 5
OPM3 (PMBok)	Standardise	Measure	Control	Continuously improve	---
P3M3 (PRINCE2)	Awareness	Repeatable	Defined	Managed	Optimised
PMI (2008)	Special-Purpose PMO	Departmental PMO	Enterprise PMO	-	-
APM (2012)	Program PMO	Portfolio PMO	Project PMO	-	-
Tylor (2011), Al-Nahj (2012), Andrew (2013), Daptiv (2013) and Nehme (2014)	Supportive PMO	Controlling PMO	Directive PMO	-	-

Table 8.11: Different maturity levels of PMO based on the outcome of literature

Knowledge Management and PMOs are closely related, as discussed in literature review (see section 3.5.2). People's knowledge of the PMO is extremely significant to successfully implementing its roles. A likert scale was adopted for the responses collected for this question, which ranged from Do not know (0-20%) (0) to Excellent (80-100%) (5), as shown in Table 8.12. The highest score was scored by respondents who claimed to have excellent knowledge of the PMO, with a percentage of around 42%. The second highest score was those who said they had a good knowledge of the PMO (28%) and a similar percentage of respondents identified their knowledge as average (20%). Fewer respondents expressed having a low knowledge of the PMO with a percentage of 7%. Lastly, some of the participants said they had no knowledge of PMO at all (3%).

Scale	People's knowledge of the maturity levels of PMOs
Excellent (80-100%)	7%
Good (60-80%)	28%
Average (40-60%)	20%
Poor (20-40%)	42%
Do not know (0-20%)	3%

Table 8.12: People's knowledge of the maturity levels of PMOs based on quantitative analysis

Related to the importance of people's knowledge of PMO is how they see its importance in terms of increasing business performance. A likert scale was adopted for the responses, which ranged from Unimportant (0-25%) (0) to Very Important (75-100%) (4), as shown in Table 8.13. The highest score was presented by "very important", with a percentage of around 65%. The second highest score came from respondents rating it as "fairly important" (28%). However, a few respondents might expect the existence of PMO was "slightly important" (6%) and few other respondents felt it was "unimportant", with a percentage of 1%.

Scale	Evaluating the importance of PMOs
Very Important (75-100%)	65%
Fairly Important (50-75%)	28%
Slightly Important (25-50%)	6%
Unimportant (0-25%)	1%

Table 8.13: Evaluating the importance of PMOs based on quantitative analysis

Interviews revealed that the PMO's roles and functions may vary depending on the organisation's size and objectives. For instance, respondent 3 suggested that: *"There must be a specific path so that we can route a PMO vehicle from point A to point B. It is better to start fewer tasks for the office but over time and develop this concept by employees and increase the awareness of decision makers of the importance of the presence of the office we can create a good environment for the office more functions and features. My simple knowledge is that the office starts from simple to medium levels and then to advanced based on the size of the company and its activity and maturity"*. Many interviewees identified that the major responsibilities of the PMO could range from providing PM support to directing management of project: *"Maturity levels in the PMO concept can be determined by dividing them into two parts: Firstly, the scope of work of the Office: It can be divided into three main sections: First, the PMO group can be 2 to 8 people working in one large project or executed on time. Second: PMO department in the central administration. Third: PMO office meaning at the level of the whole company. Secondly, methodology of the Office: It can also be divided into three sections according to the scope of work of the Office: First, the methodology of the work of the Office as a support for the identification and application of project practices in the actual implementation stages. Second: The methodology of the work of the office as a controller for the management and control of the project practices, organization, evaluation and utilization Including in future projects. Third: The methodology of the work of the Office as an executive director to achieve the strategies and objectives of the company in general"* (R1).

Levels	Maturity Levels of PMOs
Zero	Primitive phase (no PMO or effective tools to achieve practices.
First	Center of excellence PMOs provide the organisation with methodologies, standards, and tools to enable project teams and project managers to deliver project successfully.
Second	Organisational unit PMO/ Divisional PMO/ Departmental PMO provide control for business services or units.
Third	Enterprise PMO/ Strategic PMO provide directive roles to align projects and organisation's units to corporate strategy and ensuring appropriate enterprise governance.

Table 8.14: Different maturity levels of PMO based on qualitative analysis

To successfully establish and evaluate the PMO's roles in an organisation, a number of suggested PMMMs have been proposed. For instance, the Organisational Project Management Maturity Model (OPM3), proposed by PMI (2008), has been used widely by a number of organisations (Shahram, 2014). OPM3 addresses the development of PMO in four maturity levels, namely: to standardise, measure, control, and continuously improve. Another recognised model is the Portfolio Program Project Management Maturity Model (P3M3) by PRINCE2 (2008), which is used in a similar manner to OPM3 but has one more maturity level. P3M3 addresses the customisation of PMO in five maturity levels namely: awareness, repeatable, defined, managed, and optimised. Both PMMMs, whether PMBoK or PRINCE2, are considered a process-based-approach to systematically address the PMO roles to be developed from an initial maturity level to a Center of Excellence and an optimised level of PMO by following certain processes (Anderson et al, 2007).

The improvement and effectiveness of various KM activities and systems are dependent upon the existing Knowledge Management Maturity Model "KMMM" (Feng, 2006; Hsieh et al, 2009). The KMMM can progressively assist the organisation to develop a proper KM system, which is similar to the role of the PMMM (Kanakanhlli and Pee, 2009). There are a number of existing studies that set out to develop a comprehensive KMMM, such as Feng (2006) and Kanakanhlli and Pee (2009). Feng (2006) proposed five levels of maturity to address the KM development as well as identifying four major processes to create, store, share, and apply KM as in table 8.15. In this model, the first two levels are mainly focused on the required preparation works such as defining the needs to adopt KM practices and increasing the awareness by people and organisation to invest in KM. The remaining levels of maturity are focused on finding ways to improve and maintain KM practices.

The previous KMMM has been tested and refined by different organisations, including governmental organisations and commercial banks. From this research project's point of view, Feng (2006) has not been applied yet to the PMO or in any of the project-based organisations. One weakness of this model is that it fails to address the key players of KM as it focuses more on the KM processes and gives more comprehensive details about its practices. To ensure that this model is valid, further and wider research is needed. Furthermore, it can be compared to other studies. The importance of KM components can be seen by Kanakanhlli and Pee's (2009) KMMM. This model is divided its maturity levels into five namely: Initial, Aware, Defined, Managed, and Optimised. The KMMM presented by Kanakanhlli and Pee (2009) categorised

the key players of KM into three important components: People, Processes, and Technology, in order to address the current issues facing KM implementation. Building upon current scholarship in the field, this research sets out to explore some of the factors that have not been explored sufficiently in the literature, such as the importance of people's interactions and the availability of the technology factor that not extensively covered. Kanakanhlli and Pee (2009) suggested that their model could be adopted in any general organisations. To the best of this researcher's knowledge, the Feng's KMMM is important in identifying and outlining KM processes and practices, whereas Kanakanhlli and Pee's KMMM gives more consideration to the important players in KM. This research assumes that these two models are quite similar in frame-working KM activities and can be integrated as a complementary KMMM to maximise their importance and effectiveness. Therefore, the incorporation of KMMM is not yet examined in project based organisations and/or in the PMO, which seems to be the missing part that needed to be addressed and discussed.

Integrated different maturity levels of PMO with PM	Integrated different maturity levels of PMO with KM
<p style="text-align: center;">No PMO Developing/Initial Standardize</p> <ul style="list-style-type: none"> <input type="checkbox"/> No formal PM processes exist across the organisation 	<p style="text-align: center;">In general:</p> <p>Little or no intention to formally manage organisational knowledge</p> <hr/> <p style="text-align: center;">Initial activities and/or enablers of KM:</p> <p>Organisation is aware of and has intention to manage its organisational knowledge but it might not know how to do so</p>
<p style="text-align: center;">PMO Group Supportive PMO Defined/measure Special purpose PMO or Unit or in a single Project Level</p> <ul style="list-style-type: none"> <input type="checkbox"/> To support and increases PM awareness <input type="checkbox"/> To integrate PM in PMO and developing basic PM practices <input type="checkbox"/> To provide a consultative role to projects via PMO <input type="checkbox"/> To serve as a project repository and lessons learned <input type="checkbox"/> To provide training and coaching and supporting the improvement of PMs and project teams <input type="checkbox"/> To provide general communication with the project team 	<p style="text-align: center;">PMO Functions to Encourage and Support KM Processes</p> <ul style="list-style-type: none"> <input type="checkbox"/> To initiate and increase KM awareness's and developing basic PM practices in the PMO <input type="checkbox"/> To define the concept of KM in practice <input type="checkbox"/> To develop Intranet and any types of networks in organization <input type="checkbox"/> To develop community of practices
<p style="text-align: center;">PMO Department Controlling PMO Managed/monitor Departmental Level</p> <ul style="list-style-type: none"> <input type="checkbox"/> To control and manage projects' knowledge in the PMO <input type="checkbox"/> To integrate PM with the organisational goals and strategies via PMO <input type="checkbox"/> To adopt PM framework or methodologies <input type="checkbox"/> To apply specific templates, forms, and tools 	<p style="text-align: center;">PMO Functions to Encourage and Support KM Processes</p> <ul style="list-style-type: none"> <input type="checkbox"/> To manage project's knowledge n the PMO and integrating KM with organizational strategy <input type="checkbox"/> To establish a unit to take the responsibility and accountability of KM <input type="checkbox"/> To provide systematic for supporting KM <input type="checkbox"/> To establish and develop standard for KM <input type="checkbox"/> To develop KM sub processes
<p style="text-align: center;">PMO office Directive PMO Optimised/ Strategic Regional or Centralised Enterprise Level Continuously Improve</p> <ul style="list-style-type: none"> <input type="checkbox"/> To have more directive roles in developing, managing, and optimising the PM practices in the PMO <input type="checkbox"/> To insure all PM practices are applied across the entire organization through the PMO <input type="checkbox"/> To set up and develop PM function within the organization <input type="checkbox"/> To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organisation 	<p style="text-align: center;">PMO Functions to Encourage and Support KM Processes</p> <ul style="list-style-type: none"> <input type="checkbox"/> To optimize the KM system in the PMO <input type="checkbox"/> To Put control in place for all KM processes and activities <input type="checkbox"/> To integrating the KM processes and procedures <input type="checkbox"/> To continuously improving the KM processes and procedures

Table 8.15: Different maturity levels of PMO adapted based on (PMI, 2008 and Feng, 2006)

To put things together, there is no big difference by comparing previous models. But by considering that the PMBoK methodology is recommended two different categories of PMO types, one from an organisational point of view, which divided PMO at three types namely: 1) PMO in a single project or as a centre of excellence of PMO, 2) Departmental PMO, 3) Enterprise or Centralised PMO. Another category by the PMBoK is called operational level of PMO, which divided into three levels: 1) supportive PMO, 2) controlling PMO, 3) directive PMO. Those can be useful and linked directly to select the appropriate PM maturity model as it has been adopted by a number of organisations (Bentley, 2009).

As discussed earlier in the literature review, the majority of researchers, including Al-Nahj (2012), Daptiv (2013), Andrew (2013), Jordan (2015) assume that the PMO's core function can be divided into three maturity levels: supportive, controlling, and directive. Similarly, the outcome of the interviews suggesting these maturity levels of PMO as illustrated in figure 8.7. First, primitive phase where no PMO does existed or the availability of effective tools to achieve practices not implemented. Second, PMO group or project support/ specific PMO. Third, Centre of Excellence PMOs. Fourth, departmental PMO. Fifth, enterprise PMO. Respondents also defined that as over time, organisations are moving from an operation and tactical PMO towards a more directive and strategic level. However, respondents as discussed previously in the differences that differentiate levels of maturity in this chapter revealed that each maturity level of PMO has its own strategy and role in the delivery of the organisation's output as pointed out in figure 8.7.

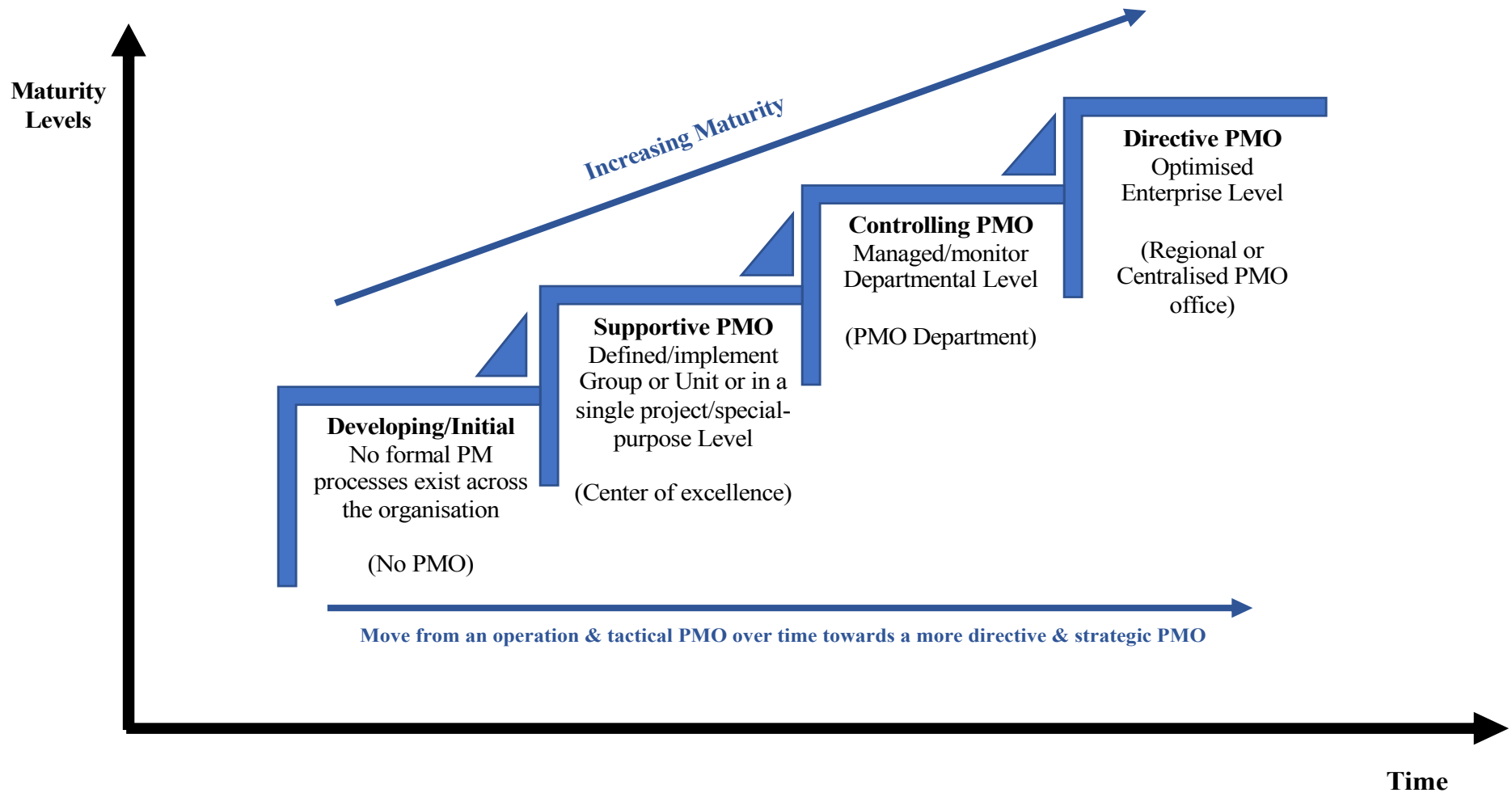


Figure 8.7: Addressing the fifth objective: Different maturity levels of PMO

8.3 Link objectives with the proposed conceptual framework:

The preliminary theoretical framework for PM and KM implementation via a PMO has been identified based on the outcome of literature review (see section 4.2). Although, as the research aims to propose an effective framework to develop the KM processes from the PMO perspective. The conceptual framework was considered that the four processes of KM need to be managed through the different phases of the project: initiation, planning, execution, and closing phase. PMOs roles have been divided into four maturity levels. This can be useful as this research aims to identify such levels and to propose a framework to maximise the importance of different levels. The proposed conceptual framework is designed to be: First, linked directly with the research objectives provided in chapter 1. Second, investigated in literature review in both chapter two and three. Third, have been developed in chapter four and then analysed in chapter six and seven based on the outcome of conducting mixed methods approach. To address the research aim, five objectives have been discussed largely in this research. This in order to facilitate and built the research conceptual framework. As previously described, it is obvious that all these objectives are relatively close to each other and can be complementing to satisfy the main aim.

Figure 8.8 is provided to describe the current practices by identifying and evaluating the current difficulties and challenges that affecting the management and completion of construction projects can be addresses and reduced by the PMO functions to improve organisation's performance as discussed previously in the first objective. The effect of PMO functions to enforce and maintain best practice of PM were addressed at various maturity levels of PMO as suggested in the key findings of objective two. The steps and procedures for the establishment and evaluation of PMOs were concluded by thirteen phases combining both sides as a road-map, which investigated in the third objective. The important types and components of KM and their implementation via PMOs have been discussed in objective four and concluded by six steps and procedures to convert tacit into explicit knowledge. Before the introducing of research aim, objective five were used to illustrate the different maturity levels of PMOs, which resulted in three main levels of PMO namely; Center of excellence PMOs provide the organisation with methodologies, standards, and tools to enable project teams and project managers to deliver project successfully. Second, organisational unit PMO/ Divisional PMO/ Departmental PMO provide control for business services or units. Third, enterprise PMO/ Strategic PMO provide directive roles to align projects and organisation's units to corporate strategy and ensuring appropriate enterprise governance.

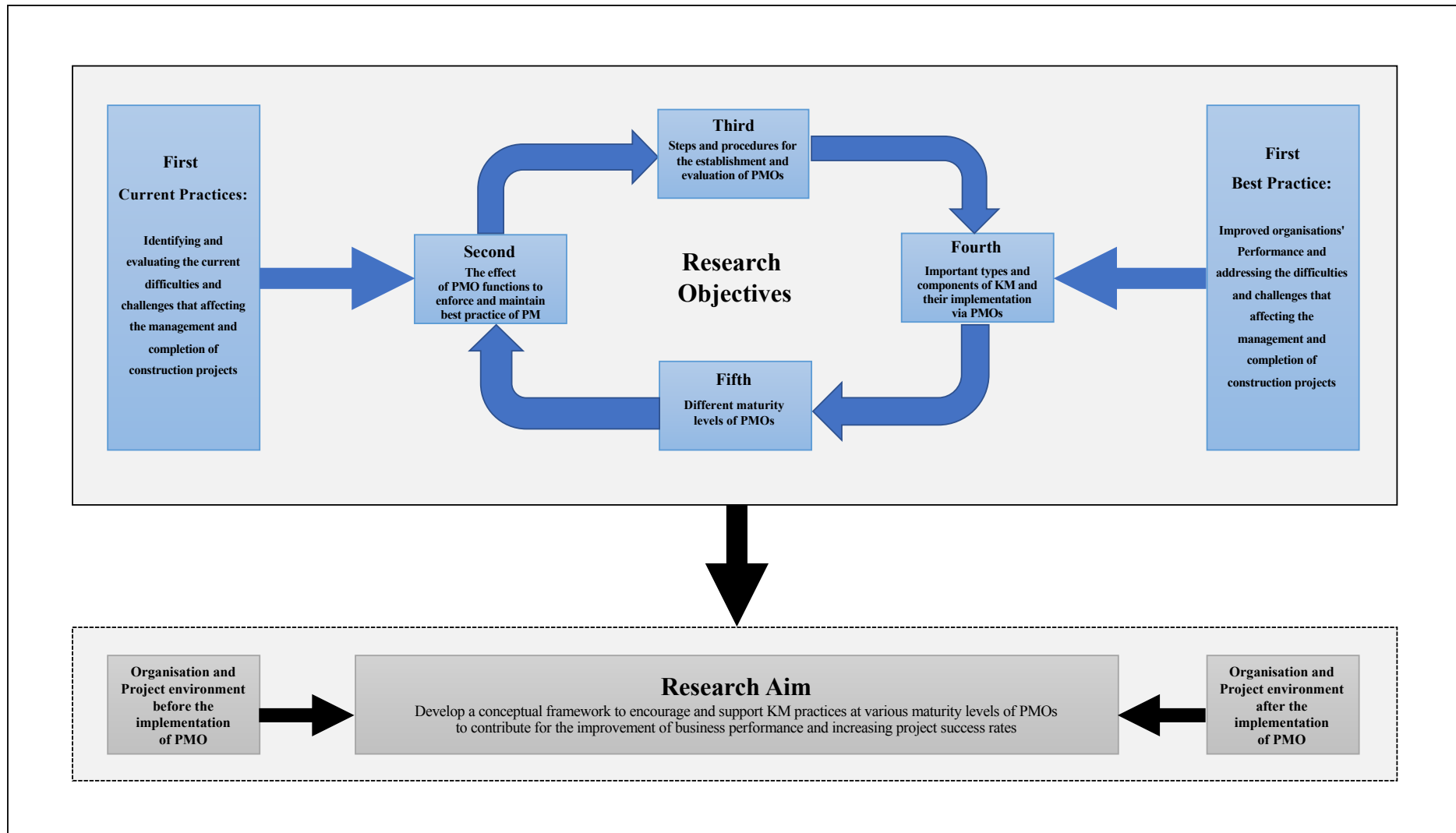


Figure 8.8: Review research aim and objectives before introducing the proposed conceptual framework

8.4 Proposed conceptual framework

Maturity levels of PMO	PMO Functions to Encourage and Support KM Processes and Practices at different maturity levels
<p style="text-align: center;">Level 0</p>	<p style="text-align: center;">The effective roles of KM to organisational learning (OL)</p>
<p style="text-align: center;">Primitive Phase Developing/Initial</p> <ul style="list-style-type: none"> ➤ Individualised approaches to knowledge management using lesson learnt mentality – no organization interface ➤ No-PMO or effective tools to achieve practices ➤ No formal PM processes exist across the organization ➤ Organisation is aware of and has intention to manage its organisational knowledge but it might not know how to do so 	<ul style="list-style-type: none"> ➤ Development of KM to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time. ➤ Development of KM to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time. ➤ Learning is based acquiring knowledge: Knowledge management is a good factor to gain the best lessons and experiences. Learning is based on acquiring knowledge and developing appropriate processes to maximize their utilization. ➤ Peoples' knowledge is important for OL: Knowledge management helps to care for people and their role is effective in increasing the maturity of the company. Knowledge management through the mechanism of its work to benefit from previous experiences and knowledge gained and different information contribute to increase the level of learning and maturity in the company. ➤ KM achievement for OL: The constant change and stay in the competition reflect learning styles, as well as lessons learned to facilitate the implementation of future projects and meet challenges. Increased transparency, availability and accessibility of information, teamwork and continuous communication are all positive impacts that contribute to organizational education.
<p style="text-align: center;">Level 1</p>	<p style="text-align: center;">PMO group possible solutions/options for encouraging KM implementation</p>
<p style="text-align: center;">Center of Excellence PMOs</p> <p style="text-align: center;">Supportive PMO Defined/Developed Project/Organisation Level</p> <ul style="list-style-type: none"> ➤ Provide the organisation with methodologies, standards, and tools to enable project teams and PMs to deliver project successfully ➤ To provide training and coaching and supporting the improvement of PMs and project teams ➤ To serve as a project repository and lessons learned ➤ Provide project related services or to support specific purpose ➤ To provide a consultative role to projects ➤ To set up and develop PM function within the organization ➤ Provides support and assistance when needed. Provide best practices and ideas to correct defects and achieve best results ➤ A group of experts working as a support and linking between the top management and various projects ➤ To initiate and increase KM awareness's and developing basic PM practices in the PMO ➤ To define the concept of KM in practice ➤ To develop Intranet and any types of networks in organization ➤ To develop community of practices 	<ul style="list-style-type: none"> ➤ Build organisational memory: Storing best practices and maintain previous experiences to be used in future projects. ➤ Developing individuals' skills: PMO contributes to the development of skills in individuals by mixing experts with fresh graduates employees. ➤ Increase the outcome of creativity: Motivate employees to come up with new ideas and initiatives that can contribute for increasing business performance. ➤ Managing KM processes: The dissemination of useful ideas, facilitate more effective cooperative processes, ensure continued knowledge acquisition and organizational learning. ➤ Providing training and coaching: It is possible to activate the role of the Center of Excellence PMO in providing training courses. ➤ Rising awareness among people: Contributing to raising awareness among people of the importance of the existence of this concept and that if implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general. ➤ Sending employees to different workshop: The role of PMO is noticeable in providing great support in sending administrative competencies to develop them and to attract qualified competencies. ➤ The development of standards, regulations, and practices: The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company.
<p style="text-align: center;">Level 2</p>	<p style="text-align: center;">PMO department possible solutions/options for encouraging KM implementation</p>
<p style="text-align: center;">PMO Department</p> <p style="text-align: center;">Controlling PMO Managed/Monitor Organisational Unit PMO/Divisional PMO Departmental Level</p> <ul style="list-style-type: none"> ➤ Provide control for business services or units ➤ To integrate PM with the organisational goals and strategies ➤ To adopt PM framework or methodologies ➤ To apply specific templates, forms, and tools ➤ Link project management practices to trade ➤ Provides appropriate reports on the status of different projects ➤ To manage project's knowledge in the PMO and integrating KM with organizational strategy ➤ To establish a unit to take the responsibility and accountability of KM ➤ To provide systematic for supporting KM ➤ To establish and develop standard for KM ➤ To develop KM sub processes 	<ul style="list-style-type: none"> ➤ Spread KM culture: To maximize knowledge management and disseminate its culture and provide developmental and cultural programs to share experiences. ➤ Rely more on human activity: PMO's contribution is to rely on human activity to generate more knowledge than to rely on computer usage and communication links may not be effective. ➤ Link KM to specific system: The contribution of PMO is to develop an effective knowledge management system that not only involves the use of technology factors but also links the employees of the organization and connects them with experts in the same field. ➤ Qualify project managers and project teams: Prepare a plan to send employees to gain knowledge and experience. ➤ Provide healthy working environment: investing optimally in creating an appropriate working environment.
<p style="text-align: center;">Level 3</p>	<p style="text-align: center;">PMO office possible solutions/options for encouraging KM implementation</p>
<p style="text-align: center;">PMO Office</p> <p style="text-align: center;">Directive PMO Optimised/ Strategic Regional or Centralised Enterprise Level</p> <ul style="list-style-type: none"> ➤ To provide directive roles to align projects and organisations units to corporate strategy and ensuring appropriate enterprise governance ➤ To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organisation ➤ To insure all PM practices are applied across the entire organisation ➤ Effective strategies and continuous development of practices that suit the way the firm works ➤ An effective leadership role in guiding projects with unlimited powers and responsibilities ➤ To optimize the KM system in the PMO ➤ To Put control in place for all KM processes and activities ➤ To integrating the KM processes and procedures ➤ To continuously improving the KM processes and procedures 	<ul style="list-style-type: none"> ➤ Send employees to acquire knowledge: Employees are sent to many workshops and conferences, both internally and externally according to the needs of the work. ➤ Provide effective programs: Providing effective internal programs and courses offered by specialists in many fields. ➤ Center of excellence: Working as a learning center where the company can achieve best practices, transfer experiences and provide full support. ➤ Support project managers: Develop their abilities and skills and work on them to be used optimally in the management and development of the projects they are working on. ➤ Develop strategic plan: to increase the office's tasks and prepare it for ongoing training sessions. ➤ Optimizing the working environment: To find a suitable environment through which all members of the team and department managers can participate in achieving the objectives of the company ➤ Apply new policies and roles: To enforce the policies of the office to maintain valuable knowledge.

Figure 8.8: Summary of the proposed conceptual framework

As discussed previously in chapter one, the adoption of PMOs is not without challenge. The biggest challenge currently facing the Kingdom of Saudi Arabia (KSA)'s construction firms is the introduction of immigration controls, in 2012, which state only a maximum of 50% of employees can originate from outside the KSA (Diry, 2012; Alsahli, 2013). Given that most Project Management staff are either European or American citizens, this, together with the temporary and transient nature of construction projects, is causing a significant challenge to most medium to large construction firms operating in the KSA. As a result, the KSA's construction firms are now facing a skills and knowledge drain as Project Management staff leave both the organisation and country (Deemah, 2014; Halwah, 2013; Majmah, 2013). Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival. Within the current literature, there is insufficient exploration of how PM and KM work within the PMO. This is a significant gap in the existing literature. Therefore, an attempt should be given to integrate KM practices into PMO as an effective tool to encourage and facilitate the various processes of KM and develop the importance of PMO from KM perspective. This will result in improving efficiency of PM and increasing project success rate.

The temporary nature of construction firms is unique and complex; it involves multidisciplinary organisations and multinational people with different expertise and specialties. During the duration of projects most of the knowledge is generated to achieve the client's needs and business objectives. The construction industry recognises the benefits of implementing KM in their strategy. However, the limitations of current KM practice within the construction sector are decreasing its development. The shortcomings of current practice need a suitable methodology to encourage and support KM. Integrating strong KM processes into the construction market will provide greater value for money through the achievement of instilling learning within construction organisations.

The existing research discussed previously in literature review showed that construction firms are experiencing low productivity levels and huge labour, material, and management energy waste. The adoption of traditional construction management approaches is not a solution to current problems within the construction sector and is unlikely to improve the industry's productivity and profitability. Construction organisations are becoming increasingly aware of the importance of KM for improving their competitiveness by integrating knowledge to reduce

time and cost factors (Bergeron, 2003; Ahmad et al., 2007). This can be done through sharing and reusing previous experience, whether successful or unsuccessful. Employees can begin to find solutions for their problems without spending more effort, time, and cost by reinventing the type of solution that can be found and accessed elsewhere in the company. Koskela *et al.*, (2009) confirmed that construction projects are unique as in each phase of the project lifecycle more potential and opportunities of different knowledge can be captured.

The national economic situation and environment have a direct influence on construction. Many factors such as capital movement, the environment of investment, and interest rates impact upon the construction industry. Cultural and social factors, including human personalities, social values, and views, also need to be taken into account. Furthermore, technology changes rapidly, and if KM is not in place, a company can fail to foresee how a technological change might impact upon the retention of knowledge.

Interviews revealed that the cost of retaining talented employees is expensive; this will put more pressure on companies to lose skilled people and a knowledgeable workforce. Researchers (Bahra, 2001; Kamara et al., 2002) believe that the powerful tools for encouraging KM are found in systematic identification to ensure the best KM practices can be utilised and distributed. To present the KM model, some elements need to be considered by finding hybrid solutions to incorporate both people and technology. The construction projects scenario has become more dynamic, interactive, and complicated. Suggested KM models are noted to be important factors in enhancing the competitive advantage for organisations.

The process of KM can be defined as the creation of an effective process to create, interact, and share by individuals and/or teams (Sanchez and Palacios, 2008). The comprehensive KM concept view is to manage and identifying the involvement of all processes (Yang and Wan, 2004). The effective utilisation of KM processes and the availability of suitable organisational environments should contribute to an increase in the overall organisational quality and in the quantity of individuals and teams who benefit from both explicit and tacit knowledge (Palacios, 2008). However, as discussed in chapter two, which pointed out different researchers in identifying a unique KM process model are using different terms. Each model can represent different levels of detail and focus to differentiate their perspectives from others. The majority

of literatures from overseas have different terms for the proposed processes of KM, which can be illustrated in the table 8.16:

Researchers	Type of Process
Fong and Choi (2009)	Knowledge acquisition, knowledge creation, knowledge storage, knowledge distribution, knowledge use, knowledge maintaining.
Zaim et al (2007)	Knowledge generation and development; knowledge codification and storage; knowledge transfer and sharing; and knowledge utilization.
Zack et al (2009)	Knowledge location and sharing; Knowledge experimental and creation.
Singh and Soltani (2010)	Knowledge creation, knowledge use, knowledge transfer, Knowledge protection.
Alavi and Leidner (2001)	Knowledge creation, knowledge sharing, knowledge distribution.
Mills and Smith (2011)	Knowledge creation, knowledge acquisition.
Mishra and Bhaskar (2011)	Knowledge creation, transfer, storage.

Table 8.16: type of KM processes

The analysis of questionnaires as shown in table 8.17 has found that generally most of the respondents were strongly agree with the statement provided in organisational structure and human resource management. Such as the factor of that to facilitate the exchange of knowledge throughout the organisation. There is a need to have well designed processes., which indicates around 93% were evaluated this from agree to strongly agree. Whilst most participants were strongly disagreed about the statement presented in the organisational culture and competitive advantage. For example, the statement of senior management and project managers are encouraged knowledge management in their teams and across the organisation, which can confirm that 14% were strongly disagree and 43% were disagree about the existence of this factor. It can be seen also from the chart underneath that the highest percentages were presented by to facilitate the exchange of knowledge throughout the organisation, there is a need to have well designed processes with a percentage of 57%. It was surprising to find that the availability

of organisation to have difficult and expensive knowledge management systems that are difficult for rivals to duplicate as the lowest factor where only two people who were strongly agree about this.

Key factors of KM implementation			
KM Processes		Perspectives necessary to KM adoption	
Knowledge Creation Process	There is no set of processes to acquire knowledge about suppliers and customers.	Organisational Structure	Creating knowledge should be supported by a standardised reward system.
	There is no set of processes to create knowledge across the organisation.		To facilitate the creation of knowledge throughout the organisation. There is a need to have well designed processes.
	There is no set of processes to generate from existing knowledge some types of new knowledge.		The organisation's structure should facilitate the discovery, creation, and transfer of new knowledge.
Knowledge Transferring Process	Organisation should have a specific process for organising and filtering knowledge.	Organisational Culture	There is a limitation to frequently used Collaborative and team working to capture and disseminate knowledge.
	Organisation should have a specific process to transfer explicit knowledge to individuals.		There is a limitation of Employees to understand the need for knowledge management to improve company's performance.
	Organisation should have a specific process to collect tacit knowledge from individuals into the organisation.		There is a limitation of Senior management and project managers to encourage knowledge management in their teams and across the organisation.
Knowledge Reusing Process	The utilisation of knowledge management can improve efficiency by matching problems and challenges to the source of knowledge.	Human Resources	Human resource management should be a knowledge facilitator by getting all the information needed to the right people at the right time.
	The development of new services, policies, and strategies should be based on the knowledge gained.		The implication of knowledge management practices should contribute to human resource development.
Knowledge Capturing Process	There is no set of process to protect knowledge from inappropriate use inside and outside the organisation.	Competitive Advantage	There is a limitation of organisation to have difficult and expensive knowledge management systems that are difficult for rivals to duplicate.
	Organisation should have polices and procedures to protect its trade secrets.		The organisation should uses both knowledge management and competitive advantage to increase market position.
Knowledge Components	People cannot perform and understand their own and other's tasks.	Organisational Learning	There is a limitation to often sends employees to different workshops, seminars, and conferences to acquire knowledge.
	People cannot communicate easily with specialists in the field to gain knowledge.		There is a limitation to frequently providing internal training programs and coaching sessions for staff.
	There is a need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation.		There is a limitation to make employees aware of the goals and strategies of the organisation.

Table 8.17: Key factors of KM implementation based on quantitative analysis

A number of interviewees were agreed that the PMO roles are effective for encouraging and facilitating the various processes of KM: "PMO works to link knowledge management to a

specific system that helps them create and validate knowledge assets. If PMO is the main engine of various knowledge management processes which aims at the end of the road to achieve an educated organization” (R7). Whilst respondent 5 was pointing out the important of PMO department to provide programs and coaching for project teams: “In response to your question about the programs offered by the PMO department, we have a plan to send our employees to gain knowledge and experience, as well as our work during the previous period to provide developmental and cultural programs to share experiences. The focus of the department on developing staff skills and investing optimally in creating an appropriate working environment, has positive implications for understanding and understanding the company's strategic objectives” (R5). The contribution of PMO is to develop an effective KM system that not only involves the use of technology factors but also links the employees of the organisation and connects them with experts in the same field: “The contribution of PMO is to develop an effective knowledge management system that not only involves the use of technology factors but also links the employees of the organization and connects them with experts in the same field. PMO's contribution is to rely on human activity to generate more knowledge than to rely on computer usage and communication links may not be effective. The above factors can be achieved only through PMO's role in providing appropriate training programs” (R6). It was also confirmed the availability of PMO department can: “Maximize knowledge management and disseminate its culture in the institution and to find effective programs such as PMO” (R8).

To sum up previous sections, the most interesting finding was that the application of KM processes needs to be supported by some necessary perspectives to facilitate its implementation. Another important finding was that the components of knowledge are key factors to enable its existence and achieving organisational learning based on the knowledge captured. This finding also confirms that the association between literature review and this result is obvious as there is no optimal use of KM processes and practices. These findings further support the idea of using the proposed perspectives to KM adoption. It is therefore likely that such connections exist between KM processes and perspectives to KM adoption as shown in figure 8.9. A possible explanation for these results may be the lack of adequate processes to create knowledge across the organisation, which can be addressed by to facilitate

the creation of knowledge throughout the organisation, there is a need to have well designed processes.

The integration of KM processes at different maturity levels of PMOs is assembled and configured in as in the following proposed framework. Such as, an understanding of their implementation is guided by the different maturity levels of PMO, which can help to identify, measures, and select the appropriate level according to the organisation's needs and maturity. For example, Center of Excellence PMOs can support and encourage the implementation of KM by: Build organisational memory, developing individuals' skills, increase the outcome of creativity, managing KM processes, providing training and coaching, rising awareness among people, sending employees to different workshop, and the development of standards, regulations, and practices.

Whereas the PMO department can contribute to achieve the following success factors: Spread KM culture, relay more on human activity, link KM to specific system, qualify project managers and project teams, and provide healthy working environment. Although the existence of PMO as an office can help the implementation of KM by encouraging the following aspects: Send employees to acquire knowledge, provide effective programs, center of excellence, support project managers, develop strategic plan, optimizing the working environment, and apply new policies and roles: To enforce the policies of the office to maintain valuable knowledge. However, as highlighted in this proposed framework that the adoption of KM processes have been addressed in different maturity levels of PMO, the first level have been called Primitive Phase, Developing/Initial, Individualised approaches to knowledge management using lesson learnt mentality were no-organisation interface, no PMO or effective tools to achieve practices does existed, no formal PM processes exist across the organisation or the organisation is aware of and has intention to manage its organisational knowledge but it might not know how to do so.

Maturity levels of PMO		Key Factors of KM Implementation via PMO				PMO Functions to Encourage and Support KM Processes and Practices at different maturity levels				
Level 0	Processes	Knowledge Creation	Knowledge Sharing	Knowledge Application	Knowledge Capturing					
<p>No-PMO</p> <p>Primitive Phase</p> <p>Developing/Initial</p>	<p>In general:</p> <p>Little or no intention to formally manage organisational knowledge</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Organisation and its people are not aware of the need to formally manage its knowledge resources <input type="checkbox"/> No formal processes to create, share and apply organisational knowledge <input type="checkbox"/> No specific KM technology or infrastructure in place <input type="checkbox"/> At this stage required preparation works are undertaken and KM processes and practices should be defined and planned <input type="checkbox"/> PMO in this level not aware for the important of managing project knowledge 								
	<p>Initial activities and/or enablers of KM:</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Management is aware of the need for formal KM, therefore there is a need to prepare and plan the different processes and component of KM <input type="checkbox"/> SWOT analysis, Feasibility study and requirements analysis need to consider the role of PMO in developing KM <input type="checkbox"/> Knowledge indispensable for performing routine task is documented and the current difficulties and challenges of KM should be defined <input type="checkbox"/> Organisations should undertake some basic practices to assess the initial response by PMs and project teams 								
<p>Individualised approaches to knowledge management using lesson learnt mentality – no organisation interface</p> <p>No-PMO or effective tools to achieve practices</p> <p>No formal PM processes exist across the organization</p> <p>Organisation is aware of and has intention to manage its organisational knowledge but it might not know how to do so</p>	<p>Current KM Practices</p>	<p>Contributed to the creation of wrong decisions: Do not take advantage of previous knowledge.</p> <p>Awareness and attention are missing: For contributing in knowledge management practices.</p> <p>There is a lack of interest by people: In the importance of transferring their experiences to others.</p> <p>Weak qualification of the company: Ineffective competitive advantage.</p>	<p>Personal judgement: Much of the knowledge is published only by personal judgment or not properly conveyed to decision makers because of the lack of incentives and initiatives to transfer knowledge.</p> <p>Effect the speedy and availability of knowledge: Take a long time to find the people concerned and then transferred to the beneficiary or the transfer of knowledge is only when needed.</p>	<p>Lessons learnt missing: After the completion of the projects, not all activities are documented.</p> <p>The maturity of the organisation not developing: there are not many initiatives to apply knowledge or using valuable knowledge for the change of existing policies.</p>	<p>Loss of valuable knowledge: Professional knowledge from specialists in different areas not acquired correctly. Most staff from American and European countries when they left, organization encountered great difficulties and losing important knowledge.</p> <p>Essay to access by competitors: There are no specific initiatives to acquire daily knowledge and then classify it to make it difficult to imitate by competitors.</p>					
<p>The effective roles of KM to organisational learning (OL)</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>	<p>Competitive Advantage and the Capturing of Knowledge</p>					
<p>Development of KM to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time.</p> <p>Development of KM to support the development of OL: The greater the interest in knowledge management processes, the more mature the company becomes. Knowledge management objectives can be achieved in a short time but achieving organizational learning goals needs more time.</p> <p>Learning is based acquiring knowledge: Knowledge management is a good factor to gain the best lessons and experiences. Learning is based on acquiring knowledge and developing appropriate processes to maximize their utilization.</p> <p>Peoples' knowledge is important for OL: Knowledge management helps to care for people and their role is effective in increasing the maturity of the company. Knowledge management through the mechanism of its work to benefit from previous experiences and knowledge gained and different information contribute to increase the level of learning and maturity in the company.</p> <p>KM achievement for OL: The constant change and stay in the competition reflect learning styles, as well as lessons learned to facilitate the implementation of future projects and meet challenges. Increased transparency, availability and accessibility of information, teamwork and continuous communication are all positive impacts that contribute to organisational education.</p>	<p>Perspectives necessary for facilitating KM implementation</p>	<p>There is no specific department or group of people are responsible for managing and collecting best practices: A responsible entity should be identified for the knowledge lifecycle, both in the projects being implemented and in the administrative work in the head office.</p> <p>A clear structure to create knowledge does not exist: The activation of the role of senior management should be defined in promoting the creation of knowledge.</p> <p>The role of project manager should contribute to motivate team members: To share their experiences, maximize knowledge and have beneficial returns for everyone.</p>	<p>Common language not effective: The majority of staff in construction have different language of communication according to their nationalities and cultures.</p> <p>Communication and coordination missing: Organisation needs to have a unified methodology or effective management of communication and coordination.</p> <p>Different nationalities and cultures not considered: The majority of staff in construction come from different nationalities and their cultures, attitudes, and behaviors are different than the local employees.</p> <p>Not properly supported the awareness of people to share their knowledge: Many of the employees in the project are not developing their performance and activating their role and importance in the constructive cooperation that serves the entire of the company.</p>	<p>Communication between projects and HR missing: Without a clear presence of a department or group to support knowledge management, human resources management should be involved and must be able to make use of knowledge.</p> <p>Knowledge not organised and supported: The large number of responsibilities and the lack of support for human resources management limit the appropriate sharing of valuable knowledge.</p> <p>Knowledge practices not documented: Availability, empowerment, time factor, people's ability, awareness, loyalty and dedication to work are of paramount importance in defining the role of human resources management in the application and reuse of valuable knowledge, information and experiences.</p> <p>There is no formal initiatives: Organisation must ensure valuable knowledge are in place by provide training, launch initiatives and develop incentives.</p>	<p>Attracting competencies not effective: The optimal acquisition of knowledge is the acquisition of competencies as the long-term survival of the employees with the company, this gave an indication that the company's environment is valid and that it remains committed to the rules of competition.</p> <p>Provide training programs missing: Organisation needs to provide training programs and support the rehabilitation of current employees.</p> <p>Classify knowledge not exist: knowledge should be classified for optimal acquisition.</p> <p>Protection of knowledge: Effective modern systems, processes and practices must be in place to help make it difficult to transport them outside the company.</p> <p>Governance: Competitive advantage is based on the presence of strong governance in the company, which enabling the organisation to know the relationships and tasks between the departments and projects and how to successfully manage internal and external operations.</p>					
<p>Level 1</p>	<p>Processes</p>	<p>Knowledge Creation</p>	<p>Knowledge Sharing</p>	<p>Knowledge Application</p>	<p>Knowledge Capturing</p>					
<p>Center of Excellence PMOs</p> <p>Supportive PMO</p> <p>Defined/Developed</p> <p>Project/Organisation Level</p> <p>Low-Level</p>	<p>In general:</p> <p>Adapted based on KM maturity model (Feng, 2006)</p>	<ul style="list-style-type: none"> <input type="checkbox"/> Valuing knowledge creation <input type="checkbox"/> Respecting to the originality of Knowledge <input type="checkbox"/> Learning tool <input type="checkbox"/> Plot assistant design <input type="checkbox"/> Simulation Software <input type="checkbox"/> Brain and thinking support systems 	<ul style="list-style-type: none"> <input type="checkbox"/> Facilitating informal communication <input type="checkbox"/> Electronic notice board <input type="checkbox"/> Video Conference meeting <input type="checkbox"/> Email and Chat room 	<ul style="list-style-type: none"> <input type="checkbox"/> Developing process to reuse existing knowledge <input type="checkbox"/> Interface design 	<ul style="list-style-type: none"> <input type="checkbox"/> Developing K. documentation <input type="checkbox"/> Developing repository systems <input type="checkbox"/> Electronic notice board <input type="checkbox"/> Document edit <input type="checkbox"/> Database 					
	<p>Provide the organisation with methodologies, standards, and tools to enable project teams and PMs to deliver project successfully</p> <p>To provide training and coaching and supporting the improvement of PMs and project teams</p> <p>To serve as a project repository and lessons learned</p> <p>Provide project related services or to support specific purpose</p> <p>To provide a consultative role to projects</p> <p>To set up and develop PM function within the organization</p> <p>Provides support and assistance when needed. Provide best practices and ideas to correct defects and achieve best results</p> <p>A group of experts working as a support and linking between the top management and various projects</p> <p>To initiate and increase KM awareness's and developing basic PM practices in the PMO</p> <p>To define the concept of KM in practice</p> <p>To develop Intranet and any types of networks in organization</p> <p>To develop community of practices</p>	<p>KM processes and their implementation via PMO Center of Excellence</p>	<p>Internal processes:</p> <ul style="list-style-type: none"> Creating knowledge must receive the absolute support of the PMO group and can be done through internal processes such as market research and knowledge of others in the same field. The role of PMO team members in recruiting talent or retaining managerial competencies helps to create new knowledge and activate existing knowledge. The role of PMO contributes to the creation of a set of approved measures that can be directed to decisions, procedures and practices to increase the future success of the company. PMO group contributes to supporting knowledge management objectives and documenting individual and group activities. The role of PMO should consider previous knowledge and use it to help acquire new. Supporting the initiative with proposals and recommendations and presenting views and experiences that are important in the development of the organization's environment. <p>External processes:</p> <ul style="list-style-type: none"> The external processes in terms of developing the competence and skill of the staff and the request of experts and specialists and the work of meetings and workshops to maximize the creation of knowledge and activate its role. PMO group seeks to provide the necessary capabilities and capabilities to activate the efficiency of knowledge. 	<p>Increase awareness among people:</p> <ul style="list-style-type: none"> Increasing awareness among people of the importance of sharing knowledge can maximize its important and success. <p>Appropriate rewards and incentives:</p> <ul style="list-style-type: none"> The spread of knowledge can be through developing appropriate rewards and incentives by PMO center of excellence. <p>Convert tacit into explicit knowledge:</p> <ul style="list-style-type: none"> Members of the PMO team must be qualified to transfer knowledge and create practices to participate as well as develop effective systems from time to time to keep abreast of the pace of transformation in the construction sector. The role of PMO in the transfer of implicit and explicit knowledge efficiently generates an important return for the company. <p>Flexibility (Formal & Informal):</p> <ul style="list-style-type: none"> There should be a high speed in the transfer of knowledge, especially between projects and senior management, in order to maintain the safe transfer of knowledge. Knowledge distribution channels are either formal such as training sessions, inter-departmental communication, projects and communication between the staff. Or be informal such as initiatives, debates and periodic meetings. The role of PMO must be effective in ensuring that knowledge is provided and accessible when needed as well as to ensure that such knowledge reaches as many people as possible. 	<p>Storing knowledge:</p> <ul style="list-style-type: none"> The role and contribution of PMO in applying some of the knowledge learned to increase the enthusiasm of staff that their expertise and information will be applied as a priority. <p>Best practices:</p> <ul style="list-style-type: none"> The knowledge application is increasing the validity of the PMO. If there are no absolute powers or overlap of responsibilities, there is difficulty in applying knowledge. <p>Knowledge access:</p> <ul style="list-style-type: none"> There is great importance in storing knowledge, using effective practices or using modern technology factors to make research and knowledge access easy. <p>Modern technology:</p> <ul style="list-style-type: none"> Link knowledge application with financial incentive systems and employee performance assessment. Knowledge is applied through the transformation of knowledge into operational processes. 	<p>Internal processes:</p> <ul style="list-style-type: none"> To determine the mechanism of acquisition of knowledge and who are the people concerned to take this responsibility, the rehabilitation of people and the identification of practices. Members of the PMO group have the authority to obtain any information about the status of the projects or to know what risks are likely to occur. PMO is a key to managing knowledge and defining the form of operations and their plan of action. Acquiring knowledge is through the PMO Group by raising awareness, providing means and clarifying the way to obtain information and knowledge. Acquire knowledge from different sources, internally such as repositories of knowledge, discussion and communication between departments and projects. PMO group should be responsible for the classification of knowledge types within the organization: for example, the knowledge of customers, the state of the market, the work carried out and then work to determine their importance to the organization. <p>External processes:</p> <ul style="list-style-type: none"> PMO group should be responsible for encouraging the participation of conferences and workshops, attracting qualified staff and qualifying existing staff by providing suitable training courses and coaching sessions. 				
<p>PMO Centre of Excellence possible solutions/options for encouraging KM implementation</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>	<p>Competitive Advantage and the Capturing of Knowledge</p>					
<p>Build organisational memory: Storing best practices and maintain previous experiences to be used in future projects.</p> <p>Developing individuals' skills: PMO contributes to the development of skills in individuals by mixing experts with fresh graduates employees.</p> <p>Increase the outcome of creativity: Motivate employees to come up with new ideas and initiatives that can contribute for increasing business performance.</p> <p>Managing KM processes: The dissemination of useful ideas, facilitate more effective cooperative processes, ensure continued knowledge acquisition and organizational learning.</p> <p>Providing training and coaching: It is possible to activate the role of the Center of Excellence PMO in providing training courses.</p> <p>Rising awareness among people: Contributing to raising awareness among people of the importance of the existence of this concept and that if implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general.</p> <p>Sending employees to different workshop: The role of PMO is noticeable in providing great support in sending administrative competencies to develop them and to attract qualified competencies.</p> <p>The development of standards, regulations, and practices: The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company.</p>	<p>Perspectives necessary for facilitating KM implementation via PMO Center of Excellence</p>	<p>Approval or rejection with appropriate recommendation:</p> <ul style="list-style-type: none"> The concept of PMO works to turn the life of the demand from one hand to another and then resubmit the application with approval or rejection with the appropriate recommendations. A large number of knowledges are created and organisation needs to have a mechanism or a detailed structure of knowledge rotation. <p>Linking different projects and departments:</p> <ul style="list-style-type: none"> The PMO group should have a detailed structure for the performance of the work of the knowledge management process and who are the people concerned and what means will be used and what is the importance of managing this knowledge to the people and the interest of the company as an entity. <p>Knowledge rotation:</p> <ul style="list-style-type: none"> PMO's role is to create an organizational structure that promotes knowledge exchange among different units and that knowledge is not created in places and is blocked elsewhere. PMO Group in the structure of the company are supportive and advisory, which working to restructure the company in line with the information and knowledge of the internal and external activities. 	<p>Regulatory framework:</p> <ul style="list-style-type: none"> The role of PMO helps to spread a single regulatory framework, which reduces the resort to always more severe measures. <p>Standards and policies:</p> <ul style="list-style-type: none"> The role of PMO should consider 3 fundamentals in achieving organizational culture: values - standards - practices. <p>Teamwork and collaboration:</p> <ul style="list-style-type: none"> PMO team members and project managers should be aware of their role in promoting knowledge transfer. Understand the importance of the role of PMO team members in supporting best practices and promoting teamwork and collaboration. Understand the importance of knowledge sharing and how it helps to develop the maturity of the company and how it is reflected in ensuring individuals for their jobs and the possibility to develop their skills and achieve their goals. 	<p>Guide HR to select the right training:</p> <ul style="list-style-type: none"> The PMO team should support human resources management and guide them on the quality of training programs that the company really needs. <p>Linking staff with firms' strategies:</p> <ul style="list-style-type: none"> The PMO's role is to educate, motivate and equip employees to take advantage of technology in acquired knowledge or through a good knowledge of practices. <p>Recommendation:</p> <ul style="list-style-type: none"> Informing leading employees to maximize the role of knowledge and loyalty of employees in the development of company strategies. PMO's role in prioritizing the company in acquiring business that meets the stakeholders' orientations. <p>Clarify duplication and overlapping of powers:</p> <ul style="list-style-type: none"> There is a direct relationship to the role of human resources and PMO, but the responsibilities of each party must be determined so that there is no duplication or overlapping of powers. Clarify what processes and practices should be changed or developed according to the market situation. 	<p>Lessons learnt:</p> <ul style="list-style-type: none"> PMO should act quickly to acquire knowledge from current staff and knowledge from competitors in the field. Speed in doing business by taking advantage of previous experiences and knowledge. <p>Protection of knowledge:</p> <ul style="list-style-type: none"> To monitor business on a continuous basis and not to allow competitors to benefit from hiring employees and transfer their valuable knowledge. <p>Balancing resources:</p> <ul style="list-style-type: none"> The provision of appropriate means and the distribution of resources based on good knowledge in terms of the need for different organisation's projects. 					

Maturity levels of PMO		Key Factors of KM Implementation via PMO				PMO Functions to Encourage and Support KM Processes and Practices at different maturity levels				
Level 2	Processes	Knowledge Creation	Knowledge Sharing	Knowledge Application	Knowledge Capturing					
<p>PMO Department</p> <p>Controlling PMO Managed/Monitor Organisational Unit PMO/Divisional PMO Departmental Level Moderate-Level</p> <ul style="list-style-type: none"> ➤ Provide control for business services or units ➤ To integrate PM with the organisational goals and strategies ➤ To adopt PM framework or methodologies ➤ To apply specific templates, forms, and tools ➤ Link project management practices to trade ➤ Provides appropriate reports on the status of different projects ➤ To manage project's knowledge in the PMO and integrating KM with organizational strategy ➤ To establish a unit to take the responsibility and accountability of KM ➤ To provide systematic for supporting KM ➤ To establish and develop standard for KM ➤ To develop KM sub processes 	<p>In general:</p> <p>Adapted based on KM maturity model (Feng, 2006)</p>	<ul style="list-style-type: none"> ❑ Developing knowledge creation strategies ❑ Establishing formal knowledge creation ❑ Data mining ❑ Documentation Search ❑ Knowledge detection tools ❑ Idea implement assistant tools ❑ Case-based reasoning systems ❑ Pattern simulation 	<ul style="list-style-type: none"> ❑ Establishing and developing formal channels for sharing knowledge ❑ Education and Training ❑ Enhancing the security of knowledge sharing ❑ Search engine ❑ Knowledge list ❑ Knowledge map ❑ Content-based original Search ❑ Online learning systems Expert yellow page ❑ Expert training systems ❑ Seminar and workshops 	<ul style="list-style-type: none"> ❑ Developing systems to support knowledge application ❑ Dividing the work areas to related functions ❑ Expert systems ❑ Work process systems ❑ Online prompt analysis ❑ Decision support systems 	<ul style="list-style-type: none"> ❑ Developing processes for refining knowledge ❑ Knowledge conformity check ❑ Storing knowledge in suitable place ❑ Data Repository ❑ Data storage ❑ File management systems ❑ Case-based reasoning systems ❑ FAQ ❑ Work process systems ❑ Expert systems 	<p>Feedback:</p> <ul style="list-style-type: none"> • Setting up a suggestions box, listening to views, stifling the role of people, developing good motivators. <p>Knowledge classification:</p> <ol style="list-style-type: none"> 1- Knowledge of trade: procurement and sales, resource management and strategic plan. 2- Knowledge of techniques: the importance of bringing tools and devices and processes that increase productivity and reduce the effort, time and cost. 3- Product knowledge: product quality, customer satisfaction and price competition. 4- Project management knowledge: Key processes in project management, time management, costs and resources. 5- Knowledge of administrative organizations: the role of communication, coordination and cooperation in the acquisition of knowledge. <p>Knowledge identification:</p> <ul style="list-style-type: none"> • A good background on the company's strategies and the extent to which projects are completed, which can help to choose and identify the appropriate knowledge and how to share them with owners. <p>Knowledge selection:</p> <ul style="list-style-type: none"> • The role of PMO in increasing knowledge readiness for each time and place helps to optimize acquisition of knowledge. 	<p>Externalisation:</p> <ul style="list-style-type: none"> • Creating knowledge can be gained through the department's role in stimulating research and development, learning lessons and creative thinking. • This process focuses on linking implicit and explicit knowledge. The creation of knowledge takes place through the extraterritorial realization of implicit knowledge to become collective knowledge. • External factors such as interaction with customers, suppliers and stakeholders. <p>Internalisation:</p> <ul style="list-style-type: none"> • The department also develops performance standards to evaluate and document all knowledge processes. <p>Nonaka's model:</p> <ul style="list-style-type: none"> • Knowledge creation initiatives have been designed through the implementation of the SECI concept, which reflects processes and practices within and outside the company, as well as assessment of teamwork and knowledge of community coordination and outreach. <p>Socialisation:</p> <ul style="list-style-type: none"> • The role of PMO should be effective in achieving the necessary support. Knowledge creation is built on innovation, invention, initiative and loyalty by employees to create new knowledge that helps develop the system. • The PMO should focus on creating knowledge through practice, teamwork, communication and education. The role of PMO must work to achieve these goals. • Knowledge is created through the use of certain practices such as business monitoring, discussion of activities, analysis of results. <p>Transformation:</p> <ul style="list-style-type: none"> • Knowledge creation is done by transforming knowledge into practices and activities that can be used to maximize the spread of knowledge. 	<p>Communications channels:</p> <ul style="list-style-type: none"> • The presence of such knowledge when needed or in future uses determines the role and importance of the PMO's performance in the company. • Effective communication between departments and easy access to knowledge has a positive impact in knowledge transfer. • PMO presence is an important factor in increasing the growth and maximization of knowledge by sharing, communication, exchange of ideas, skills and experiences. <p>Knowledge content:</p> <ul style="list-style-type: none"> • Transferring knowledge can be done by one of the components of knowledge - people, technology or processes. • Knowledge transfer can be done informally about the way people interact daily in work environments. • The Department's work on the transfer of knowledge in a timely manner at the appropriate place helps to spread knowledge and increase its importance. <p>Rewards programs:</p> <ul style="list-style-type: none"> • Making knowledge formal, training and continuous development, using effective systems, stimulating the role of consulting, creating opportunities and linking them with bonuses and rewards. <p>Transformation of knowledge types:</p> <ul style="list-style-type: none"> • Before attempting to disseminate a culture of knowledge management and its importance, focus on ensuring that the culture of the PMO concept is well known. Because the role of the PMO department cannot be done if we neglect to spread the culture and importance of this concept. • The role of PMO in the control of administrative regulations and projects can transfer important knowledge to stakeholders and senior management. 	<p>Availability of knowledge:</p> <ul style="list-style-type: none"> • The readiness and ease of use of knowledge is what determines the success of knowledge management. • The role of PMO in applying knowledge should be concerned with these processes: <ul style="list-style-type: none"> 1. Optimal use. 2. Reuse when needed or in new project. 3. Maximize the use of content. <p>Life-cycle of knowledge:</p> <ul style="list-style-type: none"> • PMO must stimulate good knowledge implementation, linking the knowledge management strategy with the corporate strategy as a whole. • PMO department should be the main reference for applying the knowledge and confirming its role and then documenting it • The knowledge map should be started and ends at the PMO department. <p>Quality of knowledge:</p> <ul style="list-style-type: none"> • Urgent solutions to enterprise problems as well as low reliance on experts in the implementation of business, and easy access to accurate information and increase the contribution of people to know the importance of knowledge gives good impressions on the optimal use of knowledge. • Knowledge that cannot be applied or used to solve problems or that do not help to grow and adapt factors is costly and redundant knowledge • PMO's knowledge of the company's corporate objectives, strategies and outlook and its knowledge of current business performance and strengths and weaknesses in the company, through which it can identify what knowledge can be reused and what knowledge is not needed in their application. 	
	<p>PMO department possible solutions/options for encouraging KM implementation</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>					<p>Competitive Advantage and the Capturing of Knowledge</p>
<p>PMO Office</p> <p>Directive PMO Optimised/ Strategic Regional or Centralised Enterprise Level Advanced-Level</p> <ul style="list-style-type: none"> ➤ To provide directive roles to align projects and organisations units to corporate strategy and ensuring appropriate enterprise governance ➤ To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organisation ➤ To insure all PM practices are applied across the entire organisation ➤ Effective strategies and continuous development of practices that suit the way the firm works ➤ An effective leadership role in guiding projects with unlimited powers and responsibilities ➤ To optimize the KM system in the PMO ➤ To Put control in place for all KM processes and activities ➤ To integrating the KM processes and procedures ➤ To continuously improving the KM processes and procedures 	<p>In general:</p> <p>Adapted based on KM maturity model (Feng, 2006)</p>	<ul style="list-style-type: none"> ❑ Developing the knowledge creating sub-processes ❑ Measuring the knowledge creating success 	<ul style="list-style-type: none"> ❑ Developing the knowledge sharing sub-processes ❑ Measuring the knowledge sharing success 	<ul style="list-style-type: none"> ❑ Developing knowledge app. sub-processes ❑ Measuring the knowledge application success 	<ul style="list-style-type: none"> ❑ Developing the K. storage sub-processes ❑ Measuring the K. storage success 	<p>Categorizing the knowledge:</p> <ul style="list-style-type: none"> • Categorizing the knowledge correctly by PMO and determining its type can increase the company position in the market. <p>The ease, speed, and relevance of knowledge:</p> <ul style="list-style-type: none"> • The ease, speed, and relevance of different knowledge to the right people can be used as a competitive advantage. 	<p>Dissemination and sharing of knowledge:</p> <ul style="list-style-type: none"> • This can be done through a comprehensive map of knowledge and the dissemination of its culture and its importance among all departments of management and projects. <p>Organising and coordinating knowledge:</p> <ul style="list-style-type: none"> • The role of the Office should not only be to encourage the dissemination and transfer of knowledge but also to identify appropriate processes in organizing and coordinating knowledge priorities. • There is a huge amount of information, many of which can be classified as valuable knowledge or excessive knowledge of the need of the organisation. <p>Transfer and submission of knowledge:</p> <ul style="list-style-type: none"> • This is through the creation of channels of direct and indirect communication between projects. Identify a list of important knowledge. It is also possible for the office to register some public meetings or courses and then publish them using modern means of communication. • The Office's initiative to make periodic meetings could be a good support for knowledge transfer. As well as through daily / weekly / monthly or annual reporting. <p>Transformation of knowledge types:</p> <ul style="list-style-type: none"> • Transformation of explicit and implicit knowledge into knowledge that the company benefits in a simplified and clear way. • The explicit knowledge: the Office shall transfer to individuals. For example, knowing the methods of administrative regulations, the Office is familiar with the new staff, or it is possible for the staff member to correspond to the departments of the office and to ask the question and wait for the response of the Office. • The implicit knowledge: the office must be transferred from individuals or the team to the company's system, for example, technical skills and effective solutions and constructive ideas. The Office records evaluates their applicability and dissemination to meet business needs. 			
	<p>PMO office possible solutions/options for encouraging KM implementation</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>			<p>Competitive Advantage and the Capturing of Knowledge</p>		
<p>Level 3</p>	<p>Processes</p>	<p>Knowledge Creation</p>	<p>Knowledge Sharing</p>	<p>Knowledge Application</p>	<p>Knowledge Capturing</p>	<p>Employees are knowledgeable about their tasks:</p> <ul style="list-style-type: none"> • The project-teams are completely aware of their assignments, which given to them in details by the PMO office. <p>Standardizing reports system:</p> <ul style="list-style-type: none"> • Creating the knowledge can be done by receiving periodic or monthly reports from project managers or by sending the assignees by the office to provide the necessary support. <p>Increase the awareness's of people:</p> <ul style="list-style-type: none"> • People by knowing and understanding the value of knowledge for achieving their needs and improving business performance can then participate in its achievement. <p>Linking PMO structure with different projects:</p> <ul style="list-style-type: none"> • The organizational structure of the project is independent but the PMO structure is tied to all the company's projects. <p>Collective decisions making process:</p> <ul style="list-style-type: none"> • Since PMO does not rely on one person or a specific department to implement and manage tasks. The nature of the work of the office depends in its style that the process of making a particular decision must be taken by more than one person and here can create a lot of important knowledge. 				
	<p>Level 3</p>	<p>Processes</p>	<p>Knowledge Creation</p>	<p>Knowledge Sharing</p>	<p>Knowledge Application</p>		<p>Knowledge Capturing</p>			
<p>PMO Office</p> <p>Directive PMO Optimised/ Strategic Regional or Centralised Enterprise Level Advanced-Level</p> <ul style="list-style-type: none"> ➤ To provide directive roles to align projects and organisations units to corporate strategy and ensuring appropriate enterprise governance ➤ To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organisation ➤ To insure all PM practices are applied across the entire organisation ➤ Effective strategies and continuous development of practices that suit the way the firm works ➤ An effective leadership role in guiding projects with unlimited powers and responsibilities ➤ To optimize the KM system in the PMO ➤ To Put control in place for all KM processes and activities ➤ To integrating the KM processes and procedures ➤ To continuously improving the KM processes and procedures 	<p>In general:</p> <p>Adapted based on KM maturity model (Feng, 2006)</p>	<ul style="list-style-type: none"> ❑ Developing the knowledge creating sub-processes ❑ Measuring the knowledge creating success 	<ul style="list-style-type: none"> ❑ Developing the knowledge sharing sub-processes ❑ Measuring the knowledge sharing success 	<ul style="list-style-type: none"> ❑ Developing knowledge app. sub-processes ❑ Measuring the knowledge application success 	<ul style="list-style-type: none"> ❑ Developing the K. storage sub-processes ❑ Measuring the K. storage success 	<p>Classification of knowledge:</p> <ul style="list-style-type: none"> • By specifying the file management system from the identification of the sender and recipient and the type of knowledge. • The acquisition of knowledge must be built on both internal and external factors to achieve maximum benefit. • The classification of knowledge of what suits and fits the direction of the company gives a positive impact to the acquisition of knowledge. <p>Identification of knowledge:</p> <ul style="list-style-type: none"> • By identifying experts and giving them the necessary powers. As well as ways of identifying tools for the detection of knowledge or the optimal use of information technology. • There must be specific procedures through which knowledge is secretly identified and to best acquire the knowledge of qualified personnel before leaving the company walls. <p>Storage of knowledge:</p> <ul style="list-style-type: none"> • By defining the system of controlling and arranging documents through official or informal events, as well as building an integrated database and reference through the Office. • The company must always have effective processes, policies and procedures to stored acquired knowledge and help prevent it and make it more difficult to be transferred to competitors. <p>Selection of knowledge:</p> <ul style="list-style-type: none"> • By defining the system of querying knowledge and repeating questions. • The role of PMO office is should focus on trying to bring or acquire foreign knowledge from other companies in the same field or by taking advantage of the company's current knowledge and turn it into an added value through which the company can increase the success rates. 				
	<p>PMO office possible solutions/options for encouraging KM implementation</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>		<p>Competitive Advantage and the Capturing of Knowledge</p>			
<p>PMO Office</p> <p>Directive PMO Optimised/ Strategic Regional or Centralised Enterprise Level Advanced-Level</p> <ul style="list-style-type: none"> ➤ To provide directive roles to align projects and organisations units to corporate strategy and ensuring appropriate enterprise governance ➤ To lead all the activities and procedures to enable the operation of common standards of PM within all projects that undertaken by the organisation ➤ To insure all PM practices are applied across the entire organisation ➤ Effective strategies and continuous development of practices that suit the way the firm works ➤ An effective leadership role in guiding projects with unlimited powers and responsibilities ➤ To optimize the KM system in the PMO ➤ To Put control in place for all KM processes and activities ➤ To integrating the KM processes and procedures ➤ To continuously improving the KM processes and procedures 	<p>In general:</p> <p>Adapted based on KM maturity model (Feng, 2006)</p>	<ul style="list-style-type: none"> ❑ Developing the knowledge creating sub-processes ❑ Measuring the knowledge creating success 	<ul style="list-style-type: none"> ❑ Developing the knowledge sharing sub-processes ❑ Measuring the knowledge sharing success 	<ul style="list-style-type: none"> ❑ Developing knowledge app. sub-processes ❑ Measuring the knowledge application success 	<ul style="list-style-type: none"> ❑ Developing the K. storage sub-processes ❑ Measuring the K. storage success 	<p>Developing the HR system:</p> <ul style="list-style-type: none"> • Contribution of knowledge in the development of human resources management work system, both within the PMO office or through its presence in the enterprise environment. • The PMO office can help to develop and expand the Human Resources Department, such as the creation of a training and development unit that is concerned with assessing the need for staff to develop their skills and capabilities. <p>Developing the skills, expertise, and capabilities:</p> <ul style="list-style-type: none"> • Contribution of knowledge in developing the skills, expertise and capabilities of the members of the working group. • The PMO concept not only relies on human resources management in knowledge management but relies on all other management departments as well as the knowledge gained from implementing different projects. 				
	<p>PMO office possible solutions/options for encouraging KM implementation</p>	<p>Perspectives</p>	<p>Organisational Structure and the Creation of Knowledge</p>	<p>Organisational Culture and the Sharing of Knowledge</p>	<p>Human Resource Management and the Application of Knowledge</p>		<p>Competitive Advantage and the Capturing of Knowledge</p>			

Figure 8.9: Proposed conceptual framework

8.5 Summary

As has already been discussed, the concept of KM is to share, reuse, capture, and identify the important knowledge held by employees. Similarly, PMOs can act as centers, mentors, and can give guidance in a wide range of practices. The storage and collection of project knowledge, the methods used and models, and the lessons learned can be centralised by the PMO. The utilisation of some records that relate to project performance, such as variable analysis, risk lists, updates in initial plans, status reports and others pertaining to unsuccessful or successful experiments, should be stored in some formal standards or databases to make them accessible for the future projects. Competitive advantage seems to be one of the main benefits of gaining effective knowledge, which is based on intellectual assets rather than physical assets. When employees leave the organisation, their information, ideas, experiences, and insights will be lost if there is no clear attempt made to save the information. KM, in order to be utilised, needs to be transferred and stored in the company's memory; it needs to show its effective contribution to improving business performance. It can be concluded that the idea of KM has a direct impact on collaborative decision making, innovation, and individual and collective learning, which in turn acts to improve organisational performance.

The benefits of KM for construction companies are considered to be high. KM can offer many benefits, such as taking advantage of cost savings, facilitating collaboration, increasing employee productivity and solving problems faster based on previous knowledge. The nature of construction projects requires various parties to be involved in project tasks. The smooth flow of effective knowledge can be difficult and raises some issues, such as cost and time overruns, disputes, and extensive reworks. KM plays a key role in clarifying and facilitating knowledge transfer among different phases of the project. Others are seeing the existence of KM in construction as being summarised into these benefits: activity improvement, best practice gathering, productive collaboration, intelligence enhancement, productive information use, and intellectual capital storage. The existence of the PMO should support KM by providing a set of solutions as suggested in each maturity level of PMO in order to overcome any potential obstacles. PMOs with effective knowledge and authority can be responsible for selecting the right people for the right task at the right time. PMO can enable the spread of knowledge through the whole organisation in many ways as: By allowing and advising people to share knowledge and learning with each other. By providing tools and techniques to collect knowledge and avoid their loss. PMOs should lead project managers to implement knowledge management to increase people's abilities to conduct matters more effectively.

Chapter Nine:

Validation of the research results

9.1 Introduction

This chapter is provided to ask experts in the field of interest to validate the developed conceptual framework. For increasing the validity, this research conducted a number of four interviews with experts where they were asked to provide their level of agreement with the finding at each level.

9.2 Validation procedures and the selection of experts

This research adopted several ways to verify the findings to gain more credibility. First of all, the approach of applying mixed methods to increasing the research validity and credibility have been considered (see chapter five). This chapter will firstly highlight some procedures that the research adopted in order to gain proper results and increasing the level of validity. Secondly, it will discuss the four interviews that were done with experts in the field of interest and outline how each interviewee was selected to represent each maturity level of the PMO. The process of conducting the interviews is to hear from participants their opinions and to allow them to provide their level of agreement with the finding at each level (Golafshani, 2003). Golafshani (2003) defined the validity as when the researcher trying to measure what was intended to measure or the procedures of checking the results are truly investigated. Joppe (2000) defines the reliability concept as the process of testing to what extent the findings are an accurate means of representing the whole population and whether the findings are consistent over time.

Kennedy (2009) proposed triangulation to combine different methods to increase the strength of findings and to ensure a reliable outcome. Further, Kennedy (2009) suggests that triangulation can achieve full explanation and map out the richness of findings by attempting to study the problem from more than one perspective. Mertens and Biber (2012) argue that the validation of data not the only job can be performed by triangulation, but it contributes to deliver deeper understanding for both methods as well as it acts to enhance innovation while framing the conceptual. Based upon the overlapping between methods, triangulation can be appropriate for balancing each method out and providing a richer outcome. However, this

research assumes that the triangulation is used to combine the three data sources namely: the literature review, the Questionnaire, and the Interviews. Each source of data is used in this study to provide a philosophical starting basis.

Mixed methods research have also been defined by Creswell (2015) as an approach for gathering both quantitative methods (closed ended questions) and qualitative methods (open ended questions), then integrating these methods and drawing interpretations to understand the problem of the research and to maximize the validity of the research. The secondary data have been identified throughout the literature review. The type of questions and important features for designing the questionnaires were formulated from the findings of literature review. Otherwise, the collection and analysis of the first phase (Questionnaires) were used to inform and formulate the types of questions for the second phase (Interviews). The integration occurred after the data analysis of each phase. In this case the qualitative could provide a better understanding of the research problem and proposing solutions. The design of the qualitative study was based on what was learned from the quantitative results. By collecting both quantitative and qualitative data in separate phases, the research falls under the Sequential procedure (Creswell, 2015).

The data collection procedures whether to identify the strategies of sampling or the approaches that this research have been used for validating the data as discussed largely in chapter six and seven. Before conducting the actual study, the questionnaires were sent to a number of ten qualified people to pre-test and pilot the study. Saunders at al., (2009) and Gill and Johnson (2010) suggest that pretesting the questionnaire can help to improve and determine the strengths and weaknesses by trying out question format, wording and order. It is also used to measure the quality of questions and to understand whether the questions gather the intended information or not. However, in the actual study, the data was collected randomly from medium to large organisations from multiple locations in the KSA. The survey questionnaires have been distributed equally to two groups, namely; project-based groups and office-based groups and there was an equal probability for each individual to be selected in this sample. A number of 340 of questionnaires were distributed to employees from different positions under these two groups. The respondent's positions in the organisations were various and included the following positions: PMO Leader, PMO Administration, Project Managers and Head of Departments, Operators (Engineers and Staff).

Using the whole population for every research study would be superlative. To include every subject of the population is not possible due to the population size and time constraints. However, convenience sampling was used in this research study to represent and reflect on the whole population. Battaglia (2008) and Cresswell and Clark (2011) define convenience sampling as a type of non-random or non-probability sampling technique. The target population of members were selected upon meeting certain practical criteria. Sixteen personal interviews were conducted and distributed to four main levels that represented different maturity levels of the PMO. Four interviews were conducted at each level independently. The interviews were divided into two main groups. The first groups included the PMO division with PMO leaders, teams, and the managers of different departments in senior management. The second group was the various project managers who work away from the PMO in the execution of projects and the nature of whose work is related to the head office. By applying those procedures, the research was trying to achieve validity and to gain more accurate results, with the possibility of comparing them with a similar example at the same level to ensure the optimal selection of the sample of the study.

9.3 Results from the Validation

To test and maximise the reliability and validity, participants have been invited to answer the following five questions to appraise the validity of the main features of the developed conceptual framework:

1. Does anything seem out of place or unnecessary?
2. What features are missing or are there things that you think should be added?
3. To what extent do you think this conceptual framework can be applied to address KM issues and to increase the importance of the PMO?
4. How likely or unlikely is it that this framework would be implemented in your organisation? And do you think your team can understand what it does?
5. In general, how do you see the design of the framework? The distribution of factors? And the presentation of maturity levels?

The first question was sought to evaluate whether anything seemed out of place or unnecessary. Expert RV02 did feel that the general variables that called Feng (2006) of the KM processes may not be completely needed at the beginning of each maturity level: *“I did not understand what the purpose is of putting the general factors in each level and then the development of other factors after. I see that this distracts the concentration of the structure and the achievement of its goals”*. Similar to this, RV03 found it difficult to understand how these general factors should be introduced: *“I do not know how the general factors were initially associated with the rest of the factors as described in the knowledge processes at the beginning of each level. Are these factors a summary, or they are the main factors. So, I see it is not in place. May be unimportant or are general factors for knowledge management regardless of the sector to be applied. Therefore, I would like to raise this question in terms of whether these factors only fit the construction sector? From my point of view, the factors reached are suitable for all sectors, even with different geographic regions”*.

Further, RV01 suggested that these factors should be removed to facilitate the appropriate selection between PMOs levels: *“I think only the general factors of the theory of Feng (2006) can be removed completely. Since I am a beneficiary I want to have only what I can apply into my organisation. At the level where PMO is not available, I do not know why the relationship between knowledge management and the organisational learning has been developed. I think its place is inappropriate, why are not general factors drawn to be placed here and called a summary of current practices of knowledge processes, and only primitive practices should be retained”*. However, RV04 would have liked to see more clarification that divided the current practice without the existence of PMO and the suggested three levels of PMOs as best practices: *“The level at the beginning of the structure design is completely different from the rest of the levels. I know of the lack of a PMO concept in it as described in the structure, but I think it does not fit with the rest of the levels. Therefore, it was suggested to further clarify that this level reflects current practices both for different knowledge management processes and other important practices related to supporting these processes”*.

The experts were further invited to validate if there were some features that might be missing or things that respondents believed should be added. Expert VAL01 highlighted that, whilst the organisation had already attempted to develop their strategies using different approaches,

this developed framework should include at the beginning one sentence to state that organisation should select the appropriate level in line with their maturity: *“I believe that a simple introduction or text box should be developed before starting to evaluate the structure. This in order to fits theses different types ideally with the company needs. Also, I see that the introduction of a sentence or two simple sentences to illustrate the importance of this framework and give a simple background about it”*. RV02 only suggested that: *“I think that if the numbering of possible factors provided by PMO in each level will be better. These functions can be called PMO's main tasks to promote knowledge and facilitate their various operations”*.

However, both RV03 and RV04 believed that it was important to show how the suggested four processes of KM interact with each other: *“I think it is better to determine what processes come first and second and so on. Or whether processes are linked to each other and reflect the life cycle of knowledge at each level. I think putting a simple format for this relationship at each level will increase the success rate of applying this proposal”*. In addition to this, RV04 added that: *“Are the processes placed sequentially or according to the importance or mechanism of action through PMO. I think that should be explained somewhat. I do not know why the educated organization was first addressed. Is the primitive level only to illustrate the current factors and issues facing knowledge management processes? Will this particular part be addressed at other levels after PMO is present by three proposed solutions representing the different types of this concept? Therefore, why are not they separated by current practices as a first stage and preferred practices as a second phase divided as described in the framework”*.

The interviews revealed a number of success factors by implementing this framework that lead to increase project success rates and improved business performance. This can be seen by analysing the question that asked: to what extent do you think this conceptual framework can be applied to address KM issues and increase the importance of the PMO? Taking expert RV03 as an example who was completely satisfied with importance of this conceptual framework: *“I am fully agree on the importance of this proposal to promote and facilitate knowledge management processes. Also, it is clear that there are many factors proposed in each process, whether major or subsidiary. More importantly, this structure has touched on other key roles that can be performed by the PMO and explained by this structure as important perspectives related to the above processes”*. The identification of a single perspective offered by the PMO to facilitate each process of KM and the presence of a full summary of the importance of each

level were the most interesting parts, as suggested by RV01: *“The identification of four key knowledge management processes specifically helps to identify which factors can be addressed by PMO. I think that the factors that the research contributed to offer them can give more detailed implications for each process when compared with the general factors that were selected to compare with this research. The most interesting aspect of the framework is that it has identified a single perspective to facilitate the performance of the work of each process, clarifying this overlap with the role of PMO. This gives more comprehensive solutions to the problems and difficulties of knowledge. Also, as shown in the left of the framework it can be seen that there is a good summary of PMO's mechanism of knowledge management”*.

Otherwise, RV02 illustrated the widespread importance of the PMO currently: *“The concept of PMO I think it has become of interest by both public and private sectors. But knowledge management is noticeably flawed, and many officials overlook this important aspect, which can reduce losses and time, increase profits and mature the institution. This structure I see is very appropriate and straightforward in terms of determining the appropriate factors for each level”*. RV04 agreed on the important relation between PMO and KM and confirmed that each one can support the other: *“The concept of PMO has become incredibly widespread now that it has become a reliable and true methodology in the application of various project management practices and has a large role and the team always selected for this concept represents a group of qualified people who have sufficient experience in this area. I believe that its proper application and the necessary support will address and increase the importance of acquiring different knowledge”*.

The validation of this developed framework included two questions that mainly focused on attempting to understand how this framework could be applied in practice. The questions of how likely or unlikely is it that this framework would be implemented in your organization and how far do you think your team can understand what it does, illustrated that the four interviewees felt that, after the process of reviewing this framework, it would be possible to implement it in their organisations. Expert RV01, in line with his agreement, added that the PMO teams should be able and knowledgeable to teach the project teams how to apply PMO main roles and adopt its main directions: *“Yes, of course, by identifying 3 different types of PMO's mechanisms, I can choose the appropriate level and then see what factors it contains. I think it is inappropriate to pay attention to the theory introduced since it did not give radical*

solutions to knowledge management. From my personal point of view, it is possible to remove it from the framework in order to be clearer and reach directly to the beneficiaries. I can assure that our PMO team has the ability to reach all the employees in the company faster and in case of any defect we can provide support and inform everyone about how this structure works". In addition to this, RV02 also added that there a great opportunity to implement this framework to overcome the main project issues: "Certainly, we can apply it as well as our PMO team can activate it and work to help other sections to contribute to achieve it. I think that if the team has sufficient experience and is properly qualified he can know the importance of these factors and solutions more quickly and more effectively".

Furthermore, RV03 suggested that this approach often resulted in internal and external benefits, as he mentioned that they are currently doing similar approaches to this framework: *"I think we are doing similar work in these tasks in terms of our role as a center of excellence and development and building an educated institution and the contribution of our PMO in achieving competitive advantage. Therefore, I certainly see the possibility of its application effectively".* The implementation of this framework can be more successful and achievable to deliver its function: *"I think it is very excellent, strong and direct. Therefore, do not be surprised by its application and success, especially in the construction projects and how to manage its various projects and complex. I do not think it's complicated so that our team members cannot understand and apply it" (RV04).*

Once again, interviewees were asked to clarify the need to consider in general, how they see the design of the framework? The distribution of factors? And the presentation of maturity levels? RV01 criticised again the lack of introducing the general factors (as he stated in answering the first question) and believed that otherwise the framework is doing the job and looks very organised: *"Design is more than good in general, but I have a reservation on the general factors and I think its existence is not useful. Also, why these levels not separated, and a simple note is put for example: before looking at the framework the decision makers should determine which type of PMO they currently have and then go to the specified type only. That's because I see that there are too many factors, either major or subsidiary, that are difficult to apply by one company".* Interviewer RV02, did identify some potential areas for improvement, suggesting that it would be useful to separate the proposed maturity levels from each other due to their differentiation in achieving certain objectives: *"Design is appropriate and simple to*

understand and can be applied. But in my opinion, it is better to separate these levels from each other because there is a big difference in the mechanism of their work and there could be a difference in factors or similarity between them. This would limit the work mechanism of this structure”.

It also became clear that the function of the PMO can be divided into different categories as suggested by RV02: *“The design is very good and sequential from bottom to top, it is noted that he first addressed the current practices at the level where PMO is not present and then addressed the possible solutions in the next three levels, which expressed the types and maturity levels of the concept of PMO”.* RV04 pointed out the following advantages to this framework: *“I believe that maturity levels are quite clear and appropriately detailed. The design is very good and the factors that are related to each other are mainly set and colored. Also, the difference in color quality between level and another gives quick recognition of each level separately”.*

9.4 Chapter Summary

To confirm the validity of the research project’s conceptual framework, several validation processes have been considered. Interviewees have been asked to answer five questions to provide their level of agreement. This interview has been conducted with a number of four experts in this area drawn from across the KSA. A number of interviewees agreed that the framework offers a potential solution that different maturity levels of PMOs are effective for encouraging and facilitating the various processes of KM. The contribution of this framework is to develop an effective KM system that not only involves the use of technology factors but also links the employees of the organisation and connects them with experts in the same field. The relation between KM and organisational learning reflects on the maturity of the organisation. As a result of this relation, organisations would deal with this framework as a comprehensive solution to improve business performance. Both PMO and KM depend upon each other and the success of managing construction projects can be built upon their successful relations. Finally, based on the analysis processes of conducting this validation, this research will consider these main findings and place them into a final conceptual framework.

Chapter Ten:

Conclusion and Research Contributions

10.1 Introduction (Overview)

The main purpose of this chapter is to present the overall conclusions and to show how the research contributes to the generation of new knowledge for both academic relevance, “general knowledge” and practice relevance (in the KSA context). This chapter will also highlight the research limitations and recommendations for future study.

10.2 Overall Conclusion

The complexity of today’s construction projects and the increasing competition between construction firms, as well as the larger involvement of multidisciplinary and multinational organisations within the construction industry, are convincing construction firms to be more innovative, project oriented, and knowledge driven (PMI, 2008; Kerzner, 2012). Project Management (PM) and Knowledge Management (KM) are crucial in developing business performance. The application of PM is used to employ appropriate knowledge, techniques, skills, and processes to meet the organisation’s requirements (PMI, 2008; Kerzner, 2012; APM, 2012; Alsahli, 2013). The application of KM helps to improve project activities and to secure project success by using the proper knowledge at the right time (Egbu et al; 2001, Carrillo et al, 2004; Ahmad and An, 2008; Hislop, 2009).

However, the management of construction projects is different in many aspects than general PM approaches. Construction projects require an understanding of many aspects, such as the coordination of human and material resources and the execution of an agreed plan. Moreover, there is a need to understand the KSA construction market in order to provide the knowledge that can address and overcome the reasons that have led to projects faltering and being delayed. While using PM tools and techniques, organisations often face numerous barriers and challenges. The adoption of PM processes can be increased or decreased as a result of these challenges. The services that PM deliver to an organisation can serve everyone from the PMs who manage a given project, the clients who are waiting for the completion of a project, and the different teams who execute and/or run the project (Picariello, 2014).

Organisations find it difficult to select one type of methodology over another and to successfully implement those methodologies in practice. Therefore, PRINCE2 and PMBoK propose the utilisation of the PMO as an effective tool and methodology to enforce the implementation of project management practices (Lano, 2014; Kurt et al, 2015). The investment of organisations in establishing a PMO will help to plan, control, assist, and implement certain procedures, templates, and techniques for best PM practice. According to Tylor (2012), the PMO can tailor the PRINCE2 and PMBoK with the individual needs of the organisations. However, Aubry et al, (2008) suggest the difficulty of using either PMBoK or PRINCE2 in full and suggest that organisations need to develop their own methods. Therefore, organisations have to choose between different maturity levels of the PMO to address their specific needs.

Knowledge Management (KM) is becoming one of the most significant assets for organisations and is considered to be a complement to various business activities (Wong & Fong, 2005; Hislop, 2009). Through the suitable adoption of different KM processes, organisations can increase the possibility of achieving competitive advantage and improve the organisational learning processes to enhance performance (Li & Gao, 2003; Ahmad & An, 2008). The importance of implementing different KM processes and techniques can assist construction firms to prevent similar mistakes reoccurring and the reinvention of the wheel. The implementation of KM also improves the overall business performance and provides competitive advantage for the organisation. The existence of KM in today's construction projects can support individual knowledge to know the full story of the project instead of knowing only a bit. Nasimi et al., (2014) and Alhamoudi (2010) assert that the effectiveness of the employees' participation can be a big challenge to how successfully the organisation can implement KM. If employees can interact and understand their importance to KM processes, this challenge can be reduced. For example, when employees leave the organisation, their information, ideas, experiences, and insights will be lost if there is no clear attempt made to save this information. To stay competitive within the construction sector, the availability of knowledge needs to be managed. In this context, the PMO is an effective tool that allows organisations to enforce PM, encourage knowledge transfer and translate knowledge into action.

The PMO is one of the most complex concepts within the construction sector. It is hard to find

a uniform definition that can be used by all organisations due to their different business needs. However, PMI (2012) suggests that PMOs can be considered a group of experts or departments that include a number of people from different areas within an organisation, which works on a daily basis to define and maintain standards for applying best PM practices for the whole company. However, with regard to the nature of construction projects that include a variety of processes, policies, and procedures, the PMO is mainly used in the construction sector as a coordination centre to bridge the gap between projects that are currently being implemented with their senior management (Valle et al, 2008; Taylor, 2011; Almagrabi, 2012; Andrew, 2013). The PMO is, to a large extent, about improving business performance. It should work as an agent for spreading PM standards, practices, and culture throughout the organisation. By recognising the reasons behind a project's failure, the PMO can also increase the organisation's maturity level, project efficiency, and help in quantifying what impacts on the project's success.

The relationship between using the PMO as an effective tool and applying KM as an important function of PM practices has been discussed in academia for several years as an effective means of improving organisational performance (See section 3.5.1). Anantatmula's (2012) research illustrates that both KM and the PMO can support each other as well as work to achieve overall business needs. The PMO can create and formalise KM models, processes, and concepts among various departments within the organisation. Since the existence of PMOs in project based organisations, the priority of considering KM as a function has become more important to the office. As the team members of some projects are leaving or disband from the organisation, this may give rise to issues such as the leaking of project knowledge, which could affect the reuse of important knowledge (Koskinen and Pihlanto, 2008; Ajmal and Kekale, 2010). However, Desouza and Evaristo (2006) and later Shahram *et al.* (2014) advocate that there is a significant gap in the existing literature that addresses KM practices from a PMO perspective. Companies need to clarify what type of knowledge is important for the PMO. In many cases, PMOs should act as knowledge hubs. Modern PMOs must consider project KM as a key function (Villa, 2010). The optimisation perspective of the PMO is to identify the KM function, which enables the office to facilitate and encourage collaboration among PMO leaders, project managers, and project teams; to find ways of improving project performance reports and creative effective systems for project management information; and to promote the knowledge, experiences, and perspectives of individuals (Hill, 2008).

The utilisation of different maturity levels of the PMO can overcome certain issues within KM and maximise the benefits of this relationship. The PMO needs to guide and mentor the storage and collection of project knowledge; the methods used and models, and the lessons learned, can be centralised by the PMO. It can be claimed that the responsibility and activity undertaken by PMOs as well as the level of influence they can have on various project aspects will illustrate the success of this approach or the failure. Having PMOs cannot increase the project's success by itself; the key aspect of a successful PMO is to contribute to addressing the various problems and challenges facing a particular construction firm. Therefore, it is essential that the PMO should be implemented to deliver significant development for the business performance. Once PMO roles are identified, then the level of skill and expertise of PMO staff needs to be computable enough to deliver PMOs services.

However, in regard to the complexity of managing construction projects and organisational and cultural issues such as the high turnover of staff, it is often hard to rely on information technology alone. Therefore, Egbu (2004), Tan et al (2010) and Autumnal (2014) have argued that an integrated methodology of combining KM techniques with technological approaches is the more viable option, which can be offered and served by the PMO to encourage and facilitate KM implementation. The preliminary theoretical framework for PM and KM implementation via a PMO has been identified in section 4.2. This framework was used as a first attempt to build the conceptual framework this study is aiming for. The sequential explanatory as a strategy has been selected as an appropriate type of mixed method strategies (Creswell, 2015). This was a useful strategy to expand on the outcome of one method with another. This study involved two phases that began by conducting a quantitative method to map the current practice, test and generalised the concepts, theories, and factors. The second phase following up with a qualitative method for providing detailed exploration with a number of interviews to allow this research to explore areas of interest and deepen understanding of the questions. It can be concluded that the functions of PMOs can be presented at different levels: for example, in large companies that have in place a number of projects, PMOs at this level might have more responsibilities, which may include unifying practices, participating in resources, and activating the roles of communication and cooperation to implement best PM practices. Another example can be found in small companies that only deal with one project, at this stage the PMO's functions are to control the project from inception to completion. This suggests the importance of using different maturity levels of PMOs to suits organisational needs, as recommended by this research.

10.3 Main Findings

The preliminary theoretical framework for PM and KM implementation via a PMO has been identified based on the outcomes of the literature review. The research aims to propose an effective framework to develop KM processes from the PMO perspective. The conceptual framework proposed that the four processes of KM, namely creation, capturing, sharing, and application, need to be managed through the PMO. The roles of PMOs have been divided into four maturity levels. This research proposes a framework to maximise the importance of different levels. The proposed conceptual framework is, firstly, linked directly with the research objectives provided in chapter 1. Secondly, the proposed framework is investigated in the literature review in chapters two and three. Thirdly, it has been developed in chapter four and then analysed in chapter six and seven based on the outcome of conducting mixed methods approach. Chapter nine was provided to ask experts in the field of interest to validate and explore the developed conceptual framework.

To address the research aim, five main objectives have been discussed in this research. This is in order to facilitate and build the conceptual framework. Within the current literature, there is insufficient exploration of how PM and KM work within the PMO. Therefore, this research has outlined how KM practices can be integrated into the PMO as an effective tool to encourage and facilitate the various processes of KM and develop the importance of the PMO from a KM perspective. This will result in improving the efficiency of PM and increasing project success rates.

As a result, the most interesting finding was that the application of KM processes needs to be supported by certain procedures to facilitate its implementation. Another important finding was that the components of knowledge are key factors to enable KM existence and to achieve organisational learning based on knowledge captured. The findings also confirm that the association between the findings of literature review and the findings of the research is obvious as there is no optimal use of KM processes and practices. These findings further support the idea of using the proposed perspectives for KM adoption. It is therefore likely that there is a strong connection does exist between KM processes and perspectives to enable KM implementation. The integration of KM processes into PMOs is suggested. An understanding of their implementation is guided by the different maturity levels of the PMO, which can help to identify, measures, and select the appropriate level according to the organisation's needs.

10.4 Review of the objectives

As the research identified the main aim and objectives as presented in Chapter one, this section will highlight the procedures that have been used to address each one of the objectives.

- **To generate an understanding of the reasons project falter and/or are abandoned in the KSA in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance.**

The first objective was to generate an understanding of the reasons that projects falter and/or are abandoned in the KSA, in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance. The literature revealed that the KSA government has set out to support the execution of a large number of projects over the coming years in order to deal with the large population increase. The KSA construction market will therefore become one of the largest emerging markets in the Middle East, with the KSA government set to increase its spending to \$385 billion in the next ten years (Khatib, 2016; Bakkah, 2016). In order to benefit from this, KSA construction firms are beginning to execute more than one project at the same time. As a result, companies are engaging in more types of projects than is usual for their size, or with insufficiently experienced professionals to lead their specific types of projects. Organisations are finding that PMOs should be created to meet these challenges (Alnahj, 2012; Halawah, 2013; Alsahli, 2013). The contribution of this research is that it aims to identify the major causes of project failure in the KSA, in order to come up with a new model based on creating an effective relationship between the PMO as a tool and KM as a concept to deal with these issues.

In response to these issues, the literature refers to the PMO as a strategic, management-orientated concept designed to manage business processes orientated towards construction rather than being designed to manage construction projects (Obrochta et al., 2011; ESI International, 2013). The literature review explored how the majority of government projects in the KSA are suffering from the problem of faltering and delayed projects. The reasons for projects being abandoned in the KSA can vary. However, eight major factors that caused delay and failure in many projects have been identified, alongside eight key success factors in how today's PMOs can help assist construction firms. As a result of analysing the mixed methods

whether quantitative or qualitative, it is possible to relate the success factors of the PMO to the current challenges and difficulties in the KSA. The research findings also show that new factors have emerged based on the results obtained from both methods.

- **To critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice.**

The second objective was to critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice. Quite recently, considerable attention has been given to the ability of PMOs to deliver best PM practices and to win the highest levels of project successes (Kendrick, 2009; Rouse, 2011; Almaghrabi, 2011; Dawson, 2012). The application of various management practices, techniques, knowledge, and tools to achieve the organisation's objectives represents the PM approach. Implementing PM practices is still in its early phases in less developed countries. Some professional organisations and institutions such as PMI and APM made attempts to increase the adoption of PM tools and techniques by proposing a modern methodology to achieve best PM practice. While using PM tools and techniques, organisations often face numerous barriers and challenges. The adoption of PM processes can be increased or decreased as a result of these challenges.

As a result, six common functions of PMOs have been identified, namely; Supporting Project Communication Management, Encouraging Project Knowledge Management, Improving Project Change Management, Balancing Project Resources Management, Promoting Project Finance Management, and Identifying Project Risk Management. Those factors have been evaluated by asking respondents to rank the previous practices in order of importance based on the current or the last project completed. The greatest demand was by far for Knowledge Management, with a percentage of around 46% stating this as the most important. The second most important function was seen as Communication Management (21%), followed closely by Resource Management at 18%.

However, based on the interview analysis, this research found that different types of PMO can offer different functions for the organisation. There is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. The implementation of PMO as a methodology has supported organisations to

produce unique services at the right time within the estimated budget. Some professional bodies and researchers propose to select the suitable types of PMO (APM, 2008; PMI, 2012; Andrew, 2013). Each type of PMO has different roles and functions and can be suitable for a particular organisational structure. By conducting the interviews, PMO functions can be mainly divided into: firstly, support the PM best practice in the top management and secondly, support the PM best practice in managing the execution of construction projects away from the head office.

- **To find out the basic steps and procedures used for establishing and evaluating PMOs to facilitate and addresses the barriers and challenges that face its implementation.**

The third objective was to find out the basic steps and procedures used for establishing and evaluating PMOs in order to facilitate and address the barriers and challenges that face its implementation. As discussed in the literature review, it is important to provide a number of steps and tools to establish and evaluate PMO performance as well maintain its development (PMI, 2009; Hizamul, 2010; Almaghrabi, 2011; CIO, 2012; ASPE, 2012; Wilkinson, 2013). Organisations are advised to analyse the achievements of the PMO. The process of keeping this new orientation more accountable and showing its value can be achieved through certain methods to ensure that it is directly connected to its objectives and strategies. The evaluation of PMOs can be provided to support the reasons behind establishing this office.

As a result, different steps were identified as important for implementing or evaluating PMOs in construction firms. Based on the analysis of the necessary steps for implementing a new PMO from information obtained from the questionnaires, obtaining the necessary support and identifying PMO missions, objectives, and strategies were seen as the most important factors with 33% and 30% respectively. Providing training and coaching programs to improve people skills and knowledge and defining PMO processes, teams, and tools came next, scoring percentages of 22 and 13 respectively. For developing PMOs, the availability of PM practices on site and worked across various projects and the evaluation of staff attitudes, improvements and knowledge gained scored the highest and were seen as the most important, scoring 35% and 32% respectively. The analysis of the interviews shows that there are various metrics to evaluate PMO performance. The interviews clarified the need for organisations to evaluate through different stages in order to see how the office can deal with the various procedures of

the project. Understanding the right processes for evaluating PMOs is a key part of getting more accurate results. For instance, the improvement of project managers and PMO staff can test the success of delivering PMO services or indicating their importance. Factors such as evaluating success rates and how best the office deals with PM practices can give a good indication that the office has started to show positive features. As a result of analysing the mixed method, it is possible to relate the establishment and evaluation processes of PMOs as road-map structures. The journey of the PMO may progress slowly and the successful implementation of PMO does not mean it will be the answer to all an organisation's problems or take the place of the work of other departments. It needs to be followed by a successful evaluation to increase its importance and to protect this concept from failures.

- **To critically assess the existing nature of KM components and types to identify the barriers and challenges that face its implementation in the KSA.**

The fourth objective was to critically assess the existing nature of KM components and types to identify the barriers and challenges that face its implementation in the KSA. Types of KM were discussed in section 2.3.3 and confirmed that the majority of KM studies within the literature adopt Nonaka's definition of knowledge, separating it into two fundamental types namely: explicit and tacit knowledge (Egbu, 2004; Keong et. al, 2006). Moreover, the important components of KM Implementation have been discussed by many researchers (Desouza and Paquette, 2011; Omotayo, 2015), who have emphasised that, to manage knowledge properly, consideration should be paid to three key components: people, technology, and processes. The focus of KM should be used to connect these three components for leveraging organisational knowledge. The efforts of KM cannot be effective if the work of other dimensions in the organisation are not working effectively. The effectiveness of the employees' participation can be a big challenge to how organisations can successfully implement KM. If employees can interact and understand their importance as a complementary aspect to KM, this challenge can be reduced. However, the proper establishment of KM requires the company to spend sufficient time to get results. In addition, there is a difficulty in determining knowledge value. Organisations should be able to evaluate its performance rather than waiting for the final results. The focus on knowledge activity cannot figure out the accuracy, values, and efficiency contributed by the human factor.

Based on the research analysis, the main steps to convert tacit into explicit knowledge via the PMO have been defined using the following steps. Firstly, it is important to create and support effective strategies, policies, and processes. Secondly, the organisation needs to set up and activate appropriate systems of incentive and rewards. Thirdly, they need to raise awareness and qualify people via PMO centers of excellence. Fourthly, it is important to document activities and meetings. Fifthly, the organisation needs to encourage a culture of innovation, cooperation, and trust. Sixthly, they need to create communications channels, teamwork, and initiatives. However, this research has shown that ultimately knowledge begins and ends with people. Educated organisations have to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge are the key drivers in the development of the company. People are the essential component of KM, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge.

- **To critically assess the existing nature of PMOs maturity levels and how the PM maturity model assists its development during the different phases of the project.**

The fifth objective was to critically assess the existing nature of PMOs maturity levels and to explore how the PM maturity model assists its development during different phases of the project. The implementation of the PMO and PM methodologies has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before attempting to establish the office (APM, 2008; PMI, 2012; Andrew, 2013). Each type has different roles and functions and can be suitable for a particular organisational structure. A good deal of scholarship has been written to define, propose, and assess the roles and functions of the PMO, as discussed in the literature review (chapter three). However, there is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. People's knowledge of the PMO is extremely significant to successfully implementing its roles. A likert scale was adopted for the responses collected for this question. The highest score was scored by respondents who claimed to have excellent knowledge of the PMO, with a percentage of around 42%. Fewer respondents expressed having a low knowledge of the PMO with a percentage of 7%. Lastly, some of the participants said they had no knowledge of PMO at all (3%). Related to the importance of people's knowledge

of the PMO is how they see its importance in terms of increasing business performance. The highest score was presented by those seeing the PMO as “very important”, with a percentage of around 65%. However, a few respondents saw the existence of PMO as only “slightly important” (6%).

As discussed earlier in the literature review, the majority of researchers, including Al-Nahj (2012), Daptiv (2013), Andrew (2013), Jordan (2015) assume that the PMO’s core function can be divided into three maturity levels: supportive, controlling, and directive. Similarly, the outcome of the interviews suggesting the following maturity levels of the PMO. Firstly, they identified the primitive phase where no PMO exists or the availability of effective tools to achieve practices is not implemented. Secondly, there are Centre of Excellence PMOs. Thirdly, there are departmental PMOs. Fourthly, there are enterprise PMOs. Respondents also suggested that, over time, organisations move from an operation and tactical PMO towards a more directive and strategic level of PMO. However, respondents revealed that each maturity level of PMO has its own strategy and role in the delivery of the organisation’s output.

10.5 Research Contributions

As outlined in chapter 1, this study contributes to knowledge by starting to fill some of the gaps in current knowledge through its analysis of the integration of KM processes and types in PM maturity models within the PMO. Therefore, the developed conceptual framework proposed in this research project represents the first clear attempt to evaluate the role of Knowledge Management and the role of the PMO in KSA construction firms, as well as to evaluate PMO maturity levels from a KM perspective. This study contributes to the general body of work that suggests the important relationship between KM and PMOs as an influence on organisational performance. The main contribution of this research is twofold; firstly, the research contribution made to academic and general knowledge and the research contribution to practice within the context of the KSA.

10.5.1 Research contribution to academia

The findings from this study make several contributions to the current literature. The first objective of the research was presented to generate an understanding of the reasons project falter and/or are abandoned in the KSA in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance. The contribution of this study in this regard found new factors have emerged based on the results obtained from both methods. Specifically, in relation to the reasons behind project failure in the KSA construction sector, it found that construction firms have been too slow in responding to market changes and new policies introduced by the government. Furthermore, it found that as a result, the cost of maintaining professional PM staff has increased, as has the difficulty of managing and distributing resources between projects. However, two factors were identified as being important to developing the success factors of PMOs in improving business performance. Firstly, it is important to identify project priorities in order to distribute resources efficiently and to help manage the sharing of resources between an organisation's projects. Secondly, it is vital to provide communication and coordination to bridge the gaps between different department and projects. This can be seen as an important contribution of this research in advancing the current literatures, as presented in table 10.1.

The second objective was to critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice. This research confirms that different types of PMO can offer different functions for the organisation. The implementation of the PMO as a methodology for implementing PM has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before going into the establishment processes (APM, 2008; PMI, 2012; Andrew, 2013). It is evident that the advanced level of PMO that is represented by the PMO Office has more complex functions. Due to this, this level of PMO might have more directive roles in developing, managing, and optimising PM best practice as well as in insuring all PM practices are applied across the entire organisation.

Moreover, as the third objective focused on finding the basic steps and procedures used for establishing and evaluating PMOs to facilitate and addresses the barriers and challenges that face its implementation, this study shows that new factors have emerged based on the results

obtained from both methods, as presented in table 10.1. Specifically, in the establishment processes of PMO, the identification of the organisation's maturity levels, strategic goals, and business objectives have been emerged. Two factors have been developed in the evaluation processes of PMO namely; First, the achievement of unified management policies, practices, and regulations. Second, formal evaluations of project managers and PMO staff. This again can be useful for advancing the current knowledge.

Objective number four was to critically assess the existing nature of KM components and types to identify the barriers and challenges that face its implementation in the KSA. This research found that knowledge begins and ends with people. Educated organisations have to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge are key drivers in the development of the company. People are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge. The fifth objective was to critically assess the existing nature of PMOs maturity levels and to evaluate how the PM maturity model assists its development during the different phases of the project. Research found that over time, organisations are moving from an operation and tactical PMO towards a more directive and strategic level. Each maturity level of PMO has its own strategy and role in the delivery of the organisation's output. Table 10.1 illustrates the emerging contributions that might be useful for advancing the general knowledge, as follows:

Research objectives and main aim		The emerging contribution by the research	
		The contribution of objective one	To generate an understanding of the reasons project falter and/or are abandoned in the KSA in order to clarify the important roles that can be fulfilled by the PMO to help organisations overcome these challenges and improve business performance
The contribution of objective two	To critically evaluate the functions, concepts and principles of PMOs to adopt and maintain Project Management best practice	<ul style="list-style-type: none"> The advanced level of PMO that representing by the PMO Office have more functions. Duo to this level might have more directive roles in developing, managing, and optimising the PM best practice as well as to insure all PM practices are applied across the entire organisation. 	
The contribution of objective three	To find out the basic steps and procedures used for establishing and evaluating PMOs to facilitate and addresses the barriers and challenges that face its implementation.	Steps and procedures to establish PMOs <ul style="list-style-type: none"> Identify the organisation's maturity levels, strategic goals, and business objectives. 	Steps and procedures to evaluate PMOs <ul style="list-style-type: none"> The achievement of unified management policies, practices, and regulations. Formal evaluations of project managers and PMO staff.
The contribution of objective four	To critically assess the existing nature of KM components and types to identify the barriers and challenges that face its implementation in the KSA.	<ul style="list-style-type: none"> Knowledge begins and ends with people. Educated organisations to have an effective investment in people. Activating the role of people, giving them responsibilities and increasing their knowledge as key drivers in the development of the company. As well as people are the essential component of knowledge management, so confidence-building factors among employees and the creation of a healthy working environment have positive effects on the acquisition and recycling of knowledge. 	
The contribution of objective five	To critically assess the existing nature of PMOs maturity levels and how the PM maturity model assists its development during the different phases of the project.	<ul style="list-style-type: none"> Over time, organisations are moving from an operation and tactical PMO towards a more directive and strategic level. The differences that differentiate levels of maturity revealed that each maturity level of PMO has its own strategy and role in the delivery of the organisation's output. 	
Research main contribution	To develop a conceptual framework for the implementation of Knowledge Management processes within KSA construction firms' Project Management Offices.	<ul style="list-style-type: none"> PMO roles as a center of excellence is the most concerned and applied levels to encourage and support KM processes and practices 	

Table 10.1: The emerging contribution by the research based on each objective and aim

10.5.2 Research contribution to practice

Through asking respondents about the implementation of KM processes at different maturity levels of the PMO, this research has revealed many of different functions for each maturity level of the PMO. However, one of the more significant findings to emerge from this study is that the PMO roles as a center of excellence were seen as the most effective in encouraging and supporting KM processes and practices. Center of excellence PMOs provide the organisation with methodologies, standards, and tools to enable project teams and project managers to deliver projects successfully. This is consistent with the findings of the literature review, which recognised the PMO as being largely related to the improvement of business performance. The PMO should work as an agent for spreading PM standards, practices, and culture throughout the organisation (Obrochta & Finch, 2011; Thiqah, 2013). However, by recognising the reasons behind a project's failure, the PMO can also increase the organisation's maturity level, project efficiency, and help in quantifying what impacts on the project's success (Kendrick, 2009; ESI International, 2013).

Figure 10.1 reveals several ways that Centre of excellence PMOs can contribute to encouraging a large number of KM practices. Unlike the other levels, this level can offer eight main functions for KM. Firstly, it enables the building of organisational memory, storing best practices and maintaining previous experiences to be used in future projects. Secondly, in terms of developing individuals' skills, the PMO contributes to the development of skills in individuals by mixing experts with fresh graduate employees. Thirdly, the PMO can increase the outcome of creativity by motivating employees to come up with new ideas and initiatives that can contribute to increasing business performance. Fourthly, it can manage KM processes by disseminating useful ideas, facilitating more effective cooperative processes, and ensuring continued knowledge acquisition and organizational learning. Fifthly, the PMO can provide training and coaching; it is possible to activate the role of the Center of Excellence PMO in providing training courses. Sixthly, the PMO can raise people's awareness of the importance of the concept and show how, when implemented effectively, it will lead to the acquisition of knowledge and improve the success of the system in general. Seventhly, the PMO can provide training for employees, providing support by sending staff to develop their capabilities and to attract qualified people. Eighthly, the PMO aids the development of standards, regulations, and practices by creating a known support centre.

Based on the findings of the study, there was little or no more intention to formally manage organisational knowledge. However, in the interviews, respondents suggested that several best practices for managing KM processes should be in place. However, the functions of PMOs to encourage and support KM processes have been discussed largely in the qualitative analysis, as illustrated in the figure below. As well as the necessary perspectives for facilitating KM processes via PMO Centre of Excellence. The relations between the identified perspectives and various processes of KM are important for improving business performance and increasing the presence of KM.

The PMO functions to adopt and facilitate KM practices can be seen as in the following ways. First of all, they can help consolidate the organisational structure and the creation of knowledge which can be used to approve any project requests or reject it with appropriate recommendation, linking different projects and departments, and knowledge rotation. Moreover, the PMO can assist competitive advantage and the capturing-classification of knowledge in terms of lessons learnt, the protection of knowledge, and the balancing of resources. Additionally, the PMO aids organisational culture and the transferring-sharing of knowledge by creating a regulatory framework, standards and policies, and teamwork and collaboration. Lastly, the PMO assists Human Resource Management and the re-use and application of knowledge by guiding HR to select the right training, linking staff with firms' strategies, recommendations, and clarifying the duplication and overlapping of powers. The finding of this study also suggests that there should be key indicators to evaluate KM performance via Centre of Excellence PMOs. Thus, this research argues that, as people hold knowledge and as new knowledge is created at every phase of a project, if the KSA construction sector is to respond to the risk introduced as a result of new immigration controls, it is essential that tacit knowledge is captured and stored within organisations. It must therefore follow that organisations must introduce effective mechanisms that will allow this captured knowledge to be seamlessly disseminated through the organisation, which can be achieved via a central or regional PMO. This will increase the PMO objective of being able to centralize knowledge and to convert this accumulated knowledge into new more efficient procedures and processes (Rose, 2011; Unger et al, 2012). Thus, important functions and roles of the PMO can confirm its direct impact on the practices of KM and PM, enabling the diffusion of valuable ideas and innovations throughout the organisation.

Level 1		Key Factors of KM Implementation via PMO				KM processes and their implementation via PMO Center of Excellence			
Center of Excellence PMOs		Processes:	Knowledge Creation	Knowledge Capturing	Knowledge Sharing	Knowledge Application			
<p>Supportive PMO Defined/Developed Project/Organisation Level</p> <p>Little or no intention to formally manage organisational knowledge (Based on the questionnaire's findings)</p> <p>➤ Provide the organisation with methodologies, standards, and tools to enable project teams and PMs to deliver project successfully</p> <p>➤ To provide training and coaching and supporting the improvement of PMs and project teams</p> <p>➤ To serve as a project repository and lessons learned</p> <p>➤ Provide project related services or to support specific purpose</p> <p>➤ To provide a consultative role to projects</p> <p>➤ To set up and develop PM function within the organization</p> <p>➤ Provides support and assistance when needed. Provide best practices and ideas to correct defects and achieve best results</p> <p>➤ A group of experts working as a support and linking between the top management and various projects</p> <p>➤ To initiate and increase KM awareness and developing basic PM practices in the PMO</p> <p>➤ To define the concept of KM in practice</p> <p>➤ To develop Intranet and any types of networks in organization</p> <p>➤ To develop community of practices</p>	<p>In general:</p> <ul style="list-style-type: none"> There is no set of processes to acquire knowledge about suppliers and customers. There is no set of processes to create knowledge across the organisation. There is no set of processes to generate from existing knowledge some types of new knowledge. 	<p>Appropriate solutions:</p> <ul style="list-style-type: none"> Knowledge creation is done through the participation of different working methods in identifying problems and trying to find appropriate solutions to them in an innovative and continuous manner. <p>Innovative ideas:</p> <ul style="list-style-type: none"> The selection of good alternatives, the identification of opportunities, the standardization of models and the optimal utilization of available human, natural and artistic resources, with the aim of creating new knowledge and bringing about the desired change directly related to knowledge management. <p>Opportunities:</p> <ul style="list-style-type: none"> Creating knowledge is interested in research aspects and study recent developments. Also, through the presence of clear and informed processes on how to initiate innovation and the importance of generating creative ideas. 	<p>Responsibilities and authorities:</p> <ul style="list-style-type: none"> PMO must take responsibility and absolute authority to manage all knowledge processes. PMO group need to coordinate the acquisition of knowledge, which can take place in the administrative systems or the periodic procedures or through their presence in the heads of employees. <p>Value added:</p> <ul style="list-style-type: none"> The acquisition of PMO projects periodically can be converted into knowledge. A general framework for value added for knowledge management should also be developed. Knowledge classification must identify and compare existing knowledge assets. 	<ul style="list-style-type: none"> Organisation should have a specific process for organising and filtering knowledge. Organisation should have a specific process to transfer explicit knowledge to individuals. Organisation should have a specific process to collect tacit knowledge from individuals into the organisation. 	<ul style="list-style-type: none"> The utilisation of knowledge management can improve efficiency by matching problems and challenges to the source of knowledge. The development of new services, policies, and strategies should be based on the knowledge gained. 				
	<p>Best Practices for managing KM processes:</p> <p>(Based on the interview's findings)</p> <p>PMO Functions to Encourage and Support KM Processes:</p> <p>(Based on the interview's findings)</p>	<p>Internal processes:</p> <ul style="list-style-type: none"> Creating knowledge must receive the absolute support of the PMO group and can be done through internal processes such as market research and knowledge of previous experiences or by learning the experiences of others in the same field. The role of PMO team members in recruiting talent or retaining managerial competencies helps to create new knowledge and activate existing knowledge. The role of PMO contributes to the creation of a set of approved measures that can be directed to decisions, procedures and practices to increase the future success of the company. PMO group contributes to supporting knowledge management objectives and documenting individual and group activities. The role of PMO should consider previous knowledge and use it to help acquire new. Supporting the initiative with proposals and recommendations and presenting views and experiences that are important in the development of the organization's environment. <p>External processes:</p> <ul style="list-style-type: none"> The external processes in terms of developing the competence and skill of the staff and the request of experts and specialists and the work of meetings and workshops to maximize the creation of knowledge and activate its role. PMO group seeks to provide the necessary capabilities and capabilities to activate the efficiency of knowledge. 	<p>Internal processes:</p> <ul style="list-style-type: none"> To determine the mechanism of acquisition of knowledge and who are the people concerned to take this responsibility, the rehabilitation of people and the identification of practices. Members of the PMO group have the authority to obtain any information about the status of the projects or to know what risks are likely to occur. PMO is a key to managing knowledge and defining the form of operations and their plan of action. Acquiring knowledge is through the PMO Group by raising awareness, providing means and clarifying the way to obtain information and knowledge. Acquire knowledge from different sources, internally such as repositories of knowledge, discussion and communication between departments and projects. PMO group should be responsible for the classification of knowledge types within the organization: for example, the knowledge of customers, the state of the market, the work carried out and then work to determine their importance to the organization. <p>External processes:</p> <ul style="list-style-type: none"> PMO group should be responsible for encouraging the participation of conferences and workshops, attracting qualified staff and qualifying existing staff by providing suitable training courses and coaching sessions. 	<p>Classification of knowledge:</p> <ul style="list-style-type: none"> Dissemination of knowledge helps to increase the abilities and skills of project managers and project teams and needs to be classified to access the right people and objective. <p>Delivery of knowledge:</p> <ul style="list-style-type: none"> Transfer of knowledge should be concerned with the delivery of important information to stakeholders or beneficiaries in time, form and cost appropriate. Knowledge transfer must be done quickly from the enterprise environment to the company's stores. Because there is a lot of knowledge that is generated daily. <p>Increase awareness among people:</p> <ul style="list-style-type: none"> Increasing awareness among people of the importance of sharing knowledge can maximize its important and success. <p>Appropriate rewards and incentives:</p> <ul style="list-style-type: none"> The spread of knowledge can be through developing appropriate rewards and incentives by PMO center of excellence. <p>Convert tacit into explicit knowledge:</p> <ul style="list-style-type: none"> Members of the PMO team must be qualified to transfer knowledge and create practices to participate as well as develop effective systems from time to time to keep abreast of the pace of transformation in the construction sector. The role of PMO in the transfer of implicit and explicit knowledge efficiently generates an important return for the company. <p>Flexibility (Formal & Informal):</p> <ul style="list-style-type: none"> There should be a high speed in the transfer of knowledge, especially between projects and senior management, in order to maintain the safe transfer of knowledge. Knowledge distribution channels are either formal such as training sessions, inter-departmental communication, projects and communication between the staff. Or be informal such as initiatives, debates and periodic meetings. The role of PMO must be effective in ensuring that knowledge is provided and accessible when needed as well as to ensure that such knowledge reaches as many people as possible. 	<p>Put beginners with experts:</p> <ul style="list-style-type: none"> To ensure the reuse of knowledge, the performance of decision making and the amount of changes that have occurred in administrative regulations must be assessed. Increasing the employees' awareness of the importance of their role in the application of knowledge. <p>Lessons learnt:</p> <ul style="list-style-type: none"> Learning occurs through attempts, opportunities and completion of business which is reflected in improving the level of knowledge. Knowledge is a force if applied even with errors. An efficient knowledge system must understand errors and constantly review them. <p>Storing knowledge:</p> <ul style="list-style-type: none"> The role and contribution of PMO in applying some of the knowledge learned to increase the enthusiasm of staff that their expertise and information will be applied as a priority. <p>Best practices:</p> <ul style="list-style-type: none"> The knowledge application is increasing the validity of the PMO. If there are no absolute powers or overlap of responsibilities, there is difficulty in applying knowledge. <p>Knowledge access:</p> <ul style="list-style-type: none"> There is great importance in storing knowledge, using effective practices or using modern technology factors to make research and knowledge access easy. <p>Modern technology:</p> <ul style="list-style-type: none"> Link knowledge application with financial incentive systems and employee performance assessment. Knowledge is applied through the transformation of knowledge into operational processes. 				
<p>PMO roles as a center of excellence for encouraging KM implementation</p> <p>➤ Build organisational memory: Storing best practices and maintain previous experiences to be used in future projects.</p> <p>➤ Developing individuals' skills: PMO contributes to the development of skills in individuals by mixing experts with fresh graduates employees.</p> <p>➤ Increase the outcome of creativity: Motivate employees to come up with new ideas and initiatives that can contribute for increasing business performance.</p> <p>➤ Managing KM processes: The dissemination of useful ideas, facilitate more effective cooperative processes, ensure continued knowledge acquisition and organizational learning.</p> <p>➤ Providing training and coaching: It is possible to activate the role of the Center of Excellence PMO in providing training courses.</p> <p>➤ Rising awareness among people: Contributing to raising awareness among people of the importance of the existence of this concept and that if implemented effectively will lead to the acquisition of knowledge and thus reflected on the success of the system in general.</p> <p>➤ Sending employees to different workshop: The role of PMO is noticeable in providing great support in sending administrative competencies to develop them and to attract qualified competencies.</p> <p>➤ The development of standards, regulations, and practices: The existence of a known support center by all parties that contributes to the development of standards, regulations and practices of the company.</p>	<p>In general:</p> <ul style="list-style-type: none"> Little or no intention to formally manage organisational knowledge (Based on the questionnaire's findings) <p>The relations between the identified Perspectives and various processes of KM:</p> <p>(Based on the interview's findings)</p>	<p>Organisational structure and the creation-activation of knowledge</p> <ul style="list-style-type: none"> Creating knowledge should be supported by a standardised reward system. To facilitate the creation of knowledge throughout the organisation. There is a need to have well designed processes. The organisation's structure should facilitate the discovery, creation, and transfer of new knowledge. <p>Knowledge life-cycle:</p> <ul style="list-style-type: none"> The organizational structure could include four main contents: human elements, management, processes, technology. the easy transfer of information from one department to another and how to work together and increase organizational culture of the company to create knowledge. <p>Increase initiatives:</p> <ul style="list-style-type: none"> The organizational structure must be more appropriate to knowledge management processes in terms of autonomy in decision-making and help to increase initiatives in teamwork. <p>Flexibility:</p> <ul style="list-style-type: none"> The organizational structure should provide high flexibility in the implementation of knowledge management strategies and plans. There must be an infrastructure, even if it is simple, that supports knowledge management 	<p>Competitive advantage and the capturing-classification of knowledge</p> <ul style="list-style-type: none"> There is a limitation of organisation to have difficult and expensive knowledge management systems that are difficult for rivals to duplicate. The organisation should use both knowledge management and competitive advantage to increase market position. <p>Spreading knowledge:</p> <ul style="list-style-type: none"> The acquisition of good knowledge both internally and externally and to add this knowledge correctly contributes to the achievement of competitive advantage. Managing knowledge processes is a competitive advantage if exploited quickly and rationally. <p>Retaining professionals:</p> <ul style="list-style-type: none"> The company's ability to continue winning tenders, retaining professionals, attracting qualified people, activating training and development programs, increasing cultural awareness, spreading knowledge, standardizing operations, and helping employees to know the future directions of the company are factors that achieve the competitive advantage. <p>Attracting qualified people:</p> <ul style="list-style-type: none"> Firm's ability to get the best cadres and competencies in the market to gain their valuable knowledge <p>Providing competitive prices:</p> <ul style="list-style-type: none"> Providing competitive prices based on knowledge of competitors and the provision of good products through knowledge of the local market. 	<p>Organisational culture and the transferring-sharing of knowledge</p> <p>There is a limitation to frequently used Collaborative and team working to capture and disseminate knowledge.</p> <p>There is a limitation of Employees to understand the need for knowledge management to improve company's performance.</p> <p>There is a limitation of Senior management and project managers to encourage knowledge management in their teams and across the organisation.</p> <p>Keep pace with knowledge:</p> <ul style="list-style-type: none"> The presence of innovative and effective systems to encourage the members of the project team to keep pace with knowledge management procedures. <p>Increase cooperation:</p> <ul style="list-style-type: none"> The culture of work varies according to the different nationalities. PMO group should find appropriate ways for better integration of nationalities to increase cooperation and provide a healthy working environment. <p>Clear vision:</p> <ul style="list-style-type: none"> There must be a clear vision of the tasks of the people in order to increase the Organization's culture of knowledge dissemination. Knowledge management practices both in senior management and in projects must be integrated with the company's overall levels. <p>Healthy environment:</p> <ul style="list-style-type: none"> Organizational culture is a healthy competitive environment, a good mechanism for knowledge transfer, effective means to obtain knowledge in a simple way. Managing knowledge transfer and dissemination processes requires an encouraging and stimulating organizational culture. 	<p>HR Management and the re-using-application of knowledge</p> <ul style="list-style-type: none"> Human resource management should be a knowledge facilitator by getting all the information needed to the right people at the right time. The implication of knowledge management practices should contribute to human resource development. <p>Storage of previous experiences:</p> <ul style="list-style-type: none"> With the creation of the PMO, there is an overlap of responsibilities and functions with HRM. PMO is beginning to take the lion's share in the application, storage and reuse of knowledge. <p>Overcoming some of the HR tasks:</p> <ul style="list-style-type: none"> The presence of PMO helps in supporting human resources and focuses its work on monitoring the employees of the company. <p>Responsible for all Project Managers:</p> <ul style="list-style-type: none"> Periodic reports that reach the office carry a lot of knowledge and experience, the role of PMO must be documented and the development of an appropriate mechanism for reuse either in training programs or activate the role of project managers in the transfer of new knowledge. <p>PMO Vs. HRM:</p> <ul style="list-style-type: none"> The Human Resources Department is not concerned with training and development and the coordination and application of different knowledge as the PMO department now covering those aspects. The role of human resources is fully competent financial matters for staff and the registration of attendance and absence. <p>Use latest technology:</p> <ul style="list-style-type: none"> The mechanism of PMO department is to keep pace with advances in technology, keeping pace with temporal and spatial variables and optimizing the use of the latest practices. 				
<p>Key indicators to evaluate KM performance via Centre of Excellence PMO</p> <ul style="list-style-type: none"> Sharing knowledge should be supported by a basic standardised reward system through PMO PMO is defined and designed processes to facilitate the exchange of knowledge throughout the organisation. PMO is supporting the organisation's structure to facilitate the discovery, creation, and transfer of new knowledge PMO is preparing the organisation to disseminate knowledge across the organisation. PMO is preparing the organisation to generate from existing knowledge some types of new knowledge. 	<p>Competitive Advantage:</p> <ul style="list-style-type: none"> PMO is evaluating if the organisation has difficult and expensive knowledge management systems that are difficult for rivals to duplicate. PMO is evaluating if the organisation uses knowledge management to increase market position PMO is used to protect knowledge from inappropriate use inside and outside the organisation. PMO is preparing the organisation to have in place effective policies and procedures to protect its trade secrets. 	<p>Organisational Culture:</p> <ul style="list-style-type: none"> PMO is evaluating the collaboration frequently to capture and disseminate knowledge in the organisation. PMO is evaluating the employees understanding to the need of knowledge management to improve company's performance. PMO is evaluating the senior management and PMs for encouraging knowledge management in their teams and across the organisation PMO is increasing the awareness of organisation to have a specific process for organising and filtering knowledge. PMO is putting into pace some practices for the Organisation to transfer explicit knowledge to individuals. PMO is proposing that Organisation needs to collect tacit knowledge from individuals into the organisation 	<p>Human Resource Management:</p> <ul style="list-style-type: none"> PMO is encouraging the human resource management to be a knowledge facilitator to get all the information needed to the right people at the right time. PMO is encouraging the implication of knowledge management practices can contribute to human resource development. PMO is evaluating the existence of KM to improve efficiency by matching problems and challenges to the source of knowledge. PMO is increasing the awareness that the development of new services, policies, and strategies should be based on the knowledge gained 						

PMO roles as a center of excellence is the most concerned and applied levels to encourage and support KM practices

	Current practices
	Best practices
	PMO Functions
	Key indicators

Figure 10.1: Research contribution to practice

10.6 Research Limitations

The relationship between using the PMO as an effective tool and applying KM as an important function of PM practices has been discussed in academia for several years as a means of improving organisational performance. However, as the research aimed to build a conceptual framework to combine PMO and KM, which has not been achieved yet, there was not enough time to conduct an applied study on specific companies and to wait for the actual results. This deficiency will be identified as a good starting point for further research in this area. There were also spatial difficulties that arose through the distribution of questionnaires because it was difficult to obtain suitable people for research interests in one area. Therefore, there was a need to move to several places scattered in the place of study to cover this deficit. In terms of interviewing, there were difficulties surrounding the need to wait for the managers of the departments and projects to conduct these interviews because of their busy work schedule; this meant that this stage took longer than anticipated.

PMOs are dramatically increasing in number and are becoming popular due to their effectiveness in boosting organisational levels of success. However, there was no appropriate knowledge by people who directly concerned with the running of the PMO such as their understanding of its tasks and goals. This is accompanied by a significant lack of knowledge of the minimum tasks of the PMO by some managers and workers away from the central administration, even if their mechanism is constantly linked to the office. This might be due to alternatively names sometimes being used to describe the same orientation and purposes of PMOs, as some respondents referred to this approach as Project Support Office or Central Project Office. Due to the concept of the PMO being recognized by the majority of organisations around the world, this research project chose to use the term PMO.

A good deal of scholarship has been written to define, propose, and assess the roles and functions of the PMO, as discussed in the literature review in chapter three. However, there is less research identifying the different types of PMO. Young (2014) argues that one size of PMO to deliver appropriate services will not fit all. The implementation of the PMO as PM methodologies has supported organisations to produce unique services at the right time within the estimated budget. Therefore, some professional bodies and researchers propose to select the suitable types of PMO before going into the establishment processes (APM, 2008; PMI,

2012; Andrew, 2013). Each type should be used to provide different roles and functions and can be suitable for a particular organisational structure. Almost 25 unique functions of PMOs were identified as offering possible solutions and options for encouraging KM implementation, as found through the qualitative research methods. These results can be also divided into 139 sub-functions that PMOs can generally offer to encourage and support KM processes and practices at different maturity levels. This indicated that identifying systematic patterns for PMO's functions is a big challenge, which needs to be linked directly with an organisation's size and maturity levels.

10.7 Research Recommendations

The KSA government adopted "Saudi Arabia's Vision" to increase its economic and developmental success. This vision is used as a roadmap and methodology to identify the general policies, direction, goals, and objectives, which aims to gain the KSA a leading position in all sectors. The Council of Economic and Development Affairs has been selected by the Council of Ministers to establish and control the mechanisms of the "Saudi Arabia's Vision 2030". The Council has established an effective governance model, which aims to translate the vision into different implementation programs. To accomplish its directions and services, a number of bodies have been established to support, enable, monitor, and evaluate these programs. These bodies include the project management office: the "PMO" (Argaam, 2016; Bakkah, 2016). This research recommends that government entities, institutions, and private organisations should use the PMO as a strategic office to provide directive roles to align projects and organisational units to corporate strategy in order to ensure appropriate enterprise governance and to deal with the introduction of new immigration controls.

This study also recommends the PMO as a unique solution for organisations that aim to restructure their processes and align them with the application of best practices. The outcome of implementing the PMO would enable beneficiaries to expand their competencies, enhance the level and quality of services and achieve sustainable development. Researchers might utilise the PMO to promote efficient planning and coordination within organisations to gain common organisational goals. The PMO also can be an appropriate tool which guarantees the speedy completion of all initiatives and projects to obtain sustainable action. This study

suggests the value of implementing the PMO for achieving competitive advantage by identifying opportunities and challenges and adopting effective planning tools in order to insure a solid foundation for follow-up methods and actions.

Since this study had only focused on the construction sectors, it is recommended that further studies be carried out on the PMO in relation to other industries and sectors such as the Health Sector, Information Technology, and the Oil and Gas industries to see whether there are any similarities in the findings. Because this study has only been done in relation to the KSA's context, it is also recommended that further studies be carried out on the PMO in relation to other countries to evaluate its different roles and success factors. Furthermore, future research could also explore the difference between different maturity levels of PMOs and provide different frameworks to clarify different needs and attract organisations to implement the appropriate services according to their maturity. Lastly, although the research findings confirm that respondents are not satisfied with the quality and implementation of KM practices that are provided in their organisations, it might be a good idea to investigate the benefit of this research conceptual framework on a number of different construction firms as a case study method to evaluate if this framework can contribute to improve their business performance and change current attitude towards the implementation of KM practices.

References

A

Alsahli, M. (2013). "Developing the concept of project management". Construction and projects forum in Riyadh.

Amayah, A (2013). Determinants of knowledge sharing in a public-sector organisation. *Journal of Knowledge Management*, 17(3), 454-471, doi: 10.1108/JKM-11-2012-0369.

Awad, E.M. and Ghaziri, H.M. (2004) Knowledge Management, Prentice Hall.

Ahmad, H & An, M. (2008) 'Knowledge management implementation in construction projects: a KM model for Knowledge Creation, Collection and Updating (KCCU)' *International Journal of Project Organisation and Management*, vol 11, no. 2, pp. 133-166.

Ahmad, H.S., An, M. and Gaterell, M. (2007) 'Development of KM model to simplify knowledge management implementation in construction projects', *Proceedings of the 23rd Annual ARCOM Conference, Association of Researchers in Construction Management, Belfast, UK, 3–5 September*, pp.515–516.

Al-Nahj (2012). "Project Management Office-PMO". Al-Nahj for Information Technology, Riyadh. Available at: WWW.ALNAHJ.COM assessed date: 15/02/2016

An Oracle White Paper (2009). A step-by-step plan to build and improve your PMO. Project Management Office Best Practices. Oracle Corporation UK Limited.

Aubry M, Muller R, Gluckler J (2011). Exploring PMOs through community of practice theory, *Project Management Journal*, Vol.42, No. 5, pp. 42-56.

Ajmal, M and Kekale, T. (2010). Critical factors for knowledge management in project business. *Journal of Knowledge Management*, 14(1), 156 - 168.

Argaam, (2016) Saudi Arabia invites bids for national project management role. Saudi-based Argaam Investment Company.

Artto K, Martinsuo, M, Dietrich, P and Kujala, J (2008) Project strategy: Strategy types and their contents in innovation projects. *International Journal of Managing Projects in Business*, 1 (1), 49-70.

Anantatmula, V (2012). Improving the Effectiveness of a PMO by Integrating Knowledge Management Concepts. The George Washington University. The School of Business and Public Management.

Aubry, M., Hobbs, B, Thuillier. (2007): A new framework for understanding organizational project management through the PMO. *International Journal of Project Management*. Vol. 25, No. 4, 328-336.

APM (2012) Association for Project Management Body of Knowledge. 5th edn. Buckinghamshire: APM Publishing.

APM (2006) Association for Project Management Body of Knowledge. 5th edn. Buckinghamshire: APM Publishing.

Almaghraby, R. (2011) "How to establish a Project Management Office (PMO)", *PM world today*, XIII (V), pp. 1-2.

Adab, H and Khani, M. (2007). Achieve to eminence with knowledge management tool, Journal of tadbir, No 182.

Amanah (2012). "Establish a PMO in Jeddah Municipality". Agency of Reconstruction and Project. Available at:

<http://www.jeddah.gov.sa/amanah/initiatives/munconference/pdf/madinah2-5.pdf>

accessed date: 10/06/2016

Alsadeq, I. (2011). Establishing a Project Management Office (PMO) Using the Agile Approach. Originally published as a part of 2011 PMI Global Congress Proceedings – Dublin, Ireland.

Andrew, (2013). Measure the maturity level of your PMO. Available at: <http://www.ensys.com.au/news/>. Accessed date: 11/03/2016.

Alsereihy, A & Alyoubi, A and Elemery, M. (2012) Effectiveness of Knowledge Management Strategies on Business Organizations in KSA: Critical Reviewing Study. Middle-East Journal of Scientific Research 12 (2): 223-233, 2012.

Argyris, C. (2006). *Reasons and Rationalisations: The Limits to Organisational Knowledge*, Oxford University Press, Oxford.

Alhamoudi, S. (2010). Strategic knowledge management system in public sector in Saudi Arabia: an adaptation of the Balanced Scorecard. PhD thesis, Department of Strategy and Business Systems, University of Portsmouth, UK.

Abowitz, D. and Toole, T. (2010) Mixed method research: fundamental issues of design, validity, and reliability in construction research. Journal of Construction Engineering and Management, 136(1), 108-116.

Akintoye, A. (2000). Analysis of factors influencing project cost estimating practice. *Construction Management and Economics*, 18, pp 77-89.

Alroilay, H (2017). Saudi women in the private sector. Available at:

http://www.aleqt.com/2017/11/10/article_1281166.html. Accessed date: 20-Dec-2018.

Alsadhan, A.O. (2007). *The implementation of knowledge management systems: an empirical study of critical success factors and a proposed model*. Unpublished Ph.D dissertation, School of Informatics Department of Computing. University of Bradford.

B

Bahra, N. (2001). *Competitive Knowledge Management*. Palgrave, New York, NY, 258 pp.

Bishop, J., Bouchlaghem, D., Glass, J., Matsumoto, I. (2008). Ensuring the effectiveness of a knowledge management initiative. *Journal of Knowledge Management* 12 (4), 16–29.

Bagshaw, M. (2000). Why knowledge management is here to stay. *Industrial and Commercial. Training*, 32(5), 197-1831

Braun, V. & Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3, 77-101.

Bergeron, B. (2003) 'Essentials of knowledge management'. Hoboken, New Jersey: John Wiley & Sons, Inc.

Bhatt, G. (2001) 'Knowledge management in organisations: examining the interaction between technologies, techniques, and people'. *Journal of knowledge management*, 5(1): 68-75.

Bakkah, (2016) Application of PMO in government entities in Saudi Arabia. Bakkah team for training and consulting. Available online at: <https://bakkah.net.sa/application-of-pmo-in-government-entities-in-saudi-arabia/>. Accessed date: 09-10-2016.

Bernold, L. (2007) Quantitative assessment of backhoe operator skill. *Journal of Construction Engineering and Management*, 133(11), 889-899.

Blaxter L, Hughes C, Tight M (2006). *How to Research*. (3rd Ed.). Buckingham: Open University Press.

Bergman, M. M. (2008) *Advances in mixed methods research: theories and applications*. London: Sage.

Brace, I. (2008) *Questionnaire design: how to plan, structure and write survey material for effective market research*. London: Kogan Page. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

Bergman, M. M. (2008) *Advances in mixed methods research: theories and applications*. London: Sage. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

Braun, V & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology* 3, pp.77-101.

Bhajaraju, G. (2005). KNOWLEDGE MANAGEMENT: WHY DO WE NEED IT FOR CORPORATES. *Malaysian Journal of Library & Information Science*, Vol. 10, no.2, Dec 2005: 37-50.

Baloh, P., Desouza, K. C. and Paquette, S. (2011). The concept of knowledge. In: K. C. Desouza and S. Paquette (Eds.), *Knowledge Management: An Introduction* (pp. 35-71). New York: NY: Neal-Schuman Publishers, Inc.

Battaglia, M. (2008). Non Probability Sampling. *Encyclopedia of Survey. Research Methods*. SAGE Publications, 1-4.

C

Carrillo, P. (2004). Managing knowledge: lessons from the oil and gas sector. *Construction Management and Economics* 22 (6), 631–642.

Chunha J, Figurirodo J, Matos F (2010). Knowledge management on PMO's perspective. Federal University of Pernambuco. Recife, Brazil.

CIO, (2012). 12 Common Project Management Mistakes--and How to Avoid Them. Available at: <http://www.cio.com/article/2391872/project-management/12-common-project-management-mistakes--and-how-to-avoid-them.html>. Accessed date: 05/03/2016.

Callahan, K and Lynne, B. (2004) *Essentials of Strategic Project Management*, Hoboken, NJ: John Wiley & Sons.

Central Department of Statistics & Information, (2013). Available at: <http://www.cdsi.gov.sa> accessed date: 03/10/2016.

Chua, A and Lam, W. (2005). Why KM projects fail: a multi-case analysis. *Journal of Knowledge Management*, 9(3) pp. 6-17.

Chong, S. (2006). KM critical success factors: A comparison of perceived importance versus implementation in Malaysian ICT companies. *The Learning Organisation*, 13(3), 230-256.

Cresswell, J (2007). *Qualitative inquiry and research design: choosing among five approaches*. Thousand Oaks, London: Sage.

D

Dawson, D., Ramos, C., Davidson, A., & Paterson, R. (2012). *The Well-Structured Program Management Office Keys to Managing IT Demand*. Chicago and Dallas: Booz & Company, Inc. [1]
[SEP]

Desouza, K and Evaristo, J. (2006). PMOs: a case study of knowledge- based archetypes. *International Journal of Project Management*. Vol. 26, No. 5, pp. 414-423.

Desouza, K and Paquette, S. (2011). *Knowledge management: An Introduction*. New York: NY: Neal-Schuman Publishers, Inc.

Dave, B & Koskela, L. (2009) Collaborative knowledge management a construction case study. *Salford Centre for Research and Innovation, University of Salford, Maxwell Building, Greater Manchester*.

Diakoulakis, I & Georgopoulos, N & Koulouriotis, D & Emiris, D . (2004). Towards a holistic knowledge management model. *Journal of Knowledge Management*, 8(1), 32-46.

Dawson, D., Ramos, C., Davidson, A., & Paterson, R. (2012). *The Well-Structured Program Management Office Keys to Managing IT Demand*. Chicago and Dallas: Booz & Company, Inc.

Doughty, K. & Grieco, F. (2005). IT Governance: Pass or fail? *Information Systems Control Journal*, Vol 2, 2005.

Dubberly, O. (2014). The organisational learning today. Available at: https://2005-w08.wikispaces.com/viktoryia_project1_examples. Accessed date: 17-07-2017.

Daptiv, (2013). Top 10 PMO Worst Practices: Pitfalls to Avoid. Available at: <http://blogs.daptiv.com/2012/04/the-top-10-metrics-to-track-pmo-performance/>. Accessed date; 18/03/2016.

Diry, A (2011) Discloses management and planning of construction projects. Arab British Academy for Higher Education. Available at: <http://www.abahe.co.uk/files/Arab%20Researchers/Arab%20Researchers-13-11-2012/management-and-planning-of-construction-projects.pdf>. Accessed date: 18-10-2016.

Deemah, M (2014) Businesswomen Management Awareness and Reflection on The Value of Efficiency in Small Projects. Umm Al Qura University. Department of Housing and Home Management.

Desouza, K. C. (2011). An introduction to knowledge management. In: K. C. Desouza and S. Paquette (Eds.), *Knowledge Management: An Introduction* (pp. 3-34). New York: NY: Neal- Schuman Publishers, Inc.

David, M. & Sutton, C.(2004). *Social Research: the basics*. London. SAGE Publication.

E

ESI International. (2013). *The 2012 Global State of the PMO*. Sydney: ESI International.

[1]
[SEP]

Egbu, C (2004). Managing knowledge and intellectual capital for improved organisational innovations in the construction industry: an examination of critical success factors. *Engineering, Construction and Architectural Management* 11 (5), 301–315.

Egbu, C., Botterill, K., Bates, M (2001). The influence of knowledge management and intellectual capital on organizational innovations. In: ARCOM Seventeenth Annual Conference, ARCOM, University of Salford, Salford, vol. 2, pp. 547–555.

Egbu, C., Kurul, E., Quintas, P., Hutchinson, V., Anumba, C. and Ruikar, K. (2003) Knowledge production, resources and capabilities in the construction industry. Work package 1- final report, Knowledge management for sustainable construction competitiveness project, Available from: www.knowledgemanagement.uk.net

Egbu, C, Gaskell, C. and Howes, J. (2001) The role of organisational culture and motivation in the effective utilisation of information technology for team working in construction, *Proceedings of ARCOM Seventeenth Annual Conference*, Vol. 1, pp 91-100.

Epetimehin, F & Ekundayo, O. (2011). Organisational knowledge management: survival strategy for Nigeria insurance industry. *Interdisciplinary Review of Economics and Management*, 1(2), 9-15.

Ekeke, H. (2011) Knowledge management in the Nigerian public service. Unpublished Thesis, School of Management and Business, Aberystwyth University, Wales, 322pp. + xviii, <http://hdl.handle.net/2160/7004>.

Ellinger, A (2009). Applying Lewin’s Change Model in the Development of a Learning Organization. The University of Texas at Tyler 3900 University Blvd. - HPR 226 Tyler, TX 75799 USA.

Elmahdee, M & Noraini, A & Khawla, M. (2014) Knowledge Management Practice in Malaysian Construction Companies. *Middle-East Journal of Scientific Research* 21 (11).

Emcanat (2011). “Towards Excellence in Project Management and Strategic Planning”. Available at: <http://arecha.info/index.php?lan=ZW4=> accessed date: 12/03/2016

Elizabeth, (2008). Financial Management. Available at: <http://www.nonprofitaccountingbasics.org/reporting-operations/financial-management>. Accessed date: 09/04/2016.

Esteves, T. And Caetano, A. (2010), Human Resource Management Practices and organisational Results. *Proceeding of the 2nd European Conference on Intellectual*

Capital, ECIC, Italy, 239-245.

Eckerson, W. (2006), 'Performance dashboard: measuring, mentoring, and managing your businesses, John Wiley & Sons, UK.

Epetimehin, F. M. and Ekundayo, O. (2011). Organisational knowledge management: survival strategy for Nigeria insurance industry. *Interdisciplinary Review of Economics and Management*, 1(2), 9-15.

Elizabeth, D and John, W. (2013) The role of project management offices (PMOs) in IS project success and management satisfaction. Emerald Group Publishing Limited. Available at: <http://oro.open.ac.uk/33995/2/246D196E.pdf>. Accessed date: 10-10-2016.

F

Fong, P and Choi, S. (2009) 'The processes of knowledge management in professional services firms in the construction industry: a critical assessment of both theory and practice'. *Journal of Knowledge Management*, 13 (2):110-126.

Fahy, M. (2016) Saudi Arabia's new approach to avoid construction overruns and delays. Available online at: <http://www.constructionweekonline.com/article-36932-could-saudis-pmo-law-prevent-mega-project-delays/>. Accessed date: 05-10-2016.

Fattah, Z and Nereim, V. (2016) National Project Management Office. Bechtel Among Companies Said to Bid to Manage Saudi Projects. Available online at: <http://www.bloomberg.com/news/articles/2016-07-25/bechtel-among-companies-said-to-bid-to-manage-saudi-projects>. Accessed date: 07-10-2016.

Fortes (2016). The state of PMO. Available online: <https://www.fortesglobal.com/en/about-us>. Accessed date: 11-07-2017.

Feng, J. (2006). A Knowledge Management Maturity Model and Application. *Technology Management for the Global Future, 2006. PICMET 2006, 2006. Vol. 3, pp. 1251-1255.*

Fink, A. (2013). *How to Conduct Surveys: A step-by-step guide?* London: SAGE.

G

Goffin, K., Koners, U., Baxter, D., & Van der Hoven, C. (2010). Managing Lessons Learned and Tacit Knowledge in New Product Development. *Research-Technology Management*, 53(4), 39-51.

Godbole, S. (2014) PMO: Its Impact on Project Success and Measuring Its Performance. Purdue University. Joint International Conference.

Gore, C. and Gore, E. (2000) Knowledge management: the way forward. *Total Quality management*, Vol. 10, No 4-5, pp. 554-60.

Gurtu, A. (2010) "Enterprise Project Management". PMI Virtual Library.

Goh, S. (2002). Managing effective knowledge transfer: an integrative framework and some practice implications. *Journal of Knowledge Management*. 6(1), 23-30.

Gill, J. and Johnson, P. (2010). *Research Methods for Managers*, (4th ed.), SAGE Publications Ltd, London.

Ghasemi A, Zahediasl S. (2012). Normality tests for statistical analysis: A guide for non-statisticians. *International Journal of Endocrinology and Metabolism* 2012; 10:486-9.

Goldman, F. (2010). A Structured Model of Relationship Dynamics Between Organisational Knowledge Management and Organisational Learning. *Proceedings of the 2nd European Conference on Intellectual Capital*, Lisbon, Portugal. aci, UK.

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research. *The Qualitative Report*, 8(4), 597-606. Retrieved from <http://nsuworks.nova.edu/tqr/vol8/iss4/6>

Gore, C. and Gore, E. (2000) Knowledge management: the way forward. *Total Quality management*, Vol. 10, No 4-5, pp. 554-60.

H

Hobbs, B. (2007). *The Multi-Project PMO: A Global Analysis of the Current State of Practice*. Quebec: Project Management Institute. [SEP]

Hobbs, B., & Aubry, M. (2007). A multi-phase research program investigating project management offices (PMOS): the results of phase 1. *Project Management Journal*, 38(1), 74-86.

Hobbs, B. & Aubry, M. (2010). *The Project Management Office (PMO): A Quest for Understanding*. Project Management Institute, New York, p. 5-95.

Herrgard, T.H. (2000) Difficulties in the diffusion of tacit knowledge in organisations. *Journal of Intellectual Capital*, Vol. 1, No 4, pp. 357-365.

Hill, G. M. (2008). *The Complete Project Management Office Handbook*, 2nd Edition, USA: Taylor and Francis Group.

Hislop, D. (2009) *Knowledge Management in Organisations* (2nd Ed.). Oxford University Press, Oxford.

Henderson, R. (2006). Testing experimental data for uniform normality. *Clinica-Chem Acta* 2006; 366:112-29.

Haider, M and Hussin, S and Akram, S (2016). Kurt Lewin's process model for organizational change: The role of leadership and employee involvement: A critical review. *Journal of Innovation & Knowledge*.

Halcomb, E. & Sharon, A. (2009) *Mixed methods research for nursing and the health sciences*. Chichester: Wiley. [SEP] Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

Halawah, M. (2013). "The Role of PMO in different stages of the Project". Available at: <http://www.arab-eng.org/vb/t40427.html> accessed date: 28/01/2016.

Hoffine, D. (2013). Resource Management Centres of Excellence (CoE) Update. Available at: http://www.knoxdd.com/imagine_progress_august_2013.htm. Accessed date: 26/03/2016.

Hizamul, R. (2010). Establishing A PMO more efficient and effective. Faculty of civil engineering technology Malaysia.

Hung, Y., Guang, S., Lin, Q. and Tsai, M. (2005). Critical factors in adopting a knowledge management system for the pharmaceutical industry. *Industrial Management*, 105(2).

Herrgard, T.H. (2000) Difficulties in the diffusion of tacit knowledge in organisations. *Journal of Intellectual Capital*, Vol. 1, No 4, pp. 357-365.

Hinkelmann, K and Witschel, F (2014). How to choose a research methodology? Available at: http://knut.hinkelmann.ch/lectures/project2013/p1_5_how-to-choose-a-research-methodology.pdf. Accessed date: 25/08/2016.

I

The Institute of Management (2011) PMO evaluation processes. Available at: <http://www.instituteofmanagementspecialists.org.uk>. Accessed date: 05-08-2016.

J

Jordan, A. (2015). The Next Generation PMO Leader. Available at: <http://www.projectmanagement.com/articles/296384/The-Next-Generation-PMO-Leader>. (Accessed 18-04-2016).

Julian, J. (2008) How PMOs leaders facilitate cross-project learning and continuous improvement. *Project management Journals*. Vol. 39, No. 3, pp. 43-58.

Jed, C. (2009). Content Management in a Knowledge Management Context. Available online: <http://www.prescientdigital.com/articles/content-management/content-management-in-a-knowledge-management-context>. Accessed date: 17-July-2017.

Jafari, M and Akhavan, P. (2009). A framework for the selection of KM. *Journal of knowledge management practice*. Available online at: <http://www.tlainc.com/article180.htm>. Accessed date: 17-07-2017.

Joppe, M. (2000). The Research Process. Retrieved February 25, 1998, from <http://www.ryerson.ca/~mjoppe/rp.htm>

Jupp, V. (2006) *The Sage dictionary of social research methods*. London: Sage.

K

Kendrick, J. (2009). Measures and Metrics for PMO Success. *Project Management Office Summit*. Washington, D.C.: P2C2 Group, Inc. [L]
[SEP]

Kamara, J, Chimay, A, Carillo, P (2002). A CLEVER approach to selecting a knowledge management strategy. *International Journal of Project Management* 20 (3), 205–211.

Kanapeckiene, L & Kaklauskas, E & Zavadskas, M (2010). Integrated knowledge management model and system for construction projects. *Engineering Applications of Artificial Intelligence*. Available online at: www.elsevier.com/locate/engappai. Accessed date: 10-10-2016.

King, W. (2009) Knowledge Management and Organizational Learning. Katz Graduate School of Business, University of Pittsburgh.

Keong, L & Foo, S and Goh, D. (2006) On the concept and types of knowledge. Journal of information & knowledge management. Vol. 5, No. 2.

Kennedy, P. (2009). *How to combine multiple research options: Practical Triangulation*. Available at: (<http://johnnyholland.org/2009/08/20/practical-triangulation>). Accessed date: 01-Feb-2019.

Koskinen, K & Pihlanto, P & Vanharanta, H. (2003). Tacit knowledge acquisition and sharing in a project work context. *International Journal of Project Management*, 21(4), 281-290. doi: Doi: 10.1016/s0263-7863(02)00030-3.

Keyedin, S (2012). *A Strategic Guide to the PMO (Project/Program Management Office)*. Minneapolis: Keyedin Solutions.

Kristonies, A (2005). Comparison of Change Theories. INTERNATIONAL JOURNAL OF MANAGEMENT, BUSINESS, AND ADMINISTRATION VOLUME 8, NUMBER 1, 2005.

Koskinen, K and Pihlanto, P. (2008). Knowledge Management in Project-Based Companies Hampshire, UK: Palgrave Macmillan.^[1]

Khan, B (2016). “5 Major roles a Project Management Office plays within a company”. Available at: <https://www.nqicorp.com/en/2016/12/13/5-major-roles-a-project-management-office-plays-within-a-company/>. Accessed date: 10-06-2017.

Kmart, K. (2008). Are You Looking at These PMO Opportunities For Continuous Improvement? Available at: <http://kigospace.com/pm/pmo-continuous-improvement/>. Accessed date: 20/04/2016.

Kigospace, (2014). One Page Overview of PMO Communications Management. Available at: <http://kigospace.com/pmo-2/one-page-overview-of-pmo-communications-management/>. Accessed date: 11/03/2016.

KPI, (2014). Possible PMO Metrics. Available at: <http://www.pmoguru.com/pmo-kpi-examples-for-measuring-success/>. Accessed date: 28/06/2016.

King Abdul-Aziz City for Science and Technology (2012). “Project Management Office their Units and Function”. Available at: <http://www.kacst.edu.sa/ar/depts/ecpp/Pages/strac.aspx> accessed date: 30/05/2016.

Kong, F and Cai, L. (2008). Customer Knowledge Management and Research in E-Commerce Environment. Knowledge Acquisition and Modeling, 2008. KAM '08. International Symposium, 231-235.

Khatib, H. (2016) Could Saudi's PMO law prevent mega project delays? ITP Business Publishing Ltd. Available online at: <http://www.constructionweekonline.com/article-36932-could-saudis-pmo-law-prevent-mega-project-delays/>. Accessed date: 07-10-2016.

L

Li, M. and Gao, F. (2003) ‘Why Nonaka highlights tacit knowledge: a critical review’, Journal of Knowledge Management, Vol. 7, No. 4, pp.6–14.

Levine, B and Harvey, A. (2005) *Project Portfolio Management – A Practical Guide To Selecting Projects, Managing Portfolios, and Maximizing Benefits*, San Francisco: John Wiley & Sons.

Love, P & Edum, F & Irani, Z. (2003) Management of knowledge in project environments. *International Journal of Project Management* 21 (3), 155–156.

M

Maqsood, T., Finegan, A., Walker, D (2006). Applying project histories and project learning through knowledge management in an Australian construction company. *Learning Organization* 13 (1), 80–95.

Mills, A and Smith, T. (2011) 'Knowledge management and organisational performance, a decomposed view'. *Journal of Knowledge Management*, 15 (1): 156-171.

Mishra, B and Bhaskar, A. (2011) 'Knowledge management process in two learning organisations. *Journal of Knowledge Management*, 15 (2): 344-359.

Mitchell, R and Boyle, B. (2010) 'Knowledge creation measurement methods', *Journal of Knowledge Management*, 14 (1): 67-82. [SEP]

Mertens, D and Biber, S (2012). Triangulation and Mixed Methods Research: Provocative Positions. *Journal of Mixed Methods Research* 6(2) 75–79.

Magdad, T (2010) Project management projects. Arab British Academy for Higher Education. Available online at: <http://www.abahe.co.uk/Research-Papers/Small-Business-Administration-fundamentals-and-contemporary-themes.pdf>. Accessed date: 20-10-2016.

Majmah, (2013). “Conference on the Establishment of the PMO”. Available at: [/http://www.mu.edu.sa/ar](http://www.mu.edu.sa/ar) accessed date: 20/02/2016.

Mathers, N & Fox, N & Hunn, A. (2009) Surveys and Questionnaires. The NIHR RDS for the East Midlands / Yorkshire & the Humber, 2009.

Meireles, A., Cardoso, L., Marques, J. (2010). Organisation Commitment, Knowledge Management and Social Economy: an Empirical study. *Proceedings of the 9th European Conference of Knowledge Management*, Southampton Solent University, UK., 189.

Mastering PM, (2012). Available at: http://www.mastering-project-management.com/support-files/pmo_charter_template.pdf. Accessed date: 20/02/2016

Mysliviec, R (2013). Benefits of a Knowledge Management (KM) Powered Project Management Office (PMO). Available at: <http://www.rtmconsulting.net>. Accessed date: 07-10-2016.

Marr, Bernard. 2003. Consider the culture when benchmarking KM Processes. *KM Review* Vol. 6, no.5: 6-7.

McDonough, M (2014). “The Top Ten Benefits of Project Management”. Available at: <https://www.brighthubpm.com/project-planning/2350-the-top-ten-benefits-of-project-management/>. Accessed date: 08-04-2018.

Muller R, Gluckler J, Aubry M (2013). Project management knowledge flows in networks of Project Managers and PMOs. *International Journal of Project Management*. Vol. 44, No. 2, pp. 4-19.

Motawa, I & Anumba, C & Lee, S. (2007). "An integrated system for change management in construction". *Automation in Construction*, 16(3)368-377.

Marttonen, S. (2014), "Creating risk measurement model to project portfolio management in construction company", Lappeenranta University of Technology, School of Industrial Engineering and Management, Tampere

Malhotra, R and Temponi, C. (2009) Critical decisions for ERP integration: small business issues. *International Journal of Information Management*, 29(2): 104–110.

Mysliviec, R (2013). Benefits of a Knowledge Management (KM) Powered Project Management Office (PMO).

May, T. (2011) *Social research: issues, methods and process*. 4th ed. Maidenhead: Open University Press.

Milman, A (2010). *Paradigms of Instruction and Assessment*. Available online at: http://www.aera.net/publications/Default.aspx?menu_id=46&id=1406. Accessed date: 01/08/2016.

Matthews, B. & Ross, L. (2010) *Research methods: a practical guide for the social sciences*. Harlow: Longman. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

Montana, P. and Charnov, B. (2009). *Management: A Streamlined Course for Students and Business People*. (Hauppauge, New York: Barron's Business Review Series, 1993), pp. 155-169.

Madhoushi, M. And Sadati, A. (2010), Knowledge Management, Antecedent of Organisational Innovation and Competitiveness. *Proceeding of the 2nd European Conference on Intellectual Capital*, ECIC, Italy, 399-405.

McDaniel, C. and Gates, R. (2002). *Marketing research: the impact of the Internet*. Hoboken, NJ. Wiley.

Moss, M. and Media, D. (2014). The Advantages and Disadvantages of Mixed Methodology Research. Available at: <http://classroom.synonym.com/advantages-disadvantages-mixed-methodology-research-4263.html>. Accessed date: 12-August-2016.

N

Nehme, M. (2014). Do You Need a Project Management Office (PMO)? (Online) Available at: <http://blog.softwareadvice.com/articles/project-management/do-you-need-a-pmo-0214/>. (Accessed 26-09-2016).

Nonaka, I., Konno, N., and Toyama, R. (2000) Emergence of Ba. In: Nonaka, I., and Nishiguchi, T. (Eds), *Knowledge emergence: Social, technical and evolutionary dimensions of knowledge creation*, Oxford University Press, Oxford

National Anti- Corruption Commission, (2016) Reasons of stalled projects. Available at: <http://www.amlak.net.sa/?p=4737>. Accessed date: 20-10-2016.

NHS, (2008). A PRACTICAL GUIDE TO SETTING UP A PMO (WITH EXAMPLES). PORTFOLIO, PROGRAMME & PROJECT MANAGEMENT OFFICES. Department of Health Informatics Directorate Informatics Capability Development branch.

- Nasimi, M and Kasmaei, S and Musapour, H. (2013) KNOWLEDGE MANAGEMENT AND COMPETITIVE ADVANTAGE FOR ORGANIZATIONS. Kuwait Chapter of Arabian Journal of Business and Management Review Vol. 2, No.5; Jan. 2013.
- Nonaka, I., & Teece, J. D. (2001). *Managing industrial knowledge: creation, transfer and utilization*. London SAGE Publication.
- Norris, C. (2005) *Epistemology*. London: Continuum. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.
- Nonaka and Von Krogh G. (2009). Tacit Knowledge and Knowledge Conversion: Controversy and Advancement in Organisational Knowledge Creation Theory *Organisation Science*. 20(3), 635-652.
- Neuman, W. (2004). *Basics of Social research: Qualitative and Quantitative Approaches*, Boston, MA, Pearson.
- Naybour, P (2016). 'The benefits of following a project management method'. *Parallel Project Training*. Available at: <https://www.apm.org.uk/blog/the-benefits-of-following-a-project-management-method/>. Accessed date: 06-05-2018.

O

- Obrochta, M., & Finch, C. (2011). *Key Performance Indicators for the PMO: Metrics for Success*. Retrieved from <http://www.pmhut.com/key-performance-indicators-for-the-pmo-metrics-for-success>. Accessed date: 10-10-2016.
- Owen J, Burstein F, & Mitchell Steven. (2004). Knowledge reuse and transfer in a project management environment.
- Olsen, W (2004). Triangulation in Social Research: Qualitative and Quantitative Methods Can Really Be Mixed. Forthcoming as a chapter in *Developments in Sociology, 2004*, ed. M. Holborn, Ormskirk: Causeway Press.
- Oltra, V (2005). Knowledge management effectiveness factors: the role of HRM. *Journal of Knowledge Management* 9 (4), 70–86.
- Olatokun, W. and Nwafor, C. (2012). The effect of extrinsic and intrinsic motivation on knowledge sharing intentions of civil servants in Ebonyi state, Nigeria. *Information Development*, 28(3), 216-234, doi: 10.1177/0266666912438567.
- Omotayo, F. (2015). "Knowledge Management as an important tool in Organisational Management: A Review of Literature" (2015). *Library Philosophy and Practice (e-journal)*. 1238. Available at: <http://digitalcommons.unl.edu/libphilprac/1238>. Accessed date: 17-07-2017.
- Owen, J and Burstein, F. (2005). Where Knowledge Management Resides within Project Management. *Case Studies in Knowledge Management*:138-153.
- Oliver, S. and Kandadi, K. (2006). How to develop knowledge culture in organisations? A multiple case study of large distributed organisations. *Journal of knowledge Management*, 10(4), 6-24.

Oakwood, (2010). PMO Best Practices. Available at: http://www.stlpmi.org/images/meeting/101210/2010_october_lunch.pdf. Accessed date: 17/03/2016.

P

PMI (2008). A guide to the project management body of knowledge. 4th edn. Pennsylvania: Project Management Institute, Inc.

PMI, (2009). Project Management Office (PMO) fundamentals - Part I. Available at: <http://jensenpmp.blogspot.com/2009/09/project-management-institute-pmi-states.html> accessed date: 24/01/2016

Project Management Institute. (2012) *The Project Management Office in Syncwith Strategy*. Newtown Square, PA: Project Management Institute.

PMI (2013). 'PMO Frameworks'. PMI's Pulse of the Profession: PMO Frameworks. (Online) Available at: http://www.pmi.org/~media/PDF/Publications/PMI_Pulse_PMO-Frameworks.ashx. (Accessed 10-Oct-2016).

Project Management Solutions, (2010). The State of the PMO. A PM SOLUTIONS RESEARCHREPORT.<http://www.pmsolutions.com/collateral/research/State%20of%20the%20PMO%202010%20Research%20Report.pdf> accessed date: 18/03/2016.

PM Solutions. (2013). The State of The PMO 2012. Glen Mills: PM Solutions.

Plessis, M. (2005) Drivers of knowledge management in the corporate environment. *International Journal of Information Management*, 25(3): 193-202.

Pathirage, C.P., Amaratunga, D. and Haigh, R. (2007) Tacit knowledge and organisational performance: Construction industry perspective. *The Journal of Knowledge Management*, Vol. 11, No1, pp. 115- 126.

Pemsel, S and Wiewiora, A. (2013). PMO a knowledge broker in project-based organisations. *International Journal of Project Management*. Vol. 31, No. 1, pp. 31-42.

Pawlowski, S and Robey, D (2004). Bridging user organization: knowledge brokering and the work of information technology professionals. *MIS Quarterly*. Vol. 28, No. 4, pp. 645-672.

Pwc, A. (2012) *Insightsand Trend: Current Portfolio, Programme, and Project. Management Practices*. New York: PwC.

Pallant, J. (2016). *SPSS Survival Manual: a Step by Step Guide to Data Analysis Using SPSS*. Maidenhead: Open University Press/McGraw-Hill, 2016. Print.

Project Contract (2015). LSTK (Lump Sum Turnkey). Available at: <https://www.theprojectdefinition.com/lstk-lump-sum-turnkey/>. Accessed date: 10-Dec-2018.

Practical PMO, (2011). PMO Tools Project Communications. Available at: <http://www.practicalpmo.com/17-pmo-tools-project-communication/> accessed date: 27/04/2016.

Peansupap, V and Walker, D. (2005) Factors affecting ICT diffusion: A case study of three large Australian construction contractors.

Punch, K. (2009). *Introduction to Social Research, Quantitative and Qualitative Approaches*, SAGE Publications Ltd, London.

Paquette, S. and Desouza, K. C. (2011). Knowledge transfer. In: K. C. Desouza and S. Paquette (Eds.), *Knowledge Management: An Introduction* (pp. 179-212). New York: NY: Neal-Schuman Publishers, Inc.

Phillimore, J. & Goodson, L. (2004) *Qualitative research in tourism: ontologies, epistemologies and methodologies*. London: Routledge. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

Punch, K. (2009). Introduction to Social Research, Quantitative and Qualitative Approaches,

Pawlowsk, J and Bick, M (2012). The Global Knowledge Management Framework: Towards a Theory for Knowledge Management in Globally Distributed Settings. Business Information Systems, ESCP Europe Berlin, Germany.

Patil, G (2016). "Project Management Challenges". Journal of Multidisciplinary Engineering Science and Technology (JMEST) ISSN: 2458-9403 Vol. 3 Issue 11, November – 2016.

Picaiello, G (2014). "The Top Ten Benefits of Project Management". Available at: <https://www.brighthubpm.com/project-planning/2350-the-top-ten-benefits-of-project-management/>. Accessed date: 08-04-2018.

PRINCE2 Foundation. (2008). Portfolio, Program and Project Office Norwich: TSO.

Project Management Institute. (2004). A guide to the project management body of knowledge: PMBOK Guide. Newtown Square, PA, USA: Project Management Institute

Project Management Institute. (2008). Organizational project management maturity model. Pennsylvania: Project Management Institute.

R

Rabiu, M. (2009). Knowledge management in Nigeria oil and gas industry: Theoretical frameworks, practical challenges and opportunities. *Petroleum Technology Development Journal*, 1, 1-10.

Robinson, H.S., Carrillo, M.P., Anumba, C.J. and Al-Ghassani, A.M. (2001) Linking knowledge management strategy to business performance in construction organisations. In: Akintoye, A. (Ed.), 17th Annual ARCOM conference, 5-7th September, Association of Researchers in Construction Management, University of Salford

Robinson, H. (2005) Knowledge management practices in large construction organizations. *Engineering, Construction and Architectural Management* 12 (5), 431–445.

RTM Consulting (2014). Benefits of a Knowledge Management (KM) Powered Project Management Office (PMO). Available at: <http://www.rtmconsulting.net>. Accessed date: 08-10-2016.

Rowley, J (2013). "5th Edition PMBOK® Guide—Chapter 1: The Project Management Office or PMO". Available at: <https://4squareviews.com/2013/01/15/5th-edition-pmbok-guide-chapter-1-the-project-management-office-or-pmo/>. Accessed date: 15-04-2018.

Rouse, M. (2011). Project Management Office (PMO). (Online) Available at: <http://searchcio.techtarget.com/definition/Project-Management-Office>. (Accessed 24-12-2015).

Rouse, M. (2014). Project Management Office (PMO). (Online) Available at: <http://searchcio.techtarget.com/definition/Project-Management-Office>. (Accessed 24-Nov-2016).

Ropes, D. And Tholke, J. (2010). Communities of Practice: Finally, a Link Between Individual and Organisational Learning in Management Development Programs.

Proceeding of the 2nd European Conference on Intellectual Capital, ECIC, Italy, 513-520.

Reich, B & Wee, S. (2006). SEARCHING FOR KNOWLEDGE IN THE PMBOK GUIDE. *Project Management Journal*, 37(2), 11-26.^[SEP]

Rania, M (2011). How to establish a Project Management Office (PMO). PM WORLD TODAY. Vol. XIII, Issue V. Available at:

<http://www.onewayforward.info/Papers/May%202011%20-%20PMWT%20Featured%20Paper%20-%20AL-MAGHRABY%20-%20PMO%20-%20FINAL2.pdf>. Accessed date: 07-10-2016.

Ramaniah, (2014). Knowledge Management. Available at: <http://www.pmi.org/Knowledge-Center/Knowledge-Shelf/Knowledge-Management.aspx>. Accessed date: 13/02/2016.

Rierner, F. J., Lapan, S. D. & Quartaroli, M. T. (2012) *Qualitative research: an introduction to methods and designs*. San Francisco: Jossey-Bass.^[SEP] Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>.

S

Sanchez, M and Palacios, M. (2008) 'Knowledge-based manufacturing enterprises: evidence from a case study'. *Journal of Manufacturing Technology Management*, 19 (4): 447-468.^[SEP]

Srikantaiah, T & Koenig, M & Al-Hawamdeh, S. (2010). *Convergence of Project Management and Knowledge Management*: Scarecrow Press.

Scott, L. (2016). We Need to Talk About Status Reports. Available at: <http://pmoflashmob.org/we-need-to-talk-about-status-reports/>. Accessed date: 17/04/2016.

Shahram S, Matthews J, Yarlagadda P (2014). Management of project knowledge at various maturity levels in PMO. *PMI Research and Education Conference*, 27-29 July 2014, Portland, Oregon, USA. Available at: <http://eprints.qut.edu.au/72889/>. Accessed date: 10-10-2016.

Stanleigh, M. (2006). Risk Management...the What, Why, and How. Available at: <http://www.bia.ca/articles/rm-risk-management.htm>. Accessed date: 10/04/2016.

Salameh, H. (2014) "A Framework to Establish a Project Management Office". *European Journal of Business and Management*, Vol (6) pp. 2.

Sun, M., Sexton, M., Aouad, G., Fleming, A., Senaratne, S., Anumba, C. (2004). Managing Changes in Construction Projects. available at: <http://www.built-environment.uwe.ac.uk/research/cprc/publications/mcd.pdf>. Accessed date: 09-10-2016.

Spender, J. C. (2008). Organisational learning and knowledge management: whence and wither? *Management Learning*, 39(2), 158-176.

Sun, P. Y.-T and Scott, J. L. (2005). An investigation of barriers to knowledge transfer. *Journal of Knowledge Management*, 9(2), 75-90, doi: 10.1108/13673270510590236.

Shadbolt, Nigel and O'Hara, Kieron. 2003. AKTuality : An overview of the Aims, Ambitions and Assumptions of the Advanced Knowledge Technologies Interdisciplinary Research Collaboration. Available at: <http://www.aktors.org/publications/selected-papers/01.pdf>.

Surbhi, S. (2016). 'Difference Between Parametric and Nonparametric Test'. Available at: <https://keydifferences.com/difference-between-parametric-and-nonparametric-test.html>. Accessed date: 03-Dec-2018.

Saunders, M. Lewis, P. and Thornhill, A. (2009). *Research Methods for Business Students*, (5th ed.), Pearson Education Limited, England, Harlow.

T

Tylor, P. (2011) How to be A PMO leader. Leading successful PMO. Gower publishing routledge, London.

Tserng, H. and Lin, Y. (2004) 'Developing an activity-based knowledge management system for contractors', *Automation in Construction*, Vol. 13, No. 6, pp.781–802.^[1]_[SEP]

Tiwana, A. (2002). *The Knowledge Management Toolkit*. Upper Saddle River, NJ, Prentice Hall.

The Project Group (2012). PMO and organisation. Available at:

<https://www.theprojectgroup.com/en/home.html>. Accessed date: 06-07-2016.

Thiqah (2013). "PMO Approach". Available at: http://www.thiqah.com/index.php?option=com_content&view=article&id=82:2009-02-17-20-29-37&catid=60:support&Itemid=123 accessed date: 05/03/2016.

TenStep (2013). 201.0 The Value of a PMO. Available at: <http://www.pmostep.com/201.0HomeValue.htm>. Accessed date: 21/04/2016.

Tuten, L and Tracy, A. (2009) Electronic methods of collecting survey data. Available at: http://www.gesis.org/fileadmin/upload/forschung/publikationen/gesis_reihen/zuma_arbeit_sberichte/97_09.pdf. Accessed date: 12-11-2016.

Teiglingen, E (2014). Semi-structured interviews. BU Graduate School.

Teddlie, C. and Tashakkori, A. (2010) Overview of contemporary issues in mixed methods research", in *Sage Handbook of Mixed Methods in Social & Behavioral Research*. Sage, California, pp 1-41.

U

United Nations Development Programme (2003). Annual Report: A world of Development Experience. electronic resource, Available at: <http://www.undp.org/annualreports/2003>. Accessed date: 18-70-2017.

V

Visitacion, M. (2009). *Making the Case for the Next-Generation PMO*. Cambridge, MA: Forrester.

Valle, J. A., da Silveira e Silvia, W., & Soares, C. A. (2008): Project Management Office (PMO) – Principles in practice. AACE International Transactions. p. PM71

Villa, T (2010). *Selling knowledge management to PMOs*. PMI Global Congress Proceeding. Marseilles, France.

Vera D, Crossan M. (2003). Organisational learning and Knowledge Management: Toward an integrative framework. In M Easter by-Smith, M Lyles (Eds.), *Handbook of organisational learning and knowledge management*. Blackwell.

VanderStoep, S. W. & Johnston, D. D. (2009) Research methods for everyday life: blending qualitative and quantitative approaches. San Francisco: Jossey-Bass. Available as an e-book via the Library catalogue: <http://prism.talis.com/derby-ac/>. Accessed date: 13-August-2016.

W

Ward, J and Aurum, A. (2004) *Knowledge management in software engineering – Describing the process*, 137–146., 15th Australian Software Engineering Conference. Melbourne.

Walker, D and Christenson, D (2005). Knowledge wisdom and networks: a project management center of excellence example. Learning organization. Vol. 12, No. 3, pp. 275-291.

Williams, T. (2008) How do organization learn lessons from projects – and do they? IEEE Transaction on Engineering Management, Vol. 55, No. 2, pp. 248-266.

Wenger, E (2008). *Communities of practice – learning, meaning and identify*. Cambridge University Press, New York.

Wellman, J (2009). *Organisational learning*. New Yourk, Palgrave McMillan.

Wang, S. and Noe, R. A. (2010). Knowledge sharing: A review and directions for future research. *Human Resource Management Review*, 20(2), 115-131.

Walczak, S. (2005). Organisational knowledge management structure. *The Learning Organisation*, 12(4), pp. 330-339.

Wiewiora A, Liang C, & Trigunarsyah, B. (2010). Inter- and intra- project knowledge transfer: analysis of knowledge transfer techniques. Paper presented at the PMI Research and Education Conference.

Wicaksana, S. (2015) *Human Resources Management*. Available at: <https://www.slideshare.net/wicaksana/2015-public-training-human-resources-management>. Accessed date: 20-0702017.

Wolthenholme, A (2009) *Never Waste a Good Crisis: A review of progress since Rethinking Construction and Thoughts for our Future, Constructing Excellence*. (http://www.constructingexcellence.org.uk/pdf/Wolstenholme_Report_Oct_2009.pdf)

Wasseluk, (2014). Change Management Model. Available at:
<http://artslikeair.com/Welcome/edu-627-weeks-6-7/>. Accessed date: 07/04/2016.

Y

Yusof, M and Bakar, H and Tufail, M. (2014). KM Vs. Competitive Advantage. Available at:
https://www.researchgate.net/figure/268331683_fig1_Figure-1-The-research-model. Accessed date: 22-07-2017.

Young, A (2014). 'One Size PMO Does NOT Fit All'. Available at:
<http://www.pmsolutions.com/blog/view/the-services-and-value-add-of-pmos-part-one/>.

Accessed date: 08-05-2017.

Yang, J and Wang, C. (2004) Advancing organisational effectiveness and knowledge management implementation'. *Tourism Management*, 25 (5): 593–601.

Z

Zaim, H & Tatoglu, E and Zaim, S. (2007) 'Performance of knowledge management practices: a causal analysis'. *Journal of Knowledge Management*, 11 (6): 54-67.

Zayed, T. and Liu Y. (2014), "Cash flow modeling for construction projects", *Engineering Construction and Architectural Management*, Vol. 21, No. 2, pp. 170-189, Emerald Group Publishing Ltd.



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11 August 2017

Ayedh Alqahtani

Dear Ayedh,

RE: ETHICS APPLICATION STR1617-62: 'The role of the Project Management Office (PMO) in promoting Knowledge Management (KM) in KSA construction companies'

Based on the information you provided, I am pleased to inform you that your application STR1617-62 has been approved.

If there are any changes to the project and/ or its methodology, please inform the Panel as soon as possible by contacting S&T-ResearchEthics@salford.ac.uk

Yours sincerely,

A handwritten signature in black ink that reads 'A Higham'.

Dr Anthony Higham
Chair of the Science & Technology Research Ethics Panel

Appendix B

[The Questionnaire]

The main aim of this Survey is to find out ‘**The role of the Project Management Office (PMO) in promoting Knowledge Management (KM) in KSA construction companies**’. This Questionnaire is a part of the course I’m currently doing for my PhD research in Construction and Project Management. In addition, the importance of this work is to develop a framework for the implementation of Knowledge management processes within KSA construction firm’s Project Management Office. It is important you fill out the questionnaire honestly and accurately. Please note that your responses will be anonymous and remain confidential. All data collected will be used by the researcher only for the purposes of this PhD, the data will be disposed of securely within 3 years of completion. There are no right or wrong answers, please answer all questions to the best of your ability.

This questionnaire can be filled out by people who work in the Head Office (PMO Office) or the site of projects. If you want to contact me regarding to this questionnaire, here my contact details:

Name: (Ayedh Qassim Alqahtani)

Phone Nr. (00966544446445 Or 00447533331115)

Email: (A.Alqahtani1@edu.salford.ac.uk)

This questionnaire is divided into three sections and the suggested time to complete it; is in between **12-15** minutes.

The Questionnaire will be begun on the next page

(Section 1: Questions from 1-18 are biographical questions to support analysis)

1) What is your gender?

- Male
- Female

2) What is your age?

- Under 30 years
- 31-40 years
- 41-50 years
- 51-60 years
- Over 60 years

3) What is your nationality?

- Kingdom of Saudi Arabia (KSA).
- American Citizens
- European Citizens
- South Asian Citizens (Indian- Pakistani..etc.).
- East Asian Citizens (Chinese- Japanese..etc.).
- Arab Citizens (Egyptian-Lebanon..etc.).
- Other (please state)

4) Please indicate the highest level of education you have achieved.

- High school
- Diploma
- Bachelor's degree
- Graduate diploma
- Master's degree
- Doctorate

5) What is the nature of your position in the organisation?

- CEO/President/Chairman
- Project Manager
- General Manager
- Operations Manager
- Finance/ Accounting Manager
- Human Resource Manager
- Engineer
- PMO or Project Management Team
- Other (please state)

6) Are you site (project) based or located in a regional or head office away from the project?

- Project based
- Office based

7) How many years have you worked in your current profession?

- Less than one year
- From 1-5 years
- From 5-10 years
- Over 10 years

8) How long have you worked in the construction industry?

- Less than one year
- From 1-5 years
- From 5-10 years
- Over 10 years

9) Thinking about the past 10 years (2007-2017) where have you been working most of the time?

- Kingdom of Saudi Arabia (KSA).
- American Countries.
- European Countries.

- South Asian Countries (India- Pakistan..etc.).
- East Asian Countries (China- Japan..etc.).
- Arab Countries (Egypt - Lebanon..etc.).
- Other (please state)

10) How long did you work in? (relate to question number 9)

- Less than one year
- From 1-5 years
- From 5-10 years
- Over 10 years

11) What type of employment do you have?

- Permanent Contract
- Contract (Fixed hire)
- Consultant (Self employed)
- Governmental Contract
- Other (please state)

12) How long have you been for current employer?

- 0-5
- 5-10
- 10-15
- Over 15

13) How many employees work for your current employer?

- 0-49
- 50-199
- 200-299
- 300-399
- 400-499
- Over 500

14) What type of client is your organisation deal with?

- Private client (who needs assistance with their private properties).
- Public client (company, factory, or business who seeks to undertake a construction project).

- Government (government based projects).

15) What type of project has your organisation executed in the last 10 years?

- Energy Projects (Power generation ...etc).
- Public Transport Projects
- Construction of Public Building.
- Industrial Projects.
- Infrastructure Projects.
- Commercial Projects (Leisure, Hotels, Malls ..etc).
- Oils & Gas Projects.
- Civil Engineering Projects (Bridges, Roads ..etc).

16) What is the size of project that your company were undertaken in the last 10 years?

- 0 – 10 Million.
- 10 – 20 Million.
- 20 – 30 Million.
- 30 – 40 Million.
- 40 – 50 Million.
- Over 50 Million.

17) What is the current nature of project in your work?

- New Projects.
- Multi-Phased Projects.
- Refurbishment Projects.

18) What is the turnover of the organisation?

- 0 – 20 Million.
- 20 – 40 Million.

- 40 – 60 Million.
- 60 – 80 Million.
- 80 – 100 Million.
- Over 100 Million.

19) What is the level of Sub-contracting is used on your current (most recent) project?

- Minimal (0-20%) ☹
- Low (20-40%) ☹
- Moderate (40-60%) ☹
- High (60-80%) ☺
- Very high (80-100%) ☺

20) Rank these types of contracts in order of preference, (where 1 is low and 8 is high).

- Fixed- Price Contracts.
- Joint-Venture Contracts.
- Negotiated Contracts.
- Turnkey Contracts.
- Prime contracting.
- Target cost.
- Guaranteed maximum price.

21) Which form of contracts that your organisation has to follow for implementing current or last project?

- FIDIC.
- NEC.
- ICC.
- Governmental Contract
- Other (please state)

(Section 2: Questions from 1-7 are relating to KSA Construction Market and the use of Project Management Office “PMO”)

(Ranking Questions)

[This is an example of the directions tips for selecting the proposed choice in Section 2]

Q1) Please keep the following factors in order of importance to you in the current or last project you have completed, where 1 is most important and 5 is least important to you:

(Project Factors)	
4	Time.
3	Quality.
1	Cost.
2	Customer Satisfaction.
5	Staff Satisfaction.

Q1) Please rank the following in order of importance when thinking about the management of construction projects, where 1 is most important to you and 6 is least important to you:

	Factors
<input type="checkbox"/>	The availability of PM practices.
<input type="checkbox"/>	Benefit from the company's database and experiences.
<input type="checkbox"/>	Possibilities and compatibility with entering the competition of new projects.
<input type="checkbox"/>	Communication and coordination among various parties and projects.
<input type="checkbox"/>	The involvement of Senior Management and Project Manager.
<input type="checkbox"/>	Knowledge gained from previous projects.

Q2) The Project Management Office (PMO) approach is aiming to improve business performance by applying the factors above. Please rank the following success factors in order of their importance based on your current or last project, where 1 is most important to you and 8 is least important to you:

	Factors
<input type="checkbox"/>	The clarity of decision making process.
<input type="checkbox"/>	An effective tool to adopt PM practices.
<input type="checkbox"/>	Effective management of human resources, technical and financial aspects.
<input type="checkbox"/>	The source of knowledge (center of excellence).
<input type="checkbox"/>	Support and providing current project information (regular and accurate reports).
<input type="checkbox"/>	Minimizing the expenses, costs, time, and reducing risk factors.
<input type="checkbox"/>	Increasing the performance of individuals, teamwork and the implementation of future projects.
<input type="checkbox"/>	More transparency and clarity to various projects policies, standards and procedures.

Q3) The Project Management Office (PMO) aims to coordinate and provide support in delivering best practice. To what extent do you feel this is important to you as a construction professional?

- Unimportant ☹ (0-25%)
- Slightly Important ☹ (25-50%)
- Fairly Important ☺ (50-75%)
- Very Important ☺ (75-100%)

Q4) The function of PMO is mainly focused in adopting and maintaining project management practices. Please rank the following practices in order of importance to you based on your current or the last project you completed, where 1 is most important to you and 6 is least important to you:

	Practices
<input type="checkbox"/>	Communication Management
<input type="checkbox"/>	Knowledge Management
<input type="checkbox"/>	Change Management
<input type="checkbox"/>	Resources Management
<input type="checkbox"/>	Cost Management
<input type="checkbox"/>	Risk Management

Q5) Please rank the following in order of importance when thinking about the establishment of project management office (PMO), where 1 is most important to you and 5 is least important to you:

	Setting up PMOs
<input type="checkbox"/>	Identify PMOs mission, objectives, and strategies.
<input type="checkbox"/>	Define PMOs Process, Team, Tools.
<input type="checkbox"/>	Obtain the Necessary Support (Fully acknowledge the needs of involving top management and/or stakeholders).
<input type="checkbox"/>	Provide training & coaching programs to improve people skills and knowledge.
<input type="checkbox"/>	Evaluate & Update PMOs.

Q6) Please rank the following in order of importance when thinking about the evaluation of project management office (PMO), where 1 is most important to you and 5 is least important to you:

Metrics to Evaluate PMO Performance	
<input type="checkbox"/>	The success percentages of company's projects that delivered over time.
<input type="checkbox"/>	The availability of PM practices on site are implemented and working across various projects.
<input type="checkbox"/>	Providing check list form and remains reporting lines.
<input type="checkbox"/>	The evaluation of staff attitudes, improvement and knowledge gained.
<input type="checkbox"/>	Provide Regular Meetings and Reports.

Q7) How well you know the PMO and its roles?

- Do not know ☹ (0-20%)
- Poor ☹ (20-40%)
- Average ☺ (40-60%)
- Good ☺ (60-80%)
- Excellent ☺ (80-100%)

(Section 3: Questions from 1&2 are relating to Knowledge Management Process and Prospective)

(Rating Questions)

[This is an example of the directions tips for selecting the proposed choice in Section 3]

	1. Acquisition Process	Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
ACP1	There is a set of processes in my organisation to acquire knowledge about our suppliers and customers.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ACP2	There is a set of processes in my organisation to disseminate knowledge across the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ACP3	There is a set of processes in my organisation to generate from existing knowledge some types of new knowledge.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q1) Knowledge Management Processes:

	1. Acquisition Process	Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
ACP1	There is a set of processes in my organisation to acquire knowledge about our suppliers and customers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ACP2	There is a set of processes in my organisation to disseminate knowledge across the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ACP3	There is a set of processes in my organisation to generate from existing knowledge some types of new knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Conversion Process		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
CP1	Organisation should have a specific process for organising and filtering knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP2	Organisation should have a specific process to transfer explicit knowledge to individuals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP3	Organisation should have a specific process to collect tacit knowledge from individuals into the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Application Process		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
AP1	The utilisation of knowledge management can improve efficiency by matching problems and challenges to the source of knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AP2	The development of new services, policies, and strategies should be based on the knowledge gained.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Protection Process		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
PP1	There is a set of process to protect knowledge from inappropriate use inside and outside the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PP2	Organisation should have policies and procedures to protect its trade secrets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q2) Knowledge Management Approaches and Prospective:

1. Knowledge Components		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
KC1	People in my organisation can perform and understand their own and other's tasks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KC2	People's in my organisation can communicate easily with specialists in the field to gain knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KC3	There is a need to have an effective tool to allow employees in multiple locations to collaborate and learn as a group within the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Organisational Learning		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
OL1	My organisation often sends employees to different workshops, seminars, and conferences to acquire knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OL2	My organisation is frequently providing internal training programs and coaching sessions for staff.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OL3	In our organisation, employees are aware of the goals and strategies of the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Organisational Structure		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
OS1	Sharing knowledge should be supported by a standardised reward system.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OS2	To facilitate the exchange of knowledge throughout the organisation. There is a need to have well designed processes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OS3	The organisation's structure can facilitate the discovery, creation, and transfer of new knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Organisational Culture		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
OC1	Collaborative and team working is frequently used in my organisation to capture and disseminate knowledge.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC2	Employees understand the need for knowledge management to improve company's performance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
OC3	Senior management and project managers are encouraging knowledge management in their teams and across the organisation.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Human Resources		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
HR1	Human resource management can be a knowledge facilitator by getting all the information needed to the right people at the right time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
HR2	The implication of knowledge management practices can contribute to human resource development.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Competitive Advantage		Strongly Disagree ☹	Disagree ☹	Neither Agree Nor Disagree ☹	Agree ☺	Strongly Agree ☺
CA1	My organisation has difficult and expensive knowledge management systems that are difficult for rivals to duplicate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CA2	The organisation uses knowledge management to increase market position.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Your comments:

Thank you very much for assisting me for completing this questionnaire. And if you wish to leave a feedback or comments regarding to the questionnaire, please do it in the space below.



If you would like to receive a copy of the research results, please indicate your email address below:

THANK YOU VERY MUCH FOR YOUR TIME AND EFFORTS TO COMPLETE THIS SURVEY!

Appendix C

Questionnaires Piloting

Dear respondents

Pretesting this questionnaire can help to improve and determine the strengths and weaknesses by concerning question format, wording and order. It is also used to measure the quality of question and understand whether question gathers intended information or not. Therefore, after completing the survey, please answer the following questions:

1. Do you feel that each question can measure what it is supposed to know? And do you feel that some questions are not important or make you uncomfortable?
2. Do you find that all the words can be understood? And are there any questions that you do not understand?
3. Are all response choices and options appropriate? And do you suggest other choices and options for answering questions?
4. How long does it take to complete? And do you think all respondents can easily follow directions?
5. Does the design and order of questions can create a positive impression that motivates people to respond?

Thank you very much

Appendix D

Interview Schedule

Second Phase (Personal Interview)

First of all, I would like to thank you for coming to the interview today. And to let you know this interview is a part of the course I'm currently doing for my PhD's program and the objective of this research is to find out **'The role of the Project Management Office (PMO) in promoting Knowledge Management (KM) in KSA construction companies'**. If you have any problems or do not understand any question, please let me know throw the interview and I will clarify anything that you do not understand.

1. How much experience do you have working in Project Management or PMO?
2. In few words, how can you describe the concept of PMO?
3. In few words, how can you describe the concept of KM?
4. What level of expertise would you say you were using best practice of PM? Does your company have qualified staff, holding professional certificates in PM such as (PMP, PRINC2, others)?
5. How does your organization deal with the new immigration control? And do you think the cost of maintaining professional PM staff is high?
6. What are the common problems and difficulties affecting the completion of construction projects in KSA?
7. How important role does PMO play in the management of construction projects and improving business performance?
8. What are the important functions of PMO in supporting project managers? And do you feel PMO can play a main role in adopting and maintaining best project management practices?
9. What is considered as a source of knowledge or components of KM in the organization? And what type of knowledge can be found in the project?
10. How to convert tacit knowledge into explicit knowledge through knowledge management stages in a PMO?
11. How did your organisation establish PMO? Can you explain them in order of which happening first?
12. What advice would you give for construction firms needs to develop/update PMO?
13. Do you know what is the maturity level of PMO? And did your company moved from basic PMO to advance level or has plan to do that?

The End of General Questions**

14. How KM can be provided to gain organizational learning? And does PMO office contributed to offer internal training programs, coaching sessions, and send employees to different workshops to acquire knowledge?
15. Does PMO's office/project environment contributed to **create** and activate knowledge?
 - If yes, what is the type of practices, sub-processes, and components of KM were used to create and activate knowledge?
 - If no, how this can affect the creation/ activation of knowledge? And which practices, sub-processes, and components of KM you think should be used?
16. Do you believe your organisation is using well-designed **organisational structure** to facilitate the creation and activation of knowledge?
17. Does PMO's office/project environment properly contributed to **capturing** and classifying knowledge?
 - If yes, what is the type of practices, sub-processes, and components of KM were used to capture and classify knowledge?
 - If no, how this can affect the capturing/classifying of knowledge? And which practices, sub-processes, and components of KM you think should be used?
18. Does your organisation use **competitive advantage**? How it can be used to differentiate and increasing the success of company to capturing and classifying knowledge and increasing market position?
19. Does PMO's office/project environment contributed to encourage the dissemination/**transferring** of knowledge?
 - If yes, what is the type of practices, sub-processes, and components of KM were used to disseminate and transfer knowledge?
 - If no, how this can affect the dissemination/transferring of knowledge? And which practices, sub-processes and components of KM should be used?
20. Do you believe your organisation is supporting **organisational culture** to collaborative and understand the needs to transfer knowledge? And does senior management/PMs involving in encouraging team works to exchange their valuable knowledge?
21. Does PMO's office/project environment contributed to offer some facilities to assist the application/**reuse** of knowledge?
 - If yes, what is the type of practices, sub-processes, and components of KM were used to apply and reuse knowledge?
 - If no, how this can affect the application/reusing of knowledge? And which practices, sub-processes, and components of KM you think should be used?
22. How does your organisation use **HRM** in PMO's office or in project environment? And how it can be used to ensuring valuable knowledge were in place and are quite ready to be re-used again when it's needed?

Appendix E

Participant Information Sheet

‘The role of the Project Management Office (PMO) in promoting Knowledge Management (KM) in KSA construction companies’

I would like to invite you to take part in a research study. Before you decide you need to understand why the research is being done and what it would involve for you. Please take time to read the following information carefully. Ask questions if anything you read is not clear or would like more information. Take time to decide whether or not to take part.

Thank you for reading this.

Background and aim of the project

The purpose of the study is undertaking a research study as a part of the course I’m currently doing for my PhD research in Construction and Project Management at the School of Built Environment, University of Salford, Manchester (The United Kingdom). The study aims to develop a framework for the implementation of Knowledge management processes within KSA construction firm’s Project Management Offices.

The project proposal has been reviewed by the University of Salford Research Governance and Ethics Committee.

Why you have been invited to participate

You have been invited to participate because of the value of your opinion regarding the aims of the project as well as being an experienced professional working in the construction industry. You will be one of a number of individuals across the Kingdom of Saudi Arabia invited to participate. This survey can be filled out by the PMO Leader, CEO, PMO Administration, Project Managers, Head of Department, Operators Managers, Engineers, and Project Staff who understand the organisation’s knowledge management systems.

Completion of the survey is voluntary, and you may withdraw at any time without any consequence. It is up to you to decide. If you decide to take part, you will be given this information sheet to keep and be asked to sign a consent form. The main way in which you may be invited to participate are primarily through the completion of a questionnaire. However, I am also seeking participants for a follow up one to one interview.

Questionnaire

Content of the Questionnaire

The random sample is distributed equally to two groups (Head of Department group and Project Site group) and every individual in the population might be selected. The sample size is 340 from different public and private organisation in the KSA. This questionnaire is divided into three sections and the suggested time to complete it; is in between 12-15 minutes. There are no right or wrong answers. Please answer all questions to the best of your knowledge. And to let you know that the research methods I decided to use for conducting my research is questionnaire. There is no expenses or payments available to complete this survey. And your time, efforts, and contribution is highly appreciated.

Taking part in the project –benefits

I will expect from the participant to fill out the questionnaire honestly and accurately. So, if you are willing to participate, please read the questionnaire carefully and answer all questions to the best of your knowledge. I cannot promise that the study will help you but the information I get from the study will help to improve the KSA's construction market for improving business performance and overcoming failures factors. If you have a concern about any aspect of this study, you should ask to speak to the researchers who will do their best to answer your questions: Phone: (00966544446445 Or 00447533331115).

Confidentiality

Please note that your responses are anonymous and confidential and will be used by the researcher only for the purposes of research. So, there is no possible disadvantages and risks of taking part in this study. As a participant, you should know that the data will be distributed and collected through the utilisation of an anticipated secure survey tool called Bnstol Online Surveys. Your data will be stored safely, and you will be given a research code that is known only to the researcher to protect your confidentiality. So, all information which is collected about you during the course of the research will be kept strictly confidential.

If you withdraw from the study all the information and data collected from you, to date, will be destroyed and your name will be removed from all the study files. However, if you would like to receive a summary of the research results, please ask the researcher; via email:

Email: (A.Alqahtani1@edu.salford.ac.uk)

Follow up One to One interview

Content of the One to One interview

The interviewees should receive initial contact by the invitation letter, which should explain the aim of the research, the purpose of the interview, and privacy protection. The interviews will be recorded and fully transcribed to avoid any losses of the information being given. The face-to-face interviews are selected to conduct in-depth interviews. Semi-structured face-to-face interviews are to be considered.

The interview will normally take no longer than an hour and may be tape-recorded with your permission. This will be transcribed into a written format by the researcher. A copy of this will be sent to you on request. If you are not happy to consent to the one-to-one interview being taped, then it would be good if you could let me know before the agreed date so that alternative arrangements can be made if you wish to continue to participate in the project.

After the Project has finished – Results of the study

This is an ongoing study that is expected to take three years in total. I wish to assure you that at no time will anyone, or most importantly any place, be identified unless written permission has been given for me to do so.

Decisions

If you are happy to take part now you have read this information I would be grateful if you could sign the attached consent form and either return it to the email address below or bring it with you to the interview. I would be grateful if you could let me know your intention to attend an interview at the chosen time and date.

Thank you for your time and I look forward to meeting you.

I welcome any suggestions or questions regarding to the content of this information sheet.

Signed:**Researcher:**

Date:.....

This research is sponsored and funding by the Saudi Arabian Cultural Bureu in London. For additional information or who to contact to address the different enquires. Please find the contact details below:

Appendix F



Invitation Letter

United Kingdom, 21 January 2017

DEAR SURVEY PARTICIPANTS,

I am studying for a PhD in Construction and Project Management at the School of Built Environment of the University of Salford in Manchester (The United Kingdom). As part of my studies, I am required to contribute to new knowledge by undertaking a substantial research project focused on a significant issue relating to Construction of the Built Environment.

A large number of researchers and experts have found that investing in Project Management Offices (PMOs) can lead to higher levels of project success whilst also embedding strong and consistent project management practices, processes, and procedures into the organisation. Increasing the implementation of the PMO has been highlighted in the KSA government's strategic plan 'vision 2030' which articulates a series of reforms for government. However, the majority of construction projects in the KSA suffer from significant delay causing financial and production overruns.

Given most project management staff are European and American citizens, this, together with the temporary nature of construction projects, causes a problem. The KSA's construction firms are now facing a skills and knowledge drain as project management staff members leave both the organisation and country. Ultimately this leak of specialist knowledge and experience must be countered before it becomes a serious risk to both project delivery and organisational survival. One possible solution is to implement Knowledge Management (KM) via a PMO to capture the explicit and tacit knowledge these professionals hold before they depart. Thus, this research suggests that as people hold knowledge and new knowledge is created at every phase

of a project, if this knowledge is captured, it can flow seamlessly through the organisation if centrally stored and disseminated by the PMO. The research aims to develop a conceptual model for the implementation of Knowledge management processes within KSA construction firm's Project Management Offices.

To investigate these issues, I would like to invite you to complete a short questionnaire survey. The survey can be filled out by the PMO Leader, PMO Administration, Project Managers, Head of Department, and Operators (Engineers or Project Staff), who understand the organisation's knowledge management systems. Completion of the survey is voluntary and you may withdraw at any time without any consequence. Data collected is anonymous, strictly confidential and will be kept in a secure place. If you are willing to participate, please read the questionnaire carefully and answer all questions to the best of your knowledge. It would be much appreciated if you could put the survey into the box that I provided for the collection process.

Attached to this invitation is a Participant Information Sheet. This will provide you with further information about the questionnaires and who to contact if you have any questions. Should you have any queries about the survey please do not hesitate to contact me through the contact details below. Thank you very much for your time and efforts and your contribution is highly appreciated.

Kind regards

Researcher

Ayedh Qassim Alqahtani

420, Maxwell Building, University of Salford, Salford M54WT

Email: (A.Alqahtani1@edu.salford.ac.uk)

Phone: (00966544446445 Or 00447533331115)

Supervisor

Dr. Higham Anthony

410, Maxwell Building, University of Salford, Salford M54WT

Email: A.P.Higham@salford.ac.uk

Phone: (+4416(0)12956904)

Appendix G

Research Participant Consent Form

Title of Project: ‘The role of the Project Management Office (PMO) in promoting Knowledge Management (KM) in KSA construction companies’

Name of Researcher: AYEDH ALQAHTANI

- I confirm that I have read and understood the information sheet for the above study (version x- date) and what my contribution will be.

Yes	No
-----	----

- I have been given the opportunity to ask questions (face to face)

Yes	No
-----	----

- I agree to take part in the interview

Yes	No
-----	----

- I agree to the interview being tape recorded

Yes	No
-----	----

- I agree to digital images being taken during the research exercises

Yes	No
-----	----

- I understand that my participation is voluntary and that I can withdraw from the research at any time **without giving any reason**

Yes	No
-----	----

- **I agree to take part in the above study**

Yes	No
-----	----

Name of participant

Signature

Date

Name of researcher taking consentAYEDH ALQAHTANI.....

Researchers e-mail address(A.Alqahtani1@edu.salford.ac.uk).....

Appendix H

List of the courses and training programs that I participated in:

- Unit 1 Philosophical Stance
 - Week 1 Ontological Foundations
 - Week 2 Epistemological Foundations
 - Week 3 Axiological Foundations
 - Week 4 Methodological Choices
 - Week 5 Multi versus Mixed Methods
 - Week 6 Defending the Position
- Unit 2 Academic Writing
 - Week 1 Grammar Recap
 - Week 2 Structuring
 - Week 3 Verb Forms
 - Week 4 Effective Introductions
 - Week 5 Cohesive Writing
 - Week 6 Maintaining Coherence
- Introduction to Literature Searching
- Power Point: Enhancing your Presentations
- Using Other People's Work in your Research
- Giving a Presentation
- Research Ethics for PGRs
- Introduction to Literature Searching
- Introduction to academic writing
- Using Other People's Work in your Research
- Preparing for academic assessment
- Using google scholar
- Literature searching
- Presenting at academic Conference