

**A PARTICIPATORY STUDY INTO THE CREATION OF A NEW
INFRASTRUCTURE DELIVERY SYSTEM IN THE REGULATED
UK WATER SECTOR**

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Submitted in partial fulfilment of the requirements of the
Degree of Doctor of Philosophy
June, 2017

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Acknowledgements

The production of this thesis represents the culmination of a series of efforts to which my own is but a part. Without the support, challenge and commitment of a number of colleagues, family and friends, I would not have been able to reach such a fruitful conclusion. I would consequently like to acknowledge the following:

- My wife, Alina, for her continuing support, willingness to debate and preparedness to support my commitments throughout some arduous times and period of change in not only my career, but our lives;
- My academic supervisor, Prof. Peter McDermott and his drive to challenge the approach, my own psychological contract and to see the potential in this study;
- My industry supervisors, Andrew Stephenson and Chris Lane, who while vastly different, went above and beyond that which one might expect in support of this work, of me and of my goals;
- UKWASC colleagues, to whom naming would be unfair and not in keeping with this study, but without whom, two of which especially, this study would not have become what it has, and neither would I;
- The staff at the University of Salford, both affiliated with the School of the Built Environment and the KTP office especially, without whom I would not have been capable of achieving such a feat;
- The review staff, who at both my milestone reviews through this study challenged my own opinions and conceptions, as well as stoking a desire within me to make the most of this study opportunity;
- The Engineering and Physical Science Research Council, as without their support and commitment, this study would not have been possible;
- My parents, my brother, my parents-in-law and loved ones past without whom I may not have had the fortitude or capacity to undertake such a study; and
- Friends and colleagues, from Bankole and Fady academically, and Eamon and Fraser architecturally, to Darren and Andy personally, it is our social circles that often influence the values we define as real and those we thus apply in our work.

Dedication

This study is dedicated to my wife Alina and our son James.

Declaration

This thesis is submitted under University of Salford rules and regulations for the award of a PhD degree by research.

This researcher declares that he is responsible for the work carried out in this thesis. Furthermore, he wishes to state that no portion of the work referred to in this thesis has been submitted elsewhere for another degree qualification of this, or any other university.

.....

Michael Potts

October, 2016

Abbreviations

| | |
|-------|--|
| AMP5 | Asset Management Period 5 (2010-2015) |
| AMP6 | Asset Management Period 6 (2015-2020) |
| AMP7 | Asset Management Period 7 (2020-2025) |
| APT | AMP6 Procurement Team |
| AR | Action Research |
| BIS | (department for) Business, Innovation and Skills |
| CAPEX | Capital Expenditure |
| CIRIA | Construction Industry Research and Information Association |
| CM | Category Management |
| CMP | Change Management Protocol |
| CSF | Critical Success Factors |
| DfT | Department for Transport |
| DWI | Drinking Water Inspectorate |
| EA | Environment Agency |
| EPSRC | Engineering and Physical Sciences Research Council |
| EU | European Union |
| GDP | Gross Domestic Product |
| HS1 | High Speed 1 |
| HS2 | High Speed 2 |
| iCase | Industrial Case Award |
| ICO | Infrastructure Client Organisation |
| ICR | Infrastructure Cost Review |
| IDS | Infrastructure Delivery System |
| IPR | Infrastructure Procurement Routemap |
| IUK | Infrastructure United Kingdom |
| KPI | Key Performance Indicator |
| MGMP | Management of a Group of Multiple concurrent Projects |
| MPE | Multi Project Environment |
| NAO | National Audit Office |

| | |
|--------|---|
| NIP | National Infrastructure Plan |
| NZTA | New Zealand Transport Agency |
| OECD | Organisation for Economic Co-operation and Development |
| Ofwat | The Economic Regulator of the Water sector in England and Wales |
| OPEX | Operational Expenditure |
| PAR | Participatory Action Research |
| PBO | Project Based Organisation |
| PIR | Project Initiation Routemap |
| PO | Participant Observation |
| PPP | Public Private Partnerships |
| PRK | Per Route Kilometre |
| PSE | Purchaser and Supplier Engineering |
| PWC | Price Waterhouse Cooper |
| SCM | Supply Chain Management |
| SDS | Service Delivery System |
| SPM | Strategic Procurement Management |
| SPMC | Strategic Procurement Management Competence |
| STS | Socio Technical Systems |
| TCE | Transaction Cost Economics |
| TMO | Temporary Multi Organisation |
| TOTEX | Total Expenditure |
| TPCA | Three Phase Change Approach |
| UKWASC | United Kingdom Water and Sewerage Company |
| UoS | University of Salford |

Abstract

The project creates a new infrastructure delivery system through the design and implementation of a Strategic Change Model to facilitate change management. The project is premised on identifying barriers to effective delivery within an Infrastructure Client Organisation (ICO), and subsequently on finding a way to address those issues in the real world. Oscillating between theory, literature and action, the project concentrates on the creation of the new AMP6 Infrastructure Delivery System for UKWASC (United Utilities), a regulated monopolistic provider of water and wastewater services in the North West of England, responsible for delivering over £3 billion in infrastructure expenditure between 2015 and 2020.

Beginning in 2012 and employing a Three Phase Change Approach (TPCA) towards participatory action, the project utilises participant observation, action research and participatory action research over a 3+ year period. This project has focused primarily on five interventions into UKWASC to improve Strategic Procurement Management Competence (SPMC) within the organisation. With interventions premised in the use of socio-technical systems for the purposes of joint optimisation within the ICO, the project served to form the Strategic Change Model as a vehicle through which to intervene and to promote effective change management within the ICO (UKWASC).

Focusing on the single study, the project is premised on the formation of warrantable assertions as locally created representations of knowledge. Such assertions are made for the purpose of contribution to theory, practice and the participatory focused methodologies in light of strategic procurement, change management, participatory focused research and the application of systems thinking principles in the delivery of infrastructure.

NOTE: This submission consists of a bound thesis as required under the regulations, containing a number of appendices pertaining to the thesis itself. **FOR VIVA PURPOSES,** copies of the full action reports (appendices) for the thesis will be made available and submitted also. These are not for wider circulation due to commercial and ethical sensitivity issues. Access will be granted upon attaining the appropriate permissions from UKWASC and the University, including the satisfaction of associated Non-Disclosure Agreement requirements from UKWASC.

CHAPTER 1 INTRODUCTION

1.1 Chapter introduction

The following chapter aims to summate an investigation into the effective delivery of infrastructure within the UK water sector. Facilitated by an industrial case (iCase) studentship award from the Engineering and Physical Science Research Council (EPSRC), the project reflects a culmination of efforts between the University of Salford (UoS) and United Utilities Plc (UKWASC). This chapter covers the following principle areas:

- The background to the study;
- A rationale for the research study;
- The research questions and judgements;
- The study's aims and objectives;
- The scope of the study;
- An overview of the adopted research methodology;
- The contribution to knowledge made by the study in the form of warrantable assertions;
- An overview of the thesis structure;
- Chapter summary and linkages

The primary aim of this section is to give the reader a fully inclusive presentation of the study, outlining to what purpose the following chapters and the activity described within them aim to achieve.

1.2 Background to the study

Infrastructure, for the purpose of this study, is concerned with hard forms of infrastructure comprising major roads, rail, airports, ports, electricity, gas, communications, water and sewerage, waste and flood risk management (HM Treasury,

2010a). While construction is concerned with the provision of outputs, infrastructure takes on a broader connotation and is concerned with the provision of a service (Too, 2009), bringing items together via networks of nodes and singular assets that contribute to a broader service provision or outcome. The framework of arrangements and relationships, inclusive of the broad array of stakeholders involved constitutes an Infrastructure Delivery System (IDS) (Awuzie and McDermott, 2012), and involves decision making processes that lead to the identification, design, delivery and use of infrastructure facilities.

Governments have sought to involve the private sector in the delivery of these public services with this involvement being a focus in the literature. The corresponding growth in the use of Public Private Partnerships (PPPs) can be attributed to the process of government debt reduction, and the failure of traditional methods to deliver value-for-money service delivery. However, issues concerning poor quality infrastructure and the delivery of infrastructure-related services have continued to elicit high levels of interest in recent times (HM Treasury, 2010a). Criticisms concerning poor cost effectiveness and service delivery trail the organisations responsible for the provision of infrastructure services (HM Treasury, 2013), namely, Infrastructure Client Organisations (ICOs). Indeed Helm (2013) highlights that British infrastructure is a source of almost constant study and criticism, resulting in a host of demands in water, energy, transport and communications, represented by National Infrastructure Plan (NIP) Statements, made by the coalition government in light of industry reforms resulting from the October publication of the NIP 2010 (HM Treasury, 2010b). These criticisms have led to a shift in focus towards the resilience, value, investment in and efficiency of infrastructure assets, coupled with their procurement, delivery and management (HM Treasury, 2013).

Conversely, ICOs within the UK have been under extensive pressure in recent times to economise their delivery processes, increase consistency and reliability within project delivery and maximise outputs in the face of positive investor returns. Authors such as Flyvbjerg et al. (2008), HS2 (2009, 2012), Cantarelli et al. (2012), Helm (2013) and HM Treasury (2010a, 2013) point toward increasing client and management costs, as well as a lack of skills and ability within ICOs. Indeed, the Infrastructure Cost Review (ICR) (HM

Treasury, 2010a) identified client leadership, overly complicated procurement practices and poor design specification as the top three areas for reducing costs. Further issues identified include stop-start investment programmes, poor governance and ineffective incentivisation of cost control, poor asset information and cost data, specification, design and standard assets, commercial issues and procurement processes. The ICR goes further to identify supply chain delivery issues as poor integration, low investment in innovation, low levels of skills and training, low productivity and logistics.

Undoubtedly, streamlining the internal and external processes within these ICOs would bring about change. Achieving such change can pose a herculean task, and often, introducing enduring change into such organisations requires the collaborative resolve of all stakeholders involved. One of these such ICOs in the UK (UKWASC) has shown to be striving to achieve both regulatory and organisational service delivery targets, and subsequently engaged to be a part of this study to review its internal and external delivery processes with a view to engendering lasting change. With a disconnect between change focused initiatives and industry improvements (HM Treasury, 2010a), it is expected that this study would identify barriers to efficiency and introduce change processes to influence and enhance optimised service delivery. The prominent foundations to achieving these goals lie in Strategic Procurement Management theory (Cox, 1996; Kraljic, 1983; Russill, 2010; Arbulu and Tommelein, 2002) as a vehicle for what to improve, Socio-Technical Systems (Trist and Bamforth, 1951; Bradbury et al., 2008) as a fulcrum for change in delivery through intervention focusing on joint optimisation of practice, and Participatory Methods (Lewin, 1951; Susman and Evered, 1978; Kindon et al., 2007) to facilitate effective change management. The primary aim being the creation of a new Infrastructure Delivery System (IDS) as a facilitator for effective change management, the creation of which is predicated on the building of a change model embossed by the aforementioned body of theory.

1.2.1 A rationale for the research study

A significant issue for the delivery of infrastructure is the ability of ICOs to effectively manage, acquire, identify and implement a series of constructed assets. The wider

industry is clearly beset by a disconnect between theory, policy, guidance and best intentions from what is actually taking place. Indeed as recently as March 2016, the latest Government Construction Strategy for 2016-2020 (HM Treasury, 2016), born from the remnants of Infrastructure UK in the form of the new Infrastructure and Projects Authority, reinforced improving client organisational abilities, sector skills, supply chain engagement and whole-life cost management as integral strategic priorities for the sector. The National Infrastructure Plan for Skills (HM Treasury, 2015) also points towards the stagnant nature of the construction industry's productivity levels compared to manufacturing and services for example. This poor industry performance is evident in the poor construction sector KPI results across the UK between 2006 and 2011 (Constructing Excellence and Glenigan, 2011).

One such group of service providers, the water industry in England and Wales, providing services via a Pure Private Sector arrangement following privatisation in 1989, is seeing reactions to these wider industry issues in the form of guidance. Either from the government in the form of 'Smoothing Investment Cycles in the Water Sector' (HM Treasury, 2012), or from the regulatory authority Ofwat (2013) in 'Setting price controls for 2015-2020 framework and approach' documentation. With stringent pressures from regulators and a drive towards a more open competition focused market as soon as 2017, it is important that water sector ICOs address concerns around the wider effectiveness of the industry, ageing asset bases and forecast population growth in the face of an evolving regulatory environment (Akintoye and Renukappa, 2013). This places the water sector, its management and the delivery of its critical assets at the centre of the debate on improving the efficacy of UK infrastructure delivery.

1.3 Research questions & judgements

1.3.1 Questions

While the following can be summated through two questions, each question is supported by a number of areas of concern that facilitate the primary study interests.

1) What are the barriers within an ICO hampering effective infrastructure delivery?

And thus;

- a. What factors affect the delivery of infrastructure;
- b. What constitutes the delivery of infrastructure;
- c. What is the nature of the social mechanisms that facilitate the management and delivery of infrastructure; and
- d. What is an infrastructure delivery system?

2) How can I improve the delivery of infrastructure from within an ICO? *And thus;*

- a. What constitutes an appropriate approach to change;
- b. What will I be improving;
- c. How will I intervene within an ICO; and
- d. How will I know that I have changed something?

1.3.2 Judgements

In contrast to studies that engender the creation of fact via proposition building and testing, this study is premised on the idea of truth and the use of judgments. The following judgements may consequently be read as propositions in a differing research scenario, but for this study, they are intentionally prescribed as judgements and made akin to the localised setting of this study.

- The appropriate use and identification of delivery systems is not fully comprehended within ICOs;
- Strategic procurement management involves the joint optimisation of social as well as technical elements in delivery in order to be effective;
- The role of the client in the delivery of infrastructure is pivotal to the organisation, structure, identification, use and optimisation of infrastructure delivery systems;
- There is the opportunity to improve the competency levels of ICOs in the appropriate use of strategic procurement;
- An approach to change predicated on three phases involving unfreeze, move and refreeze would lead to effective change within an ICO;

- The creation of a strategic procurement management oriented change model, predicated on the joint optimisation of working practices via intervention through Socio-Technical Systems (STS) would result in improvements to the delivery of infrastructure.

1.4 Aims and objectives of the study

1.4.1 Research aims

This study is seeking to:

- Identify the barriers that hinder the adoption of a strategic approach to infrastructure delivery within ICOs; and to
- Engender effective change to facilitate optimised practices that support improved capability within an ICO in utilising strategic approaches to infrastructure delivery.

1.4.2 Research objectives

The following objectives facilitate the achievement of the aforementioned aims of this project, namely to:

1. Identify what constitutes a strategic approach to infrastructure delivery;
2. Ascertain the extent of Strategic Procurement Management Competence;
3. Identify the factors that hinder the adoption of a strategic approach to infrastructure delivery;
4. Facilitate the creation of a new Infrastructure Delivery System (IDS) in the regulated UK water sector;
5. Develop and validate the use of the Three Phase Change Approach (TPCA) within an ICO in bringing about real world change;

6. Develop and validate the effectiveness of the Strategic Change Model in enhancing Strategic Procurement Management Competence via intervention within an ICO;
7. Utilise Socio-Technical Systems (STS) as a basis for intervention within an ICO to facilitate joint optimisation.

1.5 The relationship between the Research Questions and the Research Objectives

Table 1.1 details the nature of the study objectives in corresponding to the question devised for the study, inclusive of their expanded sub components of concern.

| Research Questions | Research Objectives |
|---|---|
| What are the barriers within an ICO hampering effective infrastructure delivery? | To identify what constitutes a strategic approach to infrastructure delivery |
| | To ascertain the extent of Strategic Procurement Management Competence |
| | To identify the factors that hinder the adoption of a strategic approach to infrastructure delivery |
| | To facilitate the creation of a new Infrastructure Delivery System (IDS) in the regulated UK water sector |
| How can I improve the delivery of infrastructure from within an ICO? | To develop and validate the use of the Three Phase Change Approach (TPCA) within an ICO in bringing about real world change |
| | To develop and validate the effectiveness of the Strategic Change Model in enhancing Strategic Procurement Management Competence via intervention within an ICO |
| | To utilise Socio-Technical Systems (STS) as a basis for intervention within an ICO to facilitate joint optimisation |

Table 1.1 – The relationship between the Research Questions and Objectives

1.6 The scope of the study

While the study is concentrated on the management of a geographically defined asset base in the North West of England, its concern is on the functionality and decision making processes that pertain to infrastructure delivery within an Infrastructure Client Organisation (ICO). Infrastructure delivery is taken to be the provision of items, assets, services and facilities that contribute to a networked service provision. In the case of water and sewerage services, a single new wastewater treatment plant, or a programme of work requiring the replacement of lead piping across a region is considered infrastructure delivery. While delivery as a concept extends across the identification, rationalisation, design, procurement, execution and operation of said facilities, projects and works, this study is centred on the identification of issues hampering the effective realisation of works, and does not expressly extend into the study of operations and maintenance.

1.7 The research methodology

To facilitate the resolution of the research questions for this study, as well as the corresponding objectives, an interventionist research methodology has been adopted for the project. With this study centring on change and improvement in a longitudinal manner, which by its nature constitutes evaluating and assessing the impacts of change over time (Gray, 2004), as well as exploring causes, the approach serves a dual purpose. This study consequently adopts a single case strategy and is concerned with localisation as its medium through which to contribute to knowledge. An important premise of this project however is the use of theory in action, not action for theory; this is not grounded theory, but a single action focused 'case'.

The single case of focus for the project is a privatised monopolistic provider of regional water and sewerage infrastructure services, referred to in this study as UKWASC. The study has, to a certain extent, been embedded within UKWASC for almost 37 of this 42 month project. The method thus serves a duality of purpose in this regard, as while it is

premised on the formulation of a relevant contribution to knowledge as a project, the activities and suitability of actions are predicated on an alignment to real world practice, need and relevance. The methodological approach supports the creation of a new IDS concerned with joint optimisation, the building and testing of the Strategic Change Model, as well as the identification of the problems to address in the first instance. This is done via the Three Phase Change Approach (TPCA) towards action and research.

The study` began in the body of knowledge, focusing on literature around the delivery of infrastructure, loosely premised on the formation of a new IDS to facilitate change management. Very quickly, the opportunity to undertake early activity within UKWASC became apparent and literature on the application of participatory methods as well as undertaking change management was investigated. The TPCA was formed to primarily involve the identification of issues in Phase One, to undertake change while building a change model in tandem (the Strategic Change Model) in Phase Two, and to reflect on the efficacy of the changes and the usefulness of the model in Phase Three. As my understanding and familiarity with the participatory methods adopted during the project grew, change activity in fact took place in Phase Three as well as I began to investigate my own practice. To clarify, the TPCA focuses on a series of action focused constructs:

Phase One (unfreeze) utilises a framework of Participant Observation (PO), coupled with a variance of data collection techniques. It also involves the creation of an initial model of the 'AMP5' IDS (referred to as the model as entered), with AMP5 referring to the regulatory control period 2010-2015 that UKWASC was in at the study's outset. Also, a skills and maturity exercise was undertaken to act as a baseline of UKWASC's competency levels and to add a further dimension to the identification of barriers to the effective delivery of infrastructure. This data also helped to define the interventions.

Phase Two (transition) began with the initial identification of five interventions to be undertaken within UKWASC to correspond to the five principles of Strategic Procurement Management Competence drawn from the literature review, consisting of Risk, Selection, Governance, Cost and Innovation. This identification process was conducted using the Change Management Protocol (CMP). A tool built for the project to

act as a barrier between theory and action, and to help protect the project from scope creep or being akin to consultancy, whilst maintaining theoretical and practical relevance. Following identification, the first two interventions (Risk and Selection) were conducted 'to' the organisation utilising the Canonical form of Action Research based in the work of Susman and Evered (1978). The premise of conducting interventions was under an umbrella of Socio-Technical Systems (STS), focusing on the joint optimisation of social and technical processes in delivery.

Phase Three (Refreeze) continues with change focused activity, but via a subtle shift. Due to the changing nature of the psychological contract between myself and UKWASC, the latter three interventions, namely Governance, Cost and Innovation, are conducted utilising Participatory Action Research (PAR) based in the work of Kindon et al. (2007). A further skills and maturity exercise is conducted, as well as building the 'AMP6' model (model as exited) following the closure of activity. As a closedown to 'action', a number of semi-structured interviews were conducted focusing on the extent of the action, the validity of the Strategic Change Model, wider organisational change and further on issues hampering effective delivery within UKWASC.

1.8 Study Overview

In preparation for later sections of this thesis and for clarity, it is prudent to give an overview of the study and its primary components opposed to a pure thesis structure. Outlined within Figure 1A below, the **TPCA** is the approach to action in the real world; **PO** is a research technique for identifying areas to change; **AR** and **PAR** are research techniques for conducting change; the **skills assessments, modelling** and **closedown interviews** facilitate validating change and the use of the **Strategic Change Model** as well as serving to identify barriers to effective delivery; **STS** is the framework for intervening with people in the social world, and thus the foundation for the identification of the **Strategic Change Model**; and **Strategic Procurement Management** is the theory being used in action, and for the population of the managerial element of the **Strategic Change Model** where one is concerned with enhancing **competence**.

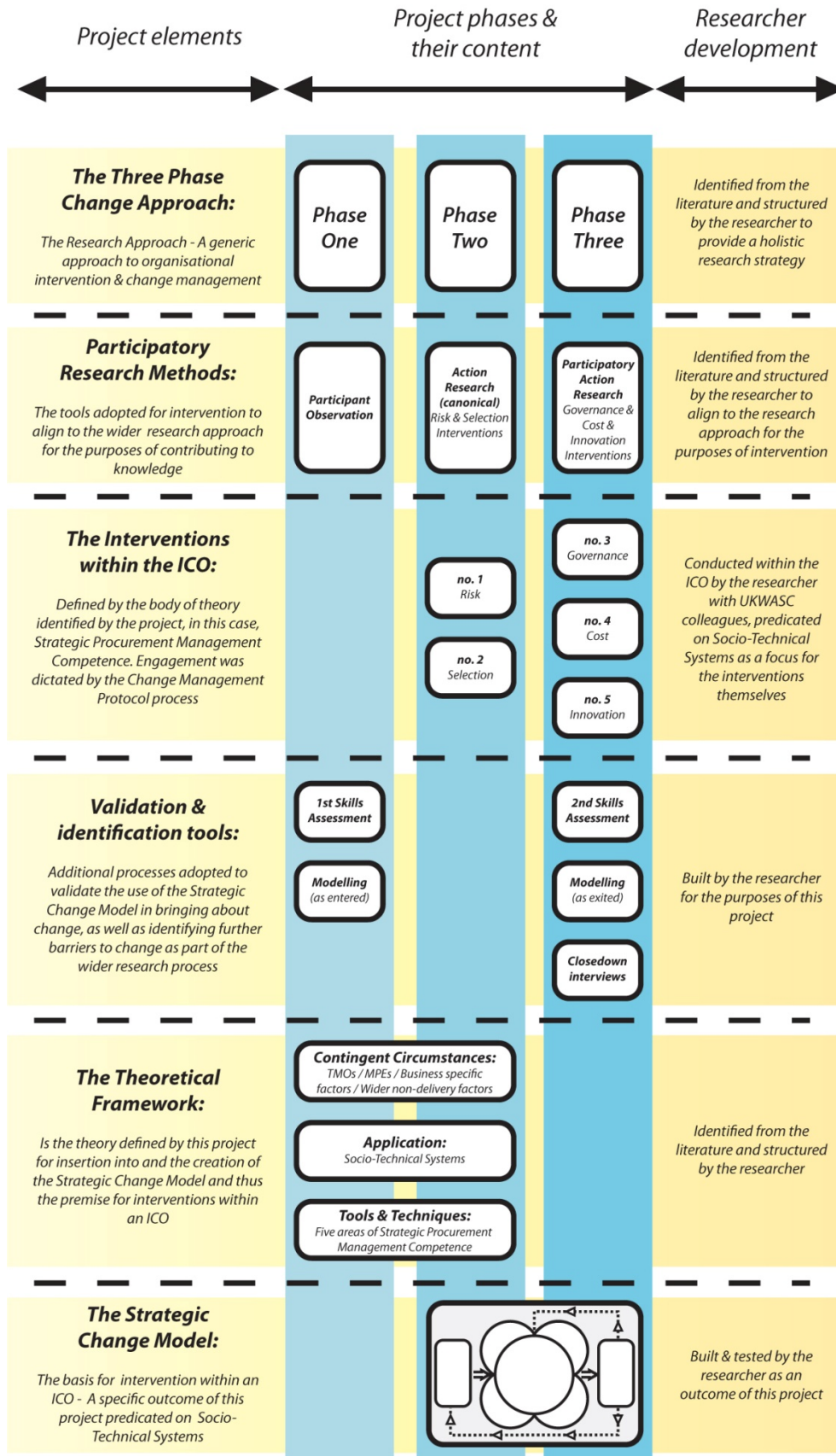


Figure 1A - Study Overview

In terms of production however, a total of 8 study reports have been created, one for PO, one combining the first and second skills and maturity assessment exercises, one for the CMP, and one for each of the five interventions. The model as entered and the model as exited are reviewed within the body of the report. To contribute into knowledge however for a study of this nature, the thesis concludes with the formation of warrantable assertions. The purpose being that for a localised study one cannot lay claim to form generalising facts applicable to a wider populous or area of study. In essence, one claims, put aptly by Bob Dick (1995), to form 'a new sentence' that we have made every effort to disprove. Such assertions, not facts, but truths, become warranted by the adoption of an appropriate methodology and through the rigorous application of theory.

1.9 Contribution to knowledge

Following review of the literature, extant espousal of the construction industry's deficiencies in project delivery and the extent of skills levels within ICOs, this study centres on the inability of industry change initiatives in bringing about real world change within the delivery of infrastructure. Whilst studies have been able to identify that there is indeed a problem, and that many of the problems originate within ICOs, to the knowledge of this researcher, no attempt has been made to address the implementation of a strategic approach to infrastructure delivery within such ICOs or indeed why strategic approaches have failed to be adopted.

The study consequently seeks to contribute to knowledge through the **development of the Strategic Change Model predicated in Strategic Procurement Management theory and Socio-Technical Systems theory**. Through intervention within an ICO via **the five principles of Strategic Procurement Management Competence**, the study will **influence the formation of a new IDS within the UK water sector** by facilitating change management grounded in joint optimisation.

1.10 Thesis structure

This report is structured into six distinct sections with eight corresponding chapters. A number of key elements make up the sections and corresponding chapters, with Figure 1B depicting the interrelationships between the important sub-sections and the overall reporting structure for the study.

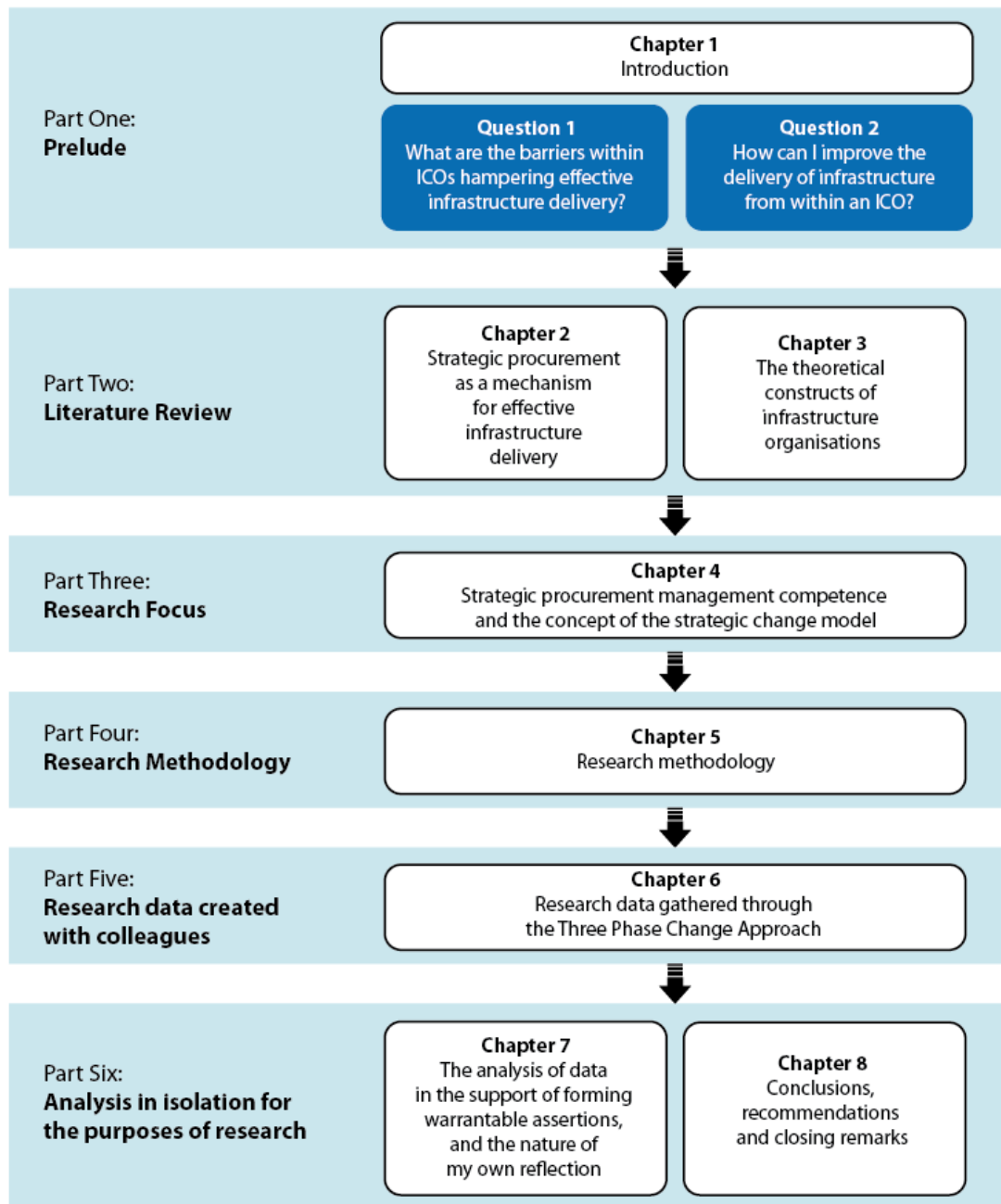


Figure 1B - Reporting sequence for this study

The corresponding chapters and their key components include:

- a) Chapter 1 provides an introduction to the study, a rationale for its scope and an overview of the methodological tools employed and the research aims & questions;
- b) Chapter 2 helps refine the focus of the study, initially by taking a macro perspective on the provision of infrastructure, the nature of infrastructure delivery in the UK, critical aspects of successful projects, and the role of the client in infrastructure delivery; it goes on to focus on the theoretical underpinnings of Strategic Procurement Management, its relationship with infrastructure delivery and the espousal of the need to enhance competence; culminating in outlining the component parts of a strategic approach to infrastructure delivery and the impact these have on the delivery of infrastructure;
- c) Chapter 3 details the nature of infrastructure delivery organisational constructs, inclusive of the temporary project organisation, complexity and the use of programme approaches; it goes on to focus on the management of change within the delivery of infrastructure, as well as the rationale for Socio-Technical Systems as an appropriate intervention construct;
- d) Chapter 4 presents a response to issues highlighted in previous chapters 2 & 3 and outlines the fulcrum of the research study via the presentation of Strategic Procurement Management Competence and the Strategic Change Model;
- e) Chapter 5 outlines the fundamental methodological components of conducting research and the philosophical framework of the interventionist approach adopted for this study, inclusive of the wider Three Phase Change Approach and its relationship with PO, AR and PAR, as well the utilisation of a single study and the manner in which contributions to knowledge can be made via a localised study;
- f) Chapter 6 presents the extent of data collected / created with colleagues in response to the study's aims, inclusive of reference to the intervention reports;

- g) Chapter 7 separates my own reflection from the knowledge that one could construe as being shared within chapter 6, and is in direct support of the formation of warrantable assertions also made within this chapter;
- h) Chapter 8 presents the closure of the project, inclusive of concluding remarks and content of further interest to future studies, readers and interested others.

1.11 Chapter summary and linkages

This chapter has served as an overview of the study's aims and objectives, as well as providing a rationale for the study in relation to the focus topic. Effort has been made to give a synopsis of the research approach adopted for the project, as well as the localised nature of this study. It is hoped that this initial introduction allows the subsequent sections of this report to elaborate on some of the key themes identified here. Pursuant to this aim, the following begins by investigating the provision of infrastructure, what it means to take a strategic approach to infrastructure delivery in response to the industry's problems, what constitutes the management of delivery and thus what makes up the basis of the strategic approach.

CHAPTER 2 STRATEGIC PROCUREMENT AS A MECHANISM FOR EFFECTIVE INFRASTRUCTURE DELIVERY

2.1 Chapter introduction

Following a brief overview of the study and its primary focal areas, the following chapter sets out the context within which this study is based, laying the groundwork for further chapters that will explore organisations, change and this study's response to their operation within the given context. It is expected that this chapter will give the reader the basis from which to understand the nature and importance of infrastructure services, the delivery of projects that facilitate those services, the client organisations that define those projects and the nature of the delivery processes they utilise to see such projects through to fruition. The following chapter structure is adopted to facilitate the above aims:

- The provision of infrastructure;
- The UK water sector;
- The importance of the ICO in delivering successful projects;
- Addressing competence in delivery through the adoption of a strategic approach;
- The management of delivery by the ICO;
- The effects of procurement strategy on the delivery of infrastructure;
- Implementing a strategic approach to the delivery of infrastructure.

2.2 The provision of infrastructure

2.2.1 Infrastructure investment and growth

As far back as Adam Smith (1776), the topic of infrastructure spend to encourage economic growth has been a focus for policy. Notably, with Aschauer (1989) has the view been taken that infrastructure spend is correlated to economic growth (Ford and

Poret, 1991; Egert et al., 2009), none more so than in the UK. In 2007 the OECD published 'Infrastructure to 2030', which focused on a number of key drivers for upcoming policy and infrastructure investment which include improving efficiency in the construction and operation of infrastructure; increasing efficiency levels in the use of infrastructure through better demand management; ensuring infrastructure is reliable and resilient; enhancing the design and capacity of infrastructure services to meet future environmental and security challenges; strengthening the life-cycle management of infrastructure assets as the focus of investment turns increasingly toward maintenance, upgrading and refurbishment of existing facilities and networks; and raising the effectiveness of infrastructure development both in meeting multiple objectives – economic, social, environmental, etc. – and in allocating resources to create maximum value. It is key then that the nature of the asset and the maximisation of investment pertaining to it is understood, and this is primarily done via asset management.

2.2.2 Asset management

The management of infrastructure invariably involves the management of assets that contribute towards a broader service, with Danylo and Lemer (1998) defining asset management as a method through which to efficiently and equitably allocate resources among competing goals and objectives. Asset management is thus more than the understanding, management and collection of a series of physical assets, it considers the organisational strategies and end users (mainly public) that manage, operate and use such assets. While a number of authors have attempted to recognise the characteristics of infrastructure assets (see Too, 2009), the characteristics of these assets is as a part of physical networks, providing conduits for other media, such as cars, water or energy and are built up of primarily long term fixed items.

ISO 55000 defines asset management however as the synchronized activity of an organization to extract value from assets, whereby an asset is an item, thing or entity that has either potential or actual value to the organization. A description which deliberately goes beyond describing simply physical items, but also organisational relationships, such that the delivery of systemic focused asset management in sectors

such as water, rail and roads need to be via an integrated approach. Reducing costs associated with asset management can be linked to the use of forward planning, while understanding the make-up of a community's infrastructure is also paramount to its efficacy as a whole. Partially irrespective of outlook, asset management and the optimisation of an integrated network focuses on the wider whole and the agglomeration of specifics. This suggests a differing vantage point from the prevalence of literature which focuses on infrastructure in terms of projects, either as megaprojects (Flyvbjerg et al., 2003; van Marrewijk et al., 2008), large engineering projects (Miller and Lessard, 2000), or merely as service-led projects (Alderman et al., 2005).

2.2.3 The nature of infrastructure delivery in the UK

In the case of the delivery of critical assets, Akintoye and Renukappa (2013) suggest that there are three forms of over-arching governmental approaches to the delivery of infrastructure provision that exist, consisting of Pure Public Sector, PPPs and Pure Private Sector. In the UK, a vast array of infrastructure is delivered under the Purely Private form. It becomes important then for this project to understand the UK context in more detail.

2.2.3.1 The UK national profile

Considered one of the globe's more economically developed countries, the UK has benefited from a larger role in global politics than its diminutive stature may suggest, due largely in part to its colonial imperialist past. With a populous of over 64 million across circa 240,000sq km, the UK's GDP of over \$3.1 trillion dollars ranks it a nominal 5th amongst world economies (OECD, 2015). Seen as a model for the knowledge economy, the UK has a large emphasis on education, research and financial sectors and a general focus on quaternary industries, reflected in that 3 of the world's top 10 universities are UK based. Substantially affected by the economic downturn following the 2007/8 credit crisis, the need to invest in and decarbonise the infrastructure stock became of the utmost importance (NAO, 2013). The government's National Infrastructure Plan (HM Treasury, 2010b) set out the framework for that future, with subsequent work outlining £257 billion in planned infrastructure investment forecast

between 2012 and 2020, 64% of which being wholly owned and financed by the private sector (NAO, 2013). Infrastructure investment however is heavily centred on the capital London leading to the Institute for Public Policy Research pointing towards the growth in evidence for diminishing returns on investment in hub-cities beyond 7 million people (IPPR, 2013). Couple that with private sector investment in the country, such that of the largest 20 major projects from the National Infrastructure Pipeline released by HM Treasury in 2012, only one project is solely publicly funded, and only two a combination, the need to focus on private investment becomes apparent.

2.2.3.2 Infrastructure delivery in the UK and the focus on the Infrastructure Client Organisation

Infrastructure investment may be of focus with regard to economic growth, but its value in terms of resilience and the future challenges to the economy, industry and country in order to maintain our infrastructure (Ofwat, 2013; HM Treasury, 2010a, 2011) are also important, such as climate change and population growth. This has led to a two pronged discussion around infrastructure, firstly the requirement to invest in infrastructure to facilitate growth (NAO, 2013) and secondly how this is done and facilitated, via services invariably provided by client organisations (HM Treasury, 2010a). Within the UK context, this focus on resilience, value, investment and efficiency can be seen within Infrastructure UK, a department within HM Treasury focused on stimulating private sector spend on infrastructure within the UK, and the Industrial Strategy 'Construction 2025' whose work builds on the 2011 National Infrastructure plan. Following on from the Infrastructure Cost Review (ICR) in 2010, policy makers have focused their attention towards issues such as stability, value, client skills, efficiency, cost benchmarking and growth (Cabinet Office, 2011), issues supported by the governments' industrial strategy.

For each £1 billion invested in UK infrastructure, the ICR advises an additional £1.299 billion UK wide GDP increase is experienced, couple that with a £2.842 billion in economic activity for each £1 billion in infrastructure construction and the argument for its value added is clear. To facilitate a focus on improved investment and maximizing its value, government policy such as the ICR in particular, focuses on the comparative cost

of infrastructure in the UK with the opportunity to improve the delivery of infrastructure said to unlock over £2-3 billion per annum in savings over the next five years (HM Treasury, 2010a). To expand on this issue, especially the rationale behind this study into the Infrastructure Client Organisation (ICO), a number of studies are identified in support of the ICO being at the fulcrum of the problem.

Commissioned by the Highways Agency in 2009, consultants EC Harris as part of the Transport Research Laboratory compared the cost differences between UK and Dutch highway construction. Previous work had highlighted that material, labour and plant costs in the UK were comparable to France and Germany, but with supervision costs, contractor's overheads and preliminaries, the UK costs became higher. Irrespective of any specification and whole life cost issues, the underlying fact remains that in the UK costs, per lane kilometre, are up to 32% higher than Dutch projects. Indeed Flyvbjerg et al. (2008) in comparing the capital costs per route-kilometre (PRK) in urban rail identify that high variance in PRK is influenced by a range of environmental factors, but highlight the importance of the decision centre, in essence, the client organisation.

A pertinent example for this debate is that of HS2 (High Speed Rail link), with predictive add-on costs (to base construction costs) totalling 31% (HS2, 2009). BSL Management Consultants (2009) in benchmarking the prospective HS2 project against six European High Speed Rail lines, as well as incorporating HS1 data for comparison found pre-phase and design and planning costs to be higher in the UK. An interesting focus on construction exists because of its value being around 80% of all costs in the HS2 example. This natural focus towards 'the biggest' area leads away from the pre-phase and design & planning phases. The issue becomes compounded when one analyses the updated HS2 Cost and Risk Model Report by consultants Davis Langdon in 2012, which outlines an additional £500 million front end contingency with no rationale provided for these management costs. The NAO's Completion and Sale of High Speed 1 report in 2012 is by no means a welcome document for supporters of HS2 either. The NAO lists 6 DfT (the ICO) failings on HS1 as:

- The Department (Dft) does not have sufficient understanding of the economic impact and regeneration benefits of transport infrastructure, compared with alternatives, so is not able to make fully-informed investment decisions;
- The Department gives insufficient attention to evaluating its major projects;
- The delivery of regeneration benefits from High Speed 1 suffered from a lack of effective leadership from the centre;
- Over-optimistic and unrealised forecasts for passenger demand on High Speed 1 left the taxpayer saddled with £4.8 billion of debt;
- Unrealistic passenger estimates for High Speed 1 must not be repeated in the business case for HS2;
- Some of the Department's assumptions about the benefit of faster travel are untenable.

It is thus fair to say that focus on the failings of HS1 lay primarily with the client responsible, ultimately, DfT, yet the resultant documentation for HS2 continues to overlook client side structural issues, approach and organisational ability / capability to effectively deliver the project. Instead, choosing to over-inflate costs. For example, Civity consultants (2012), albeit on behalf of the Department for Transport and Office of Rail Regulation, found in their study, that Network Rail, had a large operating overhead compared to a selection of European peer countries. Importantly then, the ICR report on UK infrastructure and its focus on the improvement of pre-construction processes, including early project formulation, is of note in facilitating change in the delivery of infrastructure. The ICR does not make the 'delivery' of infrastructure the sole responsibility and remit of contractors, but instead seeks to identify improvements within client / front end organisations. The ICR identifies that no single driver is at fault for higher costs within the delivery of infrastructure (see Table 2.1). With the ICR ranking client leadership, poor design specification and overly complicated procurement as the three top areas for reducing costs, and extant studies internationally by prominent authors such as Cantarelli et al. (2012) and Flyvbjerg et al. (2008) on up front project 'lock in' (of the need and value of the project, often in the face of information to the

contrary) and project cost-over-runs, it becomes clear how important the ICO is to the delivery of infrastructure.

| Focus area | Reasons for higher costs |
|-------------------------------------|---|
| Policy and systemic issues | Urban density and nature of infrastructure assets |
| | Planning and consultation process |
| | Regulatory compliance and third party influences on cost |
| | Wider construction market issues |
| | Low carbon agenda |
| Funder and client issues | Stop start investment |
| | Poor governance and ineffective incentivisation of cost control |
| | Poor asset information and cost data |
| | Specification, design and standard assets |
| | Commercial issues and procurement processes |
| | Insurance |
| Supply chain delivery issues | Poor supply chain integration |
| | Investment in innovation |
| | Skills and training |
| | Low productivity |
| | Logistics |

Table 2.1 - Reasons for higher costs in UK infrastructure delivery

(Source - Adapted from HM Treasury, 2010a)

2.2.4 The ICO as a determining factor within UK Infrastructure Delivery Systems

The delivery of infrastructure spans a range of organisations, governments, regulators and consumer bodies. Understanding the delivery of infrastructure in the UK requires

clarity around the parameters under which certain industries operate. For example, Network Rail who are the owner operator of rail infrastructure (not the trains on tracks however) across England, Scotland and Wales following the demise of Railtrack in 2002, is characterised by the fact that it is member owned rather than by shareholders, with only one actual member being the government. In effect private, but not. This is in contrast to the water sector across England and Wales following its divesture in 1989 whereby monopolistic service providers set prices in agreement with independent governmentally mandated regulators to suit specific geographic specificities and service requirements in terms of quality. Electricity differs somewhat from other industries in so far as production does not marry up to population spread and geo-politics, characterised by a split between generation, transmission, distribution and supply.

This may oversimplify a complicated process but to put delivery within the UK into context, and begin to define the nature of ICOs in terms of their strategic relationships nationally, Figure 2A serves as an overview for the national system of infrastructure provision. One could consequently map onto this a water company, a shale gas extractor or port authority and gain a clearer understanding of their relevance to the broader system. In essence, this model serves as a Service Delivery System (SDS), similar in nature to the singular project view of the Viable Infrastructure Delivery System (VIDS) of Awuzie and McDermott (2012). However, Figure 2A neither prescribes a specific industry nor focuses on singular projects only (although VIDS can be expanded), instead outlining decision areas and structure only, opposed to representing a theoretical research framework. The primary aim here being to outline that as the provision of infrastructure is inherently about providing a service, and the ICO prescribes the manner in which that service is optimised, that the ICO is at the centre of the SDS, and for the purposes of this study, an IDS is taken to be an SDS.

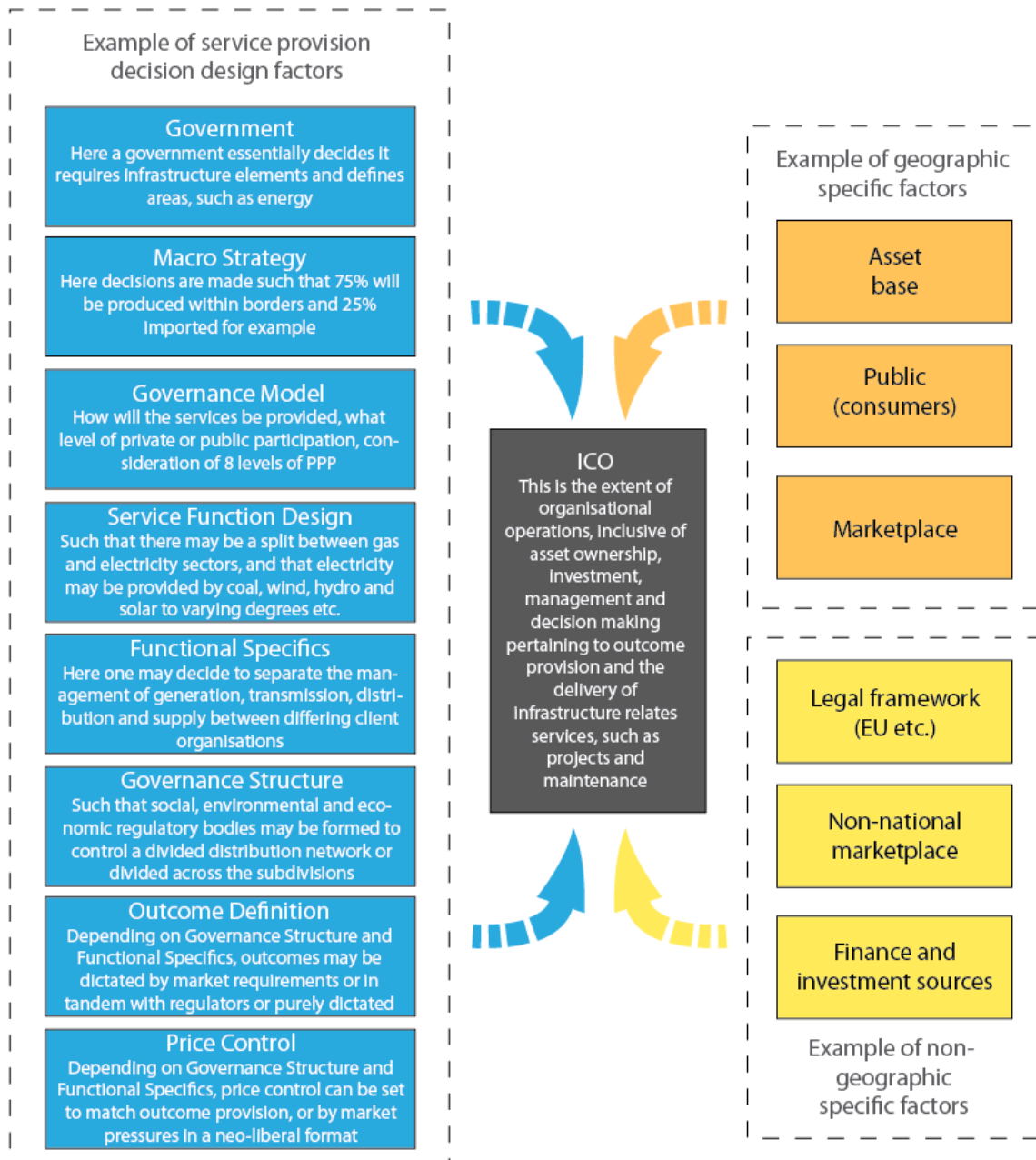


Figure 2A - Components of the UK Service Delivery System

(Source - Author)

Important to consider then is the predominately monopolistic service provision of the privatised infrastructure sectors, and the drive to marry their service outcomes with that of the common marketplace. In essence, the argument that privatisation, in its current

form at least, has not quite achieved the outcomes anticipated by the UK government in the 1980's, and that services could be more efficient on the client side, and more effective on the market side. One such sector where these two arguments are beginning to meet is in the UK water sector, where, whilst partially open to competition for large scale consumers, the sector is opening up to competition fully in 2017 to all business users. The domestic sector will soon follow and thus the water sector is potentially the best fulcrum of interest for the debate on ICO change management, and the need to deliver infrastructure services better in light of market pressures.

2.3 The UK water sector

While the UK can be seen as being asset rich and relatively cash poor, reflected in its ranking of 13th on the investor index for global infrastructure. The World Economic Forum (2012) lists the UK as 24th in terms of overall infrastructure quality while the NAO (2013) and Infrastructure UK (2013) refer to ageing assets and inefficient delivery of projects as the main stumbling blocks in UK infrastructure. To this end, focus within policy and guidance is given to critical, asset rich, but efficiency poor infrastructure providers such as the privatised water sector in England & Wales. Ofwat (The Water Services Regulation Authority) reflected this focus on efficiency as recently as January 2013 in their 'Setting price controls for 2015-2020 framework and approach' which put primary focus on issues such as project delivery, securing value for money, using water resources better, evaluating and mitigating risk and assessing historic performance.

It also places focus around outcomes opposed to outputs, which moves away from a more capital investment based model seen previously (CAPEX), to a more efficiency and enhancement based approach focused on operating costs (OPEX), looking to improve existing networks and facilities rather than simply building new ones (Ofwat, 2012). This shows that a more strategic and holistic view of infrastructure and its importance is dictating governmental attitudes and policy. Additionally, Akintoye and Renukappa (2013) identify climate change issues, population growth, distribution, changing lifestyles and consumer expectations, the European Union Water Framework Directive, the

economic environment, ageing infrastructure and water related infrastructure financing as the main challenges facing the UK water industry.

2.3.1 The Privatisation of the water sector in England and Wales

Following an array of changes in the sector beginning in 1698 with Parliaments creation of the first statutory water company, the 1000 plus water suppliers pre-1950 (mostly in accordance with local government boundaries) were amalgamated into around 150 suppliers by the 1970's. The Public Water Act in 1973 established 10 regional water authorities to further improve economy of scale and to better manage river basins, with 25% of the national water supply still provided by private water companies. Following commercial measures introduced by the Thatcher government from the late 70s to the early 80s, the 10 water authorities were privatized in 1989 via divestiture; thus, all water companies now fell under common regulation. This water sector governance structure now leaves 10 companies responsible for both water supply and sewerage services, plus 11 water only companies (Bakker, 2003; BIS, 2011).

This form of national governance arrangement produced regional monopolies across England and Wales, with the Northern Ireland and Scotland models differing in terms of their public ownership coupled with private investment. In order to govern these regional monopolistic providers, and following the model used in telecoms and energy previously, three government agencies were set up, including:

- The industry regulator OFWAT (Water Services Regulation Authority), dealing with a broad array of issues inclusive of fiscal settlement;
- The Environment Agency (EA), dealing with interaction between water companies, their provision of service and the natural environment; and
- The Drinking Water Inspectorate (DWI), focusing on quality and public health.

To help put the nature of the UK water sector into context, the following highlights the structure of the UK sector comparatively to a number of international counterparts:

| Governance mechanisms | Description | Examples |
|-------------------------|--------------------------------|--|
| Public | Public water utilities | Porto Alegre (Brazil) |
| | Public - Private partnerships | UN's Water Operators' Partnership and Waternet (Netherlands) |
| | Small scale water cooperatives | Gramastetten (Austria) |
| | Corporatized water utilities | Singapore, Saudi Arabia and Egypt |
| | Autonomization | Uganda and Zambia |
| Public - Private | Public - Private partnerships | Various, such as the Philippines |
| Private | Privatization | UK , Chile and the Czech Republic |

Table 2.2 - The international usage of public - private governance mechanisms

(Source - Adapted from Gunawansa and Bhullar, 2013)

2.3.2 The effectiveness of neo-liberalism

Discussions continue within the body of literature around the effectiveness of privatization at achieving the intended neo-liberal reforms under which the industry was privatized (Thomas and Ford, 2005; Prasad, 2006; Maziotis et al., 2012). While quality and customer satisfaction, coupled with cumulative investment (£9.3 billion in the six years before privatization and £17 billion during the six years following) is considered high compared with pre-privatization (Ofwat, 2011), efficiency levels are considered low while tariffs increased by 46% in the nine years following privatization and operating profits more than doubled (+142%) in eight years (Lobina and Hall, 2001). Cox et al. (1999) add that following privatisation, efficiency gains may depend upon the effectiveness of state regulation, with Martin and Parker (2003) suggesting that the privatisation of state owned enterprises results in improved financial performance under certain circumstances. Cox et al. (1996) discuss the impact of ownership, regulation and competition on production efficiency. With specific focus being on monopoly supply and

that highly regulated state owned enterprises are the least satisfactory structure from an economic point of view. However, by changing the ownership to private, only intermediary improvements are achieved, leading to an explanation for some of the competitive developments in the sector and the move towards a model more akin to high regulation, private ownership, and competitive supply.

2.3.3 Monopolistic water sector infrastructure delivery

Issues with monopolistic infrastructure delivery focus around matters such as vertical integration, bilateral monopolies, a lack of competition and monopoly-monopsony relationships (Hillebrandt, 1985). The extent of which has led to the assumption, such as with the regulated water sector, that the need to drive value and competitiveness does not exist. For example with Ofwat and the quinquennial price review period's, whereby determination is set via a two stage process and water companies typically get at least 90% of what they initially ask for (HM Treasury, 2012). This has led to a view that the water sector is under no great requirement to drive value and efficiency (Thomas and Ford, 2005).

In contrast, the new efficiency led delivery environment and the drive to meet statutory obligations efficiently, means that water companies are under increasingly stringent pressure to meet the demands of the regulators and their customers' demands whilst delivering a steady and trusted return on investment of around 5% (HM Treasury, 2010a; Ofwat, 2013). This means that efficiencies in delivery create added value (further projects etc.), while deficiencies create direct loss. The need to economise the delivery process therefore becomes ever more stringent as the regulators focus on efficient delivery of OPEX opposed to a purely CAPEX based investment stream (Ofwat, 2013). While the privatisation arrangement led to stringent water quality and river quality measures being met, the above focus was around the inability of the water regulator to gain value, instead choosing water quality arguments to substantiate the resolution of conflicts between profit and service levels in favour of profit via the legislation (Schofield and Shaoul, 1997). So while regulation may seem to be based on broad principles, in more recent times, Ofwat has continued to focus on quality and performance measures

opposed to efficiency. A key issue being that of gaining 'easy' wins over the previous AMP cycle's (Akintoye and Renukappa, 2013), with the industry now facing more inherent structural changes in order to progress effectively and efficiently.

2.3.4 The current state of the water sector in England and Wales

The regulated water sector asset base in England & Wales employs more than 35000 people, with the total revenue of the industry being £11.35 billion in 2009/2010; representing an increase of 2.3 per cent over the previous year (Akintoye and Renukappa, 2013). The sector can however be characterised by its high fixed costs, long term relationships, limited competition, the extent of financing required and the public perception that water is free (Akintoye and Renukappa, 2013).

A view perpetuates that the industry is stagnant, lacking in innovation and unwilling to generate more value from its processes (Ofwat, 2013), specifically around the poor development of innovative solutions due to the quinquennial price review period (HM Treasury, 2010a). The need to change within the water sector is therefore apparent. Pollard et al. (2004) identify that privatization, sector globalisation, increased competition, emerging technologies, increasingly stringent regulatory control and the trend towards financial self-sufficiency as key issues serving to 'transform the water sector'. While IUK focused on the detrimental effects of the 'AMP-cycle' on the supply chain (HM Treasury, 2012), postulating that the nature of the AMP cycle caused huge losses to the industry in terms of knowledge and man power during the early / ramp-up period (year 1-2), and when the AMP begins to ramp down (year 5). The governmental focus on engaging the supply chain to reduce costs, with a linkage to water sector cyclicity can be seen in the government's pipeline of construction activity with the express aim of reducing the negative factors of a roller-coaster industry.

2.4 The importance of the ICO in delivering successful projects

The provision of infrastructure services invariably involves the creation of new assets, either as replacements or additions to a network, with such additions in the form of

projects. The delivery of successful projects is inherently concerned with achieving anticipated outcomes within agreed timescales and to budgets, while the delivery of infrastructure projects are continually beset with cost and time overruns, habitually mismatching outputs with intended outcomes. With high profile examples including the Boston Big Dig - Central Artery Tunnel Project, California high-speed rail, the Channel Tunnel, the San Francisco-Oakland Bay Bridge Retrofit, the UK West Coast Mainline Upgrade (contributing to the eventual demise of Railtrack in 2001), and Russia's Sakhalin-1 oil and gas project, there is a seemingly endless list of examples.

Much of the criticism for such failures centres on the ICO and their inability to define project requirements, set clear objectives and realistic targets, their inadequate assessment of risk, their general inexperience, poor demand forecasting, poor project sponsorship and leadership with poor communication or stakeholder management and potentially most importantly, over-focus towards the back end of projects. Indeed Lando (2011) in his assessment of large infrastructure project failure gleaned 7 main themes from a workshop held at the 2011 European International Contractor's (EIC) General Assembly Meeting in Copenhagen. These themes deemed crucial to project success were:

- 1) The owner's role in managing the project, including the setting up of a clear allocation of authority and responsibility;
- 2) The importance of a clear and balanced risk allocation;
- 3) The role of partnership, cooperation and trust;
- 4) The formulation of an unambiguous contract with clear requirements;
- 5) Mechanisms for early conflict resolution;
- 6) The selection of the appropriate delivery method suitable under the circumstances;
- 7) The role of sufficient financing (reserves) in the face of uncertainty.

Some similarity can be seen from Lando's work in guidance set out by the Cabinet Office in 'Common causes of programme/project failure' (2012) which outlines the following causative failure issues:

- 1) Lack of a clear link between the project and the organisation's key strategic priorities, including agreed measures of success;
- 2) A lack of clear senior management and ministerial ownership and leadership;
- 3) A lack of effective engagement with stakeholders;
- 4) A lack of skills and proven approach to project management and risk management;
- 5) Too little attention to breaking projects into manageable steps;
- 6) Evaluation of proposals driven by initial price rather than long-term value for money;
- 7) A lack of understanding / contact with supply chains at senior levels;
- 8) A lack of effective integration between clients, supplier and the supply chain.

With Chan et al.s (2004) conceptual framework of factors affecting construction project success including (1) project related factors; (2) project procedures; (3) project management actions; (4) human related factors; and (5) the external environment it becomes clear how important the role of the ICO is in determining the appropriate actions taken in the delivery of critical infrastructure assets.

2.4.1 Broader ideas on successful projects

Stepping outside of the infrastructure project for a moment, it is important to familiarise ourselves with significant guidance on the delivery of projects in general. Pemsel et al. (2014) in presenting the importance of knowledge and learning in creating lasting success, suggest that characteristics of Project Based Organisations (PBO) can be categorised via four dimensions of organisation, its units, its network and the broader organisational field. These characteristics lead the authors to identify that setting goals, providing the means to achieve them, controlling progress and achieving those goals as part of a knowledge based framework to improve broader PBO definition and understanding will essentially lead to better knowledge governance and resultant performance.

Pinto and Mantel (1990) in studying the failures within 97 different project types including construction, R&D, feasibility studies and test projects, identify three

contingency variables associated with failure; namely (1) the precise way in which failure was defined; (2) the type of project; and (3) the stage of project in its life-cycle. They go on further to identify three characteristics of project performance as (1) the implementation process; (2) the perceived value of the project; and (3) client satisfaction with the delivered project. Aspect one, focused on scheduling and team performance, primarily more internally oriented measures. Aspect two focuses on the actual deliverables of the project itself, such as quality and whether deliverables have been achieved. Importantly, the project team’s assessment may not correspond with that of the client in the authors view. Client satisfaction, the third aspect, is considered an external measure in this regard. Morris (1989) provides a review of the factors affecting project success via Figure 2B. Albeit concentrating on mega projects, Murray et al. (1999) still see his conclusions as having relevance to construction projects of any size. An important focus of Morris is on the need to understand and manage the external forces affecting a project and the clarity of project definition.

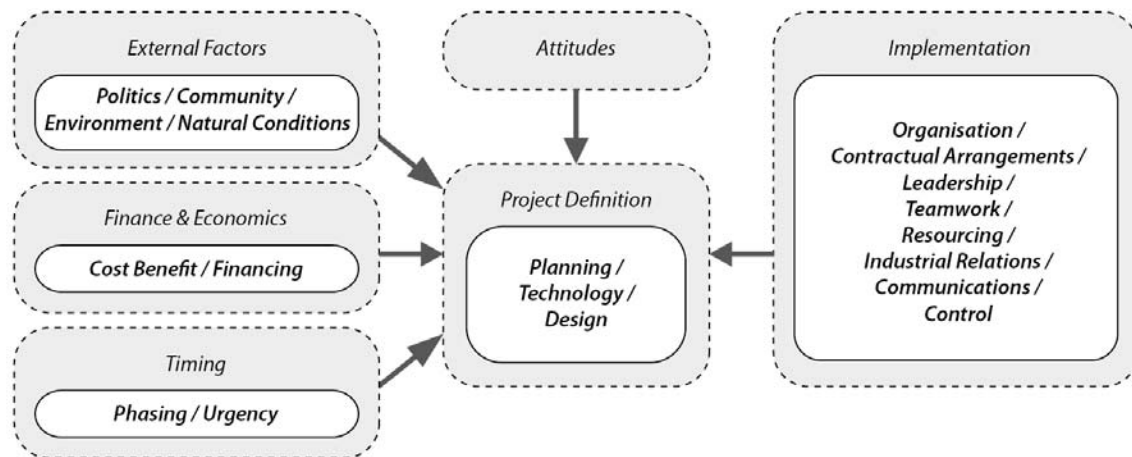


Figure 2B - Factors affecting project success

(Source - Adapted from Morris, 1989)

2.4.2 Factors affecting infrastructure delivery

With the delivery of infrastructure being influenced by external factors, as well its management across the PBO, understanding the factors that influence delivery becomes important. Primarily resulting in time delay and cost over-runs (Cantarelli et al., 2012; PWC, 2012), BIS (2011) identifies innovation and skills as the two major constraints on infrastructure supply chain performance within the UK water sector. A major contributor to such over-runs is the difference between inside and outside views of the project planning environment (Flyvbjerg, 2005) and the need for a more systemic view of the delivery environment. Flyvbjerg (2005) focuses on the need to incorporate the outside view of project environment forecasting in order to bypass any cognitive and political biases that include optimism bias and strategic misrepresentation, thus focusing directly on project outcomes.

HM Treasury (2010a) suggest factors such as stop-start investment programmes, a lack of clarity and direction, poor budget management (budget over performance), over-specification, in-effective use of competition, poor strategic use of supply chains, and a lack of investment in skills result in higher costs, resulting in the UK having the fourth highest civil engineering costs in Europe (Eurostat, 2009). Indeed Gadde and Dubois (2010) point out the deficiencies in the industry's panacea (partnering) as being significantly behind non-construction based industries. They compare construction relationships (in delivery) with high-involvement relationships, finding the industry lacking in relational dimensions that include longevity, adaptations, dependence, interaction, atmosphere, and mutual orientation. Mazet and Portier (2010) point towards the reluctance to enact partnering being based around misinterpretation of its actual requirements, poor definition, the fragmentation of processes compared to other industries and the misunderstanding of partnering as being relational opposed to transactional (Macneil, 1978).

Mazet and Portier (2010) further discuss the prevalence within the construction industry towards specialisation in specific phases of the construction process, from identification to design and construction. This separation has caused (and allowed) the delivery

process to become a series of wasteful interfaces between knowledge islands, separate actors and educated specialists (Vrijhoef and Koskela, 2000), better known as silos. These smaller scale interfaces create wastage in much the same manner as between organisations at the transaction cost level. Resulting in the requirement for more system thinkers in the construction industry to overcome such barriers and supply chain add-on costs (Wolstenholme, 2009; BIS, 2013).

An important addition to our understanding of wastage is that of the co-creation between firms and consumers presented by Prahalad and Ramaswamy (2004). They argue that the 'traditional' model of value creation is through a firm presenting its product to the market in a take it or leave it / sink or swim like manner. They add that an emergent concept of the market requires a form of overlap between consumer and firm in the definition of product being produced to better suit a smarter consumers demands. This future model of blurred boundaries represents the cornerstone of a more consumer oriented product offering, especially valuable in a market that is beginning to focus on competition and the better understanding (and relevance) of its offering, opposed to concentration on its offering alone which may be misaligned to requirements. Indeed Langford and Male (2008) add that the industry is not a single industry, but instead made up of a number of sectors that are defined by their geography, project value, complexity (technological and managerial) and by project type. Thus considering the industry as isolated is somewhat of a misnomer.

Dubois and Gadde (2000) identify a series of themes (much of which replayed in the 2016 Farmer review) relating to the delivery industry's problems in the form of (1) standardisation vs. adaptation in the industry, such that there are a plethora of standardised products used in different ways; (2) in terms of industry fragmentation, namely in two parts, firstly of the work force into 'trades' and the allocation of work packages by a primary contractor to a sub contractor; (3) the use of contracts that stipulate outputs in a manner to suit such separation, rather than coordination, easily leading away from trust towards self interest; (4) being of an industry of networks within networks promoting a temporary culture; and (5) of relational versus transactional exchanges, with transactional exchanges seen as a way of controlling costs and

benchmarking efficiencies. Couple that with an industry of standard products supplied by various, often similar suppliers, and you have somewhat of a buyer's market, but one in which the supplied price is not necessarily that favourable. With estimations of tendering alone equating to between 4 and 7% of turnovers, winning 1 out of 10 bids in the process, these costs have to be recouped somewhere, and this is purely at a subcontractor level alone. This focus on a single efficiency type (item cost) has led to a failure to see or consider overall efficiency, such as intra and inter firm efficiencies in the long term.

This issue of standardisation in construction to allow for comparative improvements to be made to industries such as aerospace and manufacturing is highlighted for example by Vernikos et al. (2013). They elude to the general lack of uptake within the water sector of offsite construction methods compared to the wider construction industry, highlighting the importance of strategic planning and innovative procurement methods as the primary drivers for the incorporation of standardisation practices and offsite construction. Goodier and Gibb (2007) consider time, quality and cost to be the key advantages of offsite construction methodologies. However, there is a need to align construction sector supply chains required in terms of both process mapping and improved collaboration, while also focusing on more bespoke modular solutions to experience the gains of the computing and automotive sectors. Such focuses are a direct response to industry problems such as that of change orders and scope creep (Assaf and Hejji, 2006), technical performance and variable standards (Frimpong et al., 2003), poor risk management (Ikediashi et al., 2014), the reduction of the implementation phase (inclusive of construction and procurement) due to its correlation with cost overrun (Singh 2010) and the technical, financial and political risks that affect projects.

On a similar theme, Love et al. (2013) assert that building information modelling (BIM) can be implemented to improve the productivity and performance of an 'asset owner's construction, operation and maintenance processes', while Frangopol and Liu (2007) assert focus on the condition, safety, optimisation, and life-cycle cost of assets to facilitate the effective management and maintenance of civil infrastructures. Indeed, as recently as 2009, major UK water companies commissioned CIRIA to produce the Whole

Life Infrastructure Asset Management guide to facilitate industry wide learning and understanding in how better to manage civil infrastructures and reduce costs accordingly.

Aziz (2013) in the study of cost variation across wastewater projects found that a high number of factors were owner originated, with the highest level of cost variation being attributed to additional work and bureaucracy in bidding / tendering. A number of recommendations focus on the owner organisation such as improved project management and contractor involvement earlier in the design phase, as well as early project planning and investment in design. And whilst four areas were focused on in the study (owner / designer / contractor / miscellaneous), the broad level of cost control and responsibility seemingly lies with the client / owner. The World Commission on Dams report (2000) identified that from their study of 81 large dam projects, the average cost overrun was 56%, with poor development of cost estimates, technical requirements and supervision by sponsors as having a significant impact on performance. Additionally, KPMG (2010) in their study into the success and failure of urban transport infrastructure projects (and programmes in this description), identify effective procurement and financing as the two most important factors affecting success. Embossing the view that the delivery approach taken by the client organisation, as well as the way they manage delivery as being critical to the success of infrastructure related projects that contribute to wider service provisions.

2.4.3 Critical success factors for infrastructure delivery

Pinto and Mantel (1990) identify from their analysis of construction projects that technical expertise & support and troubleshooting play predominant roles in influencing construction project failure. Building on prior work by Pinto and Slevin (1987), the authors draw attention to the proclivity of project managers to assume the impact of external factors that may lead to project failure, and that considering the contingent variables of an array of Critical Success Factors (CSF) is critical to determining project success. Indeed Belassi and Tukel's (1996) empirical identification of CSFs identifies factors relating to (1) the project, (2) the project manager and team, (3) the

organisation, and (4) the external environment. The authors identify the importance of upper management support, but also with the extent of competency and skills among the project manager and the team, as well as their commitment to the project. Garbharran et al. (2013) corroborate the importance of competency in determining the project team, expanding it to address a combination of up to date technology, previous knowledge & experience, competent skill-sets and appropriate contract award as part of contract management. Stepping beyond the typical time cost quality 'golden triangle', the authors suggest that success is more than a defined measurable, but that it must also consider wider, more qualitative aspects of the project.

As the ability to work collaboratively, or at least via serial relationships has been identified as key to the construction sector, Koutsikouri et al. (2008) discuss the critical success factors that influence collaborative multi-disciplinary design projects. As multi-disciplinary actions and relationships exist across single, multiple and programme delivery, it is vital to understanding their extent and impact on the efficacy of delivery. The authors break down the identified CSFs across four elements of management, design team, competencies & resources, and project enablers. Again, the importance of competence in the operation of PBOs is highlighted as an important and determining factor for success. The issue of competence is exacerbated in the utilisation and conception of PPPs (Zhang, 2005), as well as across the macro concept of delivery, and the micro phases of the project delivery process (Lim and Mohamed, 1999).

In assessing the extended CSFs for the management of multi-project environments (MPE), Nethathe et al. (2011) find that the greatest numbers of success factors are actually people related, with a need to focus on team commitment and its selection. They add further that it is important in this regard to understand and manage the size of the managing business unit and the levels of project experience for those employees. Their two rounds of questionnaires, employing both qualitative and quantitative methodologies, find that failure of one skillset in one project may adversely affect another as employees work across projects, improper communication or management support would then exacerbate this issue. In contrast to the benchmarking of Lam et al. (2004) which points towards harder, more fixed outputs that can inform the selection of

future works (when one considers the externalities argument this becomes difficult), the conclusions here point towards the determining of success factors and their measurement as you go, with people being central to improving programmes.

Gleaning from Lam et al. (2004), one might be inclined to assume appropriate selection of characteristics will result in success for the next project, yet the work here makes clear that when considering multi-project delivery, vantage points with regard to success, and the impact of the relevant actors is as important as the structural make-up of the delivery environment. This suggests that both the technical and structural components of delivery, as well as the social and human elements that facilitate it, with specific regard to their competence in delivery, are both critical determinants of project success.

2.4.4 The role of the client in delivery

The maximisation of both the technical and social components that facilitate delivery lies within the remit of the client organisation, in this case, the ICO and its ability to stipulate, utilise and take advantage of the delivery process. As delivery is about the realisation of a particular asset, it invariably marries to the wider construction process. Rowlinson (1999) suggests that the delivery process is polarised by two viewpoints, namely the client (owners) and the contractor (doers). As infrastructure delivery is subject to sub-decisions with regard to an overall organisational approach (Murray et al., 1999), sub decisions come under the remit of PBOs and their unique effect on organisational behaviour. Bresnan and Marshall (2000) allude to how transforming organisational culture via more collaborative working is a significant barrier to change within construction, such as with trust across the industry, while organisational culture is constantly being made and perceived (Hofstede, 1980). Indeed organisational culture is multifaceted and exists on different levels of cognisance and realisation, and culture may be best seen as a spectrum ranging between deep seeded beliefs to short term manifestations (Liu and Fellows, 2012).

It is the manifestation of this culture that is largely responsible for the appropriate engagement of the marketplace (Cox and Townsend, 1998), as common sense tells us

that the supply market cannot 'tell' clients what to do. The issue being that short term business outlooks (coupled with the self-interest of professional advisors it could be argued) has led to a more production line approach of singularly designated procurement approaches to one-off, competitively tendered projects. Cox and Townsend (1998) argue that the supply side to this arrangement has oriented itself accordingly to deal with such discontinuous and fragmented demand, therefore perpetuating the reactive and opportunistic nature of the industry. Thus, unlike the chicken and the egg, clients must be first to address the effective management and efficacy of their own procurement / supply strategies in order to facilitate an industry wide enlightenment of procurement practice, whereby all construction professionals are fully aware of their decisions in light of 'appropriate' practice.

Importantly, Winch (2014) focuses on the transitional view that project delivery teams are not all temporary, indeed of three identified delivery types (project based, projects and programmes, owners and operators), two are permanent, and the interfaces between these temporary and permanent teams within an organisation has been given little research attention, specifically the permanent ones. An issue here is that the two permanent forms best describe the ongoing maintenance of assets, while the temporary can best be linked to capital investment (new) projects, two processes integral to the provision of infrastructure services. Couple this with the polarised differences between private and public organisations, especially with regard to their flexibility, pro-active nature in the private sector, and politically constrained closed system approach in the public sector (Cox et al., 1999). And one can see the importance in the espousal of client competence within an underperforming sector such as water which was once public, carrying the associated 'baggage' in their delivery processes.

Indeed Worch et al. (2013) identify that while 'traditional' TCE and principal-agent approaches in infrastructure sectors have identified regulatory and contractual issues as significant sources of inefficiency, associated reforms have remained largely ineffective. The result being a need to take a capability viewpoint with regard to internal ability in utility and infrastructure sectors as research has been limited to date in such areas. Thus, the operation of the ICO from a capability perspective becomes important in

exploring the reasoning behind failures to address inefficiencies after numerous policy changes (Joskow, 2008), the extent of their learning capacity, their understanding of project versus programme management (Aritua et al., 2009), their correlation of business and project activities to foster innovation (Dodgson et al., 2005) and their effective application of the make or buy decision within supply chains (Williamson, 1985).

2.5 Addressing Competence in delivery through the identification of a Strategic Approach

What the previous sections have highlighted is the predilection of the construction industry towards a reactive and bespoke approach to delivery, with the ICO a central element to the structure of the industry. Focus can thus turn toward ICO capability and what that means. When we think about the implications and processes that differentiate one from taking a tactical and reactive approach premised on discontinuous and un-aggregated demand, we are essentially discussing a strategic approach (Emmett and Crocker, 2008). Cox and Townsend (1998) suggest that a strategic approach is more akin to understanding appropriateness and being able to deploy and understand an array of tools and techniques, from tactical to strategic, that suit a particular set of circumstances. In essence, it is not strategic or tactical, but tactical as one of the strategic tools.

A strategic approach to construction procurement is in effect, the linkage between a businesses' strategic goals and the contingent operational reality that faces them (Cox and Townsend, 1998); whereby changing a particular market structure represents a pressure to reform supply chains to suit (Cox et al., 1999). Premised on the capability to manage the interdependent relationships between social and technical aspects of delivery, Morledge and Smith (2013) add that the initiation of the construction process is typically aligned to a strategic need identified by the client.

By nature, the construction project is typically a single site operation, bringing together a series of interdependent parties that become somewhat reliant on one another, providing most value to the client that requires and initiates it (Green and Lenard, 1999). The close-down of geographically specific projects makes the formation of these PBOs temporary in nature, while the lack of project duplication again makes construction significantly departed from industries such as manufacturing. Satisfying client goals requires an understanding of external pressures, with Cousins et al. (2008) presenting that these come in the form of a demand for more sophisticated products and services by customers, a need to optimise resource bases, the emergence of new solutions (technology, products and processes) and a desire to reduce time to market. Such pressures to which a strategic approach is concerned contrast somewhat to the other streams of construction supply chain research, namely, distribution (e.g. agile construction), production (e.g. lean construction), and industrial organisational economics (e.g. transaction cost economics). Indeed a key component of the Strategic Procurement Management (SPM) view, in contrast to production and distribution approaches, is that it considers the situational reality of a project based industry (and not process) by not considering approaches that require an idealised version of a contingent reality (London and Kenley, 2001).

Cox and Townsend (1998) present that the development of procurement approaches, the rationale behind the formation of the PBO, can effectively be plotted along a timeline, with Rougvie (1987) adding that essentially, each new procurement approach has been developed in response to the practical limitations of previously popular methods. Cox (1997) refers to development of this kind as barefoot empiricism, with each panacea to previous ills being applied less and less appropriately until such time that it becomes discredited and needs to be replaced. The result is that there has been no theoretical framework upon which to derive either an ideal or an optimum procurement approach, resulting in a reactive evolution of business practice (Cox and Townsend, 1998). The authors argue that off the peg selection of procurement solutions fail to consider specific factors, and thus a strategic approach to construction procurement is a contingent one.

As a strategic approach to procurement encourages an organisation to consider longer-term goals, such as the maintenance of competitive, effective and efficient supply markets, it also allows for an organisation to undertake (and communicate) such decisions in a more structured and justifiable way (NZTA, 2014). Morledge and Smith (2013) suggest that a strategic approach to procurement (in this case single project), in response to the barefoot empiricism argument of Cox and Townsend (1998), needs to encompass all the project objectives within an appropriate strategy of how to achieve them in the most effective way. This requires an articulation / understanding of the clients' needs for any corresponding strategy to be developed, along with an understanding of the complexities inherent within the client organisation (Green and Lenard, 1999).

For example, the aggregation of demand is a core component of the strategic approach, such that identification of an array of contracts within a particular setting allows for longer term engagement with a market and can facilitate associated relational contracting efficiencies (Green and Lenard, 1999). Importantly though, achieving such economies of scale is not the end goal, such that collaboration isn't, and thus the strategic approach requires procuring organisations to constantly reflect back on their desired purpose. A strategic approach is thus focused on the appropriate use of decision making to suit the firms needs in a holistic manner, with Russill (2010, p.50) arguing that:

The guiding principle is that the buyer should develop and change supply markets to suit the needs of their business rather than to compromise that need by accepting markets as they are.....strategic procurement means managing suppliers and influencing supply markets so that they respond, now and in the future, in the way the company needs them to in order to succeed in achieving its objectives.

As such, procurement strategy is concerned with the appropriate design of market supply chains. For the purpose of this study, Andrew Cox's (1995) articulation of SPM will be adopted, insofar as SPM represents the development of an external sourcing and supply strategy which supports an organisation's business plan so to maintain as sustainable a position for that organisation in the total value chain.

2.6 The management of delivery within the ICO

In ascertaining ICO competency levels with regard to their ability to implement a strategic approach, one must identify with the factors that influence the marketplace into which such an approach is concerned, as well as the management tools that are employed to address them. In the delivery of infrastructure, this primarily relates to delivery within the context of projects, but also their relationship with programmes and portfolios, the extent of the delivery market, which is typically a multi-project environment, and the management approaches, which include supply chain management and purchase and supplier engineering for example.

2.6.1 Understanding delivery within the context of projects, programmes and portfolios

A significant issue within the delivery of infrastructure, is understanding the differences between delivery in singular and multi-project settings (Pellegrinelli, 1997; Blismas et al., 2004; De Blois and Lizarralde, 2010; De Blois, 2013; Packendorff, 2014). Importantly, infrastructure delivery characteristically exists within a Multi-Project Environment (MPE) (Aritua et al., 2011), with Payne (1995) suggesting that the multiple project context accounts for up to 90% of all projects by value. Artto et al. (2009) present the importance of appreciating the difference between single and multi project management, with Pellegrinelli (1997) arguing that organisations that force-fit programmes into project-level thinking, lose sight of the initial benefits of the creation of programmes in the first instance, such as economies of scale (externally) and process efficiency (internally). The common misconception that programme management is essentially project-based is expanded upon by authors such as Lycett et al. (2004) who identify a number of inadequacies in standard programme management approaches, arguing their basis on two flawed assumptions, that programme management is essentially scaled-up project management, and that a one size fits all approach is appropriate.

Understanding the extent of client's volumes of work therefore requires further definition, specifically in terms of projects, and potential aggregation vehicles such as

programmes and portfolios. These definitions are used interchangeably through literature, with Hashim et al. (2012) adding that research has concentrated on identification through multi-projects, portfolios, programmes, macro-projects and mega-projects. Patanakul and Milosevic (2009) suggest that the management of projects, programmes and portfolios can be conceived within a single framework embedded within a portfolio, such that management exists across single project(s), group(s) of multiple projects and programmes (Figure 2C).

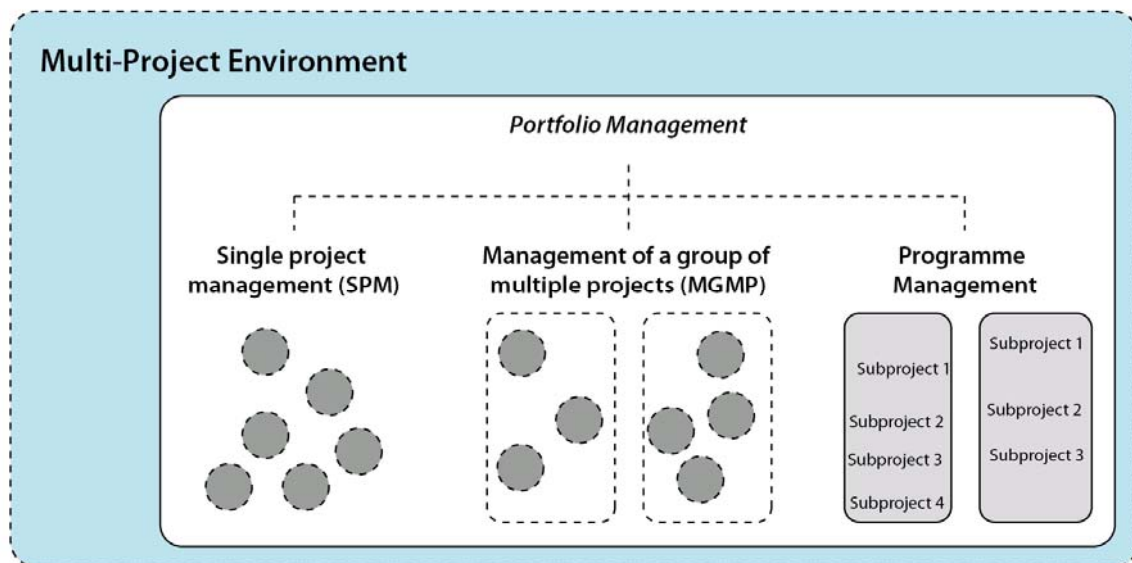


Figure 2C - Multiple project management

(Source - Adapted from Patanakul and Milosevic, 2009)

What this allows for is the delineation between management paradigms, and for the purposes here, clarity is provided regarding these components (drawing from a variety of authors inclusive of Pellegrinelli, 1997; Blismas et al., 1999; PMBOK, 2004; Blismas et al., 2004; Flyvbjerg et al., 2008; Patanakul and Milosevic, 2009; De Blois and Lizarralde, 2010; HM Treasury, 2010a; Hashim et al., 2012:

- *Projects*: are single temporary undertakings that serve a defined need with a defined outcome / output (often unique);

- *Programmes*: are a co-ordinated framework for grouping existing or new projects together (often temporary and flexible) to serve some form of defined benefit that would not otherwise be achieved if managed independently;
- *Portfolios*: are a collective group of projects and / or programme's under a singular management organisation with no inference to the manner in which those works are organised and managed;
- *Mega-Projects*: are large scale projects that are typically highly complex with high values and in some contexts can be viewed in terms of portfolio level thinking, or as part of large scale programmes;
- *Multi – projects*: a series of projects that share common characteristics or some form of external commonality, but are not necessarily goal-related;
- *Multi-Project Environment*: emphasises an array of projects and programmes in the broader context of delivery, outside of the client only focused context and definition.

2.6.2 Factors affecting multi project environments

To then make strategic decisions about MPEs, one must understand the factors that influence such environments. Blismas et al. (2004) in understanding the factors that influence project delivery within clients' MPEs suggest that dissimilar to single projects, the multi-project process is ongoing and repetitive, with streams of projects (within the programmes of the particular clients' portfolio) being continually conceived and delivered. Whilst ideas of workflow planning and continuity point towards the usefulness of manufacturing techniques for improving this environment and its continuity, Blismas et al. highlight that uncertainties across the delivery environment such as site conditions, scope changes and poor project definition do not allow for the appropriate application of such techniques.

The authors go further to identify that the concept of continuity is the single differentiating factor between a clients' MPE and that of a singular view, leading them to outline the common pattern of factors resulting in inefficiency within client MPE resulting from uncertainty (causing a need for flexibility), followed by changes, a

discontinuous demand and then inefficiencies in the supply base. Hagan et al. (2011) in the study of complex projects within MPEs present that (built upon the view of complexity as underpinned by uncertainty and interdependencies) attributes of project complexity categorised into process, people, goals and product; with factors affecting the MPE being divided amongst themes of decision making and resource (availability, allocation and scheduling). Table 2.3 outlines a number of contributing factors to the nature of complexity within the clients' MPE.

| Group | Influencing factors |
|---------------------------------|--|
| Environmental influences | Volatile business and economic environment |
| | Limited supply of property |
| | Legislative processes |
| | Unique site features |
| | Geographical disparity between sites |
| Client influences | Main corporate drivers |
| | Client indecisiveness and non-uniformity |
| Planning influences | Prototyping, testing and investigation before production |
| | Long and differing lead times |
| Third party influences | Third party / stakeholder intervention |

Table 2.3 - Influential factors for construction clients' MPEs

(Source - Adapted from Blismas et al., 2004)

Additionally, Patanakul and Milosevic (2009) assert that factors affecting the management of a group of multiple concurrent projects (MGMP) can be categorized in terms of their inputs (organisational and operational), process (MGMP effectiveness) and outputs (with measurement criteria across the organisation, the project and the personal levels). What this inherently systemic view of multi-project delivery highlights is the organisational importance of project assignments, resource allocation and

organisational culture, coupled with the operational importance of project management processes and multiple-project manager competence. An overview of the factors affecting MPE is concisely provided by Hashim et al. (2012) via table 2.4.

| MPE Challenges | Uncertainty | Interdependency |
|-----------------------------|---|---|
| Organisational input | Project selection / To understand the project priority, match between the ability of project managers and the project assignments / Resource allocation | |
| Management processes | Lead group of projects / Problem solving / Information sharing / Multitasking / Communication | Management of single projects / Project management processes / To adjust and link schedules to match available resources, and remove, unnecessary variation in workloads or project managers / Inter-project interactions |
| Project output | Project managers expectation / Projects benefit | |

Table 2.4 - Summary of the challenges in MPEs

(Source - Adapted from Hashim et al., 2012)

2.6.3 The management of the MPE by the ICO

The question then arises around how ICOs implement market approaches, and the vehicles through which ICOs address strategic engagement mechanisms. Four notable

examples are that of Supply Chain Management (SCM), Category Management (CM), Business Models (BM) and Purchase and Supplier Engineering (PSE).

Commonly agreed in the literature, SCM focuses on the external environment of a business and the relevant boundaries of operation between businesses; thus the use of terms such as pipelines and chain's opposed to defined entities (London and Kenley, 2001). Cooper and Ellram (1993) identify that traditional management of supply chains relates to transaction based arrangements, while SCM deals with ongoing relationships. In the case of infrastructure, where relationships are longer term and consist of large programmes of work, SCM represents a corner stone of efficient project delivery. In general, the SCM methodology consists of four main elements, (1) Supply chain assessment, (2) Supply chain redesign, (3) Supply chain control, and (4) Continuous supply chain improvement (Vrijhoef and Koskela, 2000). With linkages to the just-in-time methods of Toyota and Deming's Plan-Do-Check-Act, Walker (2012) discusses the value of the OECDs (2007b) value criterion of efficiency (internal), effectiveness (external), relevance (customer), sustainability (value / profit etc.) and impact with regard to the operation of SCM practices, and thus the understanding of SCM as a management tool to facilitate the crossing of what can be perceived as fixed organisational boundaries.

An important vehicle in the management of infrastructure supply chains, but often employed as a subset of SCM, CM breaks the supply chain into its component parts and focuses on the end to end process of a particular set (or category) of items. Common across non-construction sectors where the aim is to leverage maximum value from a category, such as fleet vehicles for example, by managing and rationalising fleet into a category, the procurement and management of fleet is put through a standardised process with the output considered as part of a single whole. Consequently, procurement of fleet vehicles would be focused on gaining maximum value from the market based on Kraljic and Cox type scenarios of spend and market profiling. For construction, CM represents a vehicle through which to manage the leverage of volume based procurement solutions (BIS, 2013). The reasoning for this is the manner in which it combats a highly fragmented supply chain. BMs however present a supplementary tool

for studying the wider value chain and the makeup of delivery. Wikstrom et al. (2010, p.839) assert that BMs:

Are typically seen as a critical link between strategy and operations in the organizational entity (and that) business models cross intra and inter organizational boundaries of firms and projects. Thus, business models in project business do not necessarily follow the boundaries of the firm.

This is an important component in the management of delivery systems, as understanding the nature of the entities outside of the focus ICO is a core tenet of SCM, with CM and associated BM's linking these relationships back to organisational strategy, making projects a representation of a procurement system (Keegan and Turner, 2002), and thus integral to the formation of a wider management process. In defining the boundaries of operations, it becomes important to understand and evaluate the relevant factors involved in the delivery of infrastructure and their respective drivers, something specifically addressed by PSE. If BM serves as a tool to modify and analyse delivery environments, and SCM serves as management environment through which to enact it, then PSE serves as a broader management tool that incorporates SCM.

A core tenet of the successful delivery of the London 2012 Olympic Games and the London Crossrail works (Mead and Gruneberg, 2013), PSE focuses on a holistic programme view, interacting with all elements of the supply chain to remove risk, such that an individual project view is inappropriate, as a single contractor may not be aware of the pressures on a supplier elsewhere within the programme. This holistic view aids in dealing with the supply chain 'add-on' costs associated with traditional construction supply chains, of Client to Tier 1, Tier 1 to Tier 2 and so forth, which can add profit add-on cost to a contract of between 18-20% (BIS, 2013). Mead and Gruneberg (2013) add that this holistic view of delivery aims to bridge the gap between 'creative' visionaries for the built environment who may be trained artistically, and 'adapter' technicians who create the built environment. This links back to the separation of processes raised by Mazet and Portier (2010), whereby the process of delivery is broken down into its sub component parts. Thus, when considered in a holistic manner, this disconnect between

sub-deliverers of processes and the inherent knock-on effects of error, leads to the need to assess the delivery of infrastructure in a systemic manner.

2.7 The effects of procurement strategy on the delivery of infrastructure

If we now have a grasp of the environment in which project delivery exists, and the mechanisms ICOs employ to engage with associated marketplaces, as part of a consideration of competency in terms of how this is applied, the premise now turns toward the identification and enactment of a procurement strategy. Procurement strategy represents the basis upon which an organisation chooses to engage with its supply market, or sometimes in infrastructure, via its construction services supply strategy (BIS, 2013). As procurement is concerned with the acquisition of goods and services that serve a client's needs and demands in a particular market place, strategy is then primarily focused with how this is done and implemented.

2.7.1 The procurement of works in the public domain

When we discuss the delivery of infrastructure in the UK, we are often confronted with the legal obligations of the EU procurement regulations that affect the wider EU region of countries, and specifically, the expenditure of public funds. The European public contracts directive (2014/24/EU) applies to all public authorities, inclusive of private projects that in some way employ public funding, such as lottery projects, while a further directive for European utility contracts (2014/25/EU), also applies to the water, energy and transport sectors (in the main) due to their connectivity to wider public interest. The result being that contracts of a certain value must be advertised in the Official Journal of the European Union (OJEU), with affected organisations consequently under stringent rules regarding anti-competitive procurement behaviour accordingly. Once a package of works breaks 'OJEU' thresholds, procurement activity must follow one of a series of procedures, either:

The Open procedure - Involving no pre-qualification, all responses to an OJEU advertisement must be invited to tender.

The Restricted procedure - Involves a technical and financial assessment of interested parties who then make up a shortlist for tendering.

The Accelerated Restricted procedure - As above, but the contracting authority must demonstrate an appropriate need for the reduction in timeframes and the rationale behind the urgency.

The Competitive Dialogue procedure - Focuses on more complex procurements, and while similar to the restricted process of shortlisting, is not as inflexible and allows for an element of dialogue and refining with the bidders before final tenders are provided.

The Competitive Negotiated procedure - Limited to specific circumstances, such as where open competition is not viable, holistic prices are not able to be obtained, or for research purposes. The European Commission will likely seek valid rationale as to why this procedure would be chosen.

Furthermore, procuring authorities must also adhere to the EU treaty principles, with the OGC (2008) deeming the most important of these to be equal treatment, non-discrimination, mutual recognition, proportionality and transparency. While the public sector can be seen as cumbersome and restrictive to innovative thinking and procurement flexibility, it in fact protects against many of the common pitfalls of common law. One needs only read the commonly cited Blackpool and Flyde Aero Club v Blackpool Borough Council case to see how such law is made manifest through the EU legislation. Move into an infrastructure perspective and the high profile reimbursement of bidder costs for the West Coast Main Line franchise fiasco of over £40million, and failure to adhere to EU treaty principles presents a real world risk to the delivery of procurement activity to both public and private sectors alike. If one deviates from the terms of an invitation and associated stipulations one can expect to be challenged. However, once these procedures have been grasped, and there is most certainly a significant element of competency required in doing so, then the procuring organisation can use such procedures as facilitators for, rather than barriers against, the enactment of effective (and competitive) procurement strategies.

2.7.2 The value of procurement strategy

Now the mechanisms of implementation have been outlined, one should consider the actual value employing a strategy for procurement provides an ICO. Taking a strategic approach to the marketplace centres on the ability of procurers to gain more value, removing what can sometimes be a top down, 'silo' and hierarchical decision making process in large-scale organisational procurement (Emmett and Crocker, 2008). As efficiencies in the management of infrastructure are seen to be around the creation of feasible competition, the facilitation of responsibility and a strong voice within stakeholder groups, as well as the removal of bureaucracy type structures towards a more business type model (World Bank, 1994), procurement and associated strategies aim to satisfy and optimise client needs (Lenard and Mohsini, 1998), with Rowlinson (1999) identifying that procurement focuses on the acquisition of project resources for the realisation of a constructed facilities.

While the value of such definitions has been questioned (McDermott, 1999), it is clear that a procurement strategy must address all aspects of a facility to which a client has an interest. Miller et al. (2000) assert that procurement strategies are tailored to suit project delivery methods, an issue being that the application of strategy and associated procurement practices in the delivery of infrastructure is typically multi project and multi skilled. These processes by nature are different, with the procurement of differing projects requiring differing approaches, most aptly put as appropriate approaches.

Indeed Kumaraswamy and Dissanayaka (1998) discuss the importance of linking procurement systems to desired outputs/priorities. An arising problem is that it has become practice to scale up new-age construction practices such as partnering into organisational approaches in an attempt to mitigate the common problems experienced in delivery (Nifa and Ahmed, 2010). This has led to a fallacy within organisations that indeed merely implementing an appropriate contract strategy amounts to an appropriate implementation of procurement practice (Rowlinson, 1999), while organisational theory, fails to assess the direct impacts of project specific approaches (Dodgson et al., 2005). Importantly, Watermeyer (2012) considers that a strategic

approach to infrastructure delivery spans the planning and management of the wider delivery process, with strategy across the delivery and maintenance of construction works being considered via the skilful planning and managing of the associated processes. To provide clarity on what constitutes procurement strategy, the following outlines the integral parts of a procurement strategy and makes some significant delineations between its constituent elements.

2.7.3 The nature of procurement strategy

In the case of infrastructure delivery and management, the formation of requirements is typically in response to an asset management (or creation) need (Too, 2009), and thus the delivery cycle for which procurement strategies serve is somewhat departed from a typical single project view. Delivery for the purpose of this study is thus taken to be the process that leads to the operation of infrastructure related services (HM Treasury, 2013). Watermeyer (2012) defines critical decision points in the delivery of infrastructure as spanning (1) infrastructure planning, (2) procurement planning, (3) package planning, (4) package definition, (5) design development, (6) design documentation, (7) works, (8) handover; and (9) closeout. Definitions have varied widely pertaining to the relevant contractual arrangements, project delivery systems and procurement systems that facilitate delivery, and these are often discussed hand-in-hand (McDermott 1999; Miller et al. 2009). The procurement and delivery system are thus often taken to be akin to one another leading to confusion and a failure to aggregate processes and delineate between project and programmes approaches. From herein, there shall be delineation between the two, while a distinction between the delivery system and a contract strategy is also required.

The concept of delivery refers to the manner in which a physical asset comes into being and is maintained, with Pietroforte and Miller (2002) defining delivery via the continuum of project delivery methods applied across the construction industry and taught in project management, construction and engineering academic programs worldwide. Going beyond this project view however, the delivery system is to be viewed in terms of the overall strategic approach to market taken by the engaging organisation,

incorporating various aggregation methods, the procurement system (or project delivery system which operates as an engaging sub-system within that strategy), with contract strategies forming the contractual relationship between two parties to deliver the desired works. As such, the delivery system is an organisational foundation based on sourcing strategies and market approaches, the procurement system is an approach to resource allocation, delivery processes and responsibilities for the project, and the contract strategy is a mechanism to suit the nature of the works / project(s) packages.

To expose the true nature of procurement strategy and its impact in forming IDS, Figure 2D represents the authors' aim to highlight key elements drawn from the literature within a concise representation. The key elements of which are espoused in the following sections (in blue), with the **nature of works** referring to the fulcrum of the associated decision making process, such as the delivery of a new sports venue in isolation compared to the management of a host of local council requirements.

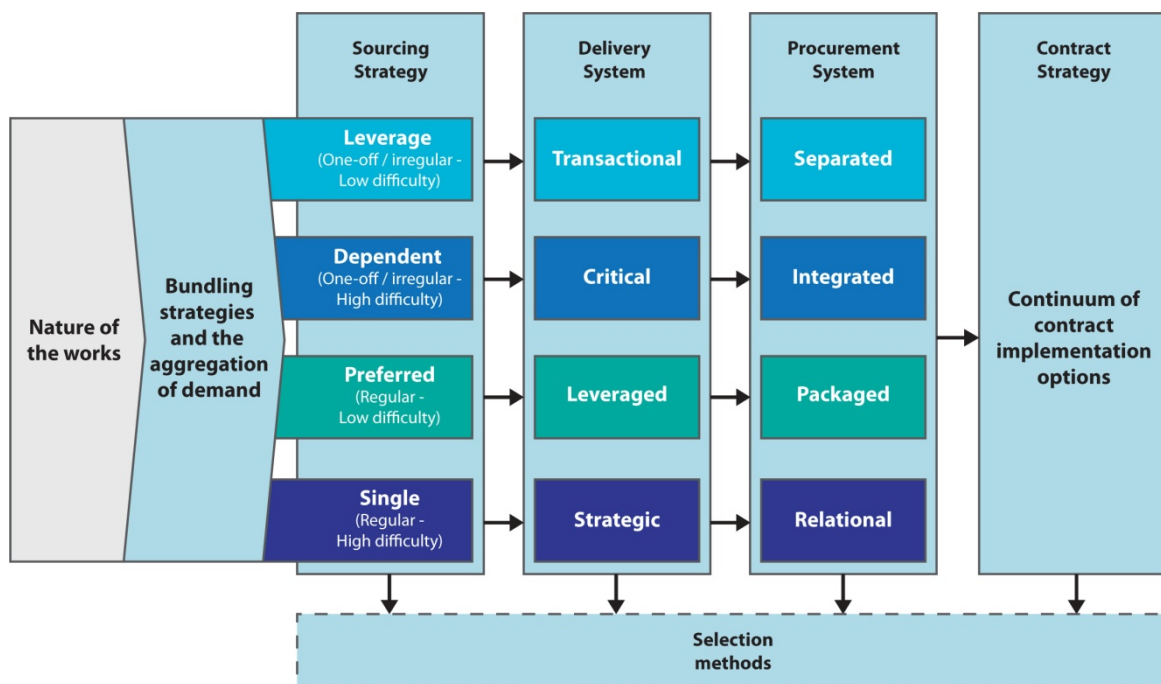


Figure 2D - The nature of procurement strategy in the creation of Infrastructure Delivery Systems

(Source - Author)

2.7.3.1 Bundling strategies, the aggregation of demand and sourcing strategy

Cox and Townsend (1998) identify that contingent delivery strategies are required to achieve consistently predictable outcomes. They add that considering procurement as a singular endeavour with a single project outlook essentially approaches the market via one off dips, employing adversarial leverage. In congruence with Acciaro (2010), they present the need for a new approach to procurement, rather than a new procurement approach. This new approach opposes the traditional approach to procurement in terms of a singular apportionment of variables in relation to a standalone project (Cox and Ireland, 2006). This approach enforces that little thought is given in construction procurement to the nature of the supply relationship that suits specific supply chains, and moreover, the actual client's needs, resulting in more arms-length, non-strategic, low-value and infrequent purchases. Based on appropriateness, this new approach is presented in Figure 2E.

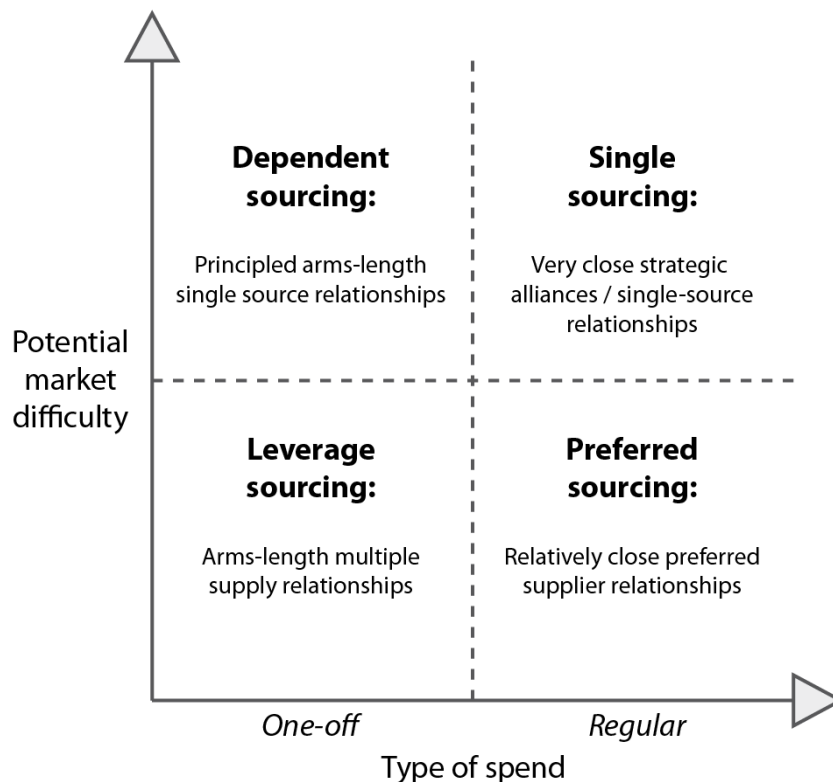


Figure 2E - Potential Sourcing Strategies

(Source - Adapted from Cox and Townsend, 1998)

These potential strategies consider regularity of spend through a framework of choice based decision making within the supply market. The use of such a segmented approach by clients towards their entire programme of construction related activity / requirements can, it is argued, begin to drive a portfolio approach towards delivery. In essence, this strategic approach breaks down into the following:

- Regular Spend: creating longer term supply relationships with proficient market suppliers who are:
 - lower in number, requires forming single source relationships
 - higher in number, requires forming relationships with preferred suppliers
- One off (or irregular) spend: creates a multitude of more arms-length type relationships based on the relative market power of suppliers, the number of suppliers and the value of the works to the client organisation

The result of this segmented approach allows for the dedication of delivery systems to suit client needs, creating fit for purpose sourcing relationships in a more appropriate use of both the market and the clients' efforts. An example of this segmented approach, giving appropriate consideration to MPE is presented by Cornelius et al. (2011) in review of the London Olympic 'clusters' that made up the clients' portfolio of works. They were formed based on the timing, location, market structure, construction technology and capacity & resources associated with the works, represented in Figure 2F.

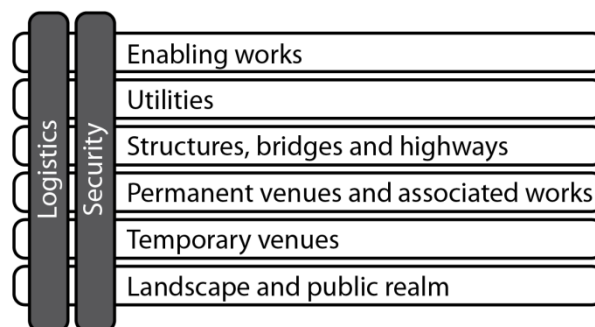


Figure 2F - The 8 'clusters' of the London Olympics procurement activity (with logistics and security spanning the other 6)

(Source - Adapted from Cornelius et al., 2011)

Similarly, one can break any portfolio of works into such bundles to suit the nature of the clients' needs, whether it be a mix of capital and maintenance works, a regulated programme of activity over a fixed period or a one off mega-project, the essence of an appropriate procurement strategy is to assess the entire picture. By then focusing on the leveraging of maximum value from bundles, one can form appropriate delivery relationships that leverage the maximum level of value and satisfaction for clients.

2.7.3.2 Delivery systems

Delivery Systems align to a procuring organisations' sourcing strategies with respect given to the environment into which it is to engage. The Infrastructure Procurement Routemap (IPR) (HM Treasury, 2013) highlights there are a series of organisational approaches to procurement (delivery systems), with the option of future scenarios as yet undiscovered.

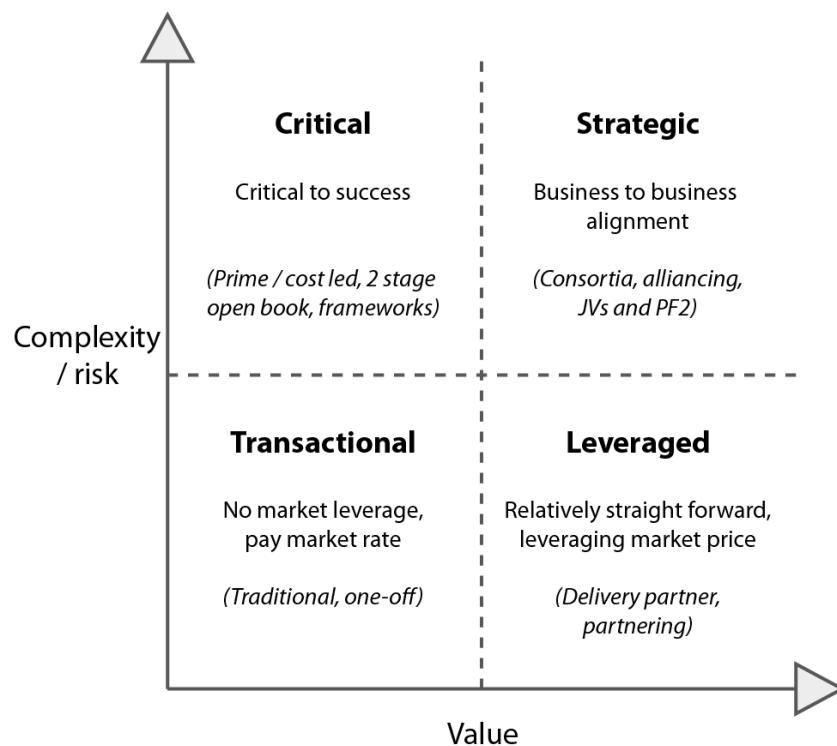


Figure 2G - Delivery System Sourcing

(Source - Adapted from Kraljic, 1983; Cox and Townsend, 1998; Cox and Ireland, 2006; HM Treasury, 2013)

Figure 2G presents these options and their effect on organisational relationships, with four primary scenarios having been focused on in delivery system literature. Their formation can be traced back to Kraljic's (1983) Purchasing Portfolio Matrix which concentrated on a firm's supply strategy. His model was premised on supply risk and profit impact and how these two underlying factors drove strategy making. An important basis for these differing scenarios is the aggregation of demand and the maximisation of market power to reduce costs. The greater the risk and value, as well as regularity of spend, the greater the need to align to, re-structure, engage and reform supply chains. This makes the critical, leveraged and strategic positions more akin to subsets in support of a portfolio approach.

It is important that strategic business needs are identified via delivery strategies, and thus procurement systems operate as a facilitator (or process) for these values and are not merely up-scaled contract strategies (Nifa and Ahmed, 2010). Whatever the make-up of the works, taking either a portfolio, programme, multi-project or project vantage point, understanding the delivery system through which those works will be delivered and the relevant impact on the client / procuring organisation is important in order to step beyond repetitive, tactical, singular procurement activity as a default position. Cox and Townsend (1998) espouse the understanding of delivery systems in terms of their:

- **Value chain positioning:** what they do and their strategic business drivers;
- **Construction and business needs:** such as a mix of capital and maintenance spend, or a single source large scale requirement for a particular purpose for example; and
- **The relative procurement strategies:** inclusive of any strategic drivers, relationship management strategies or wider supply chain management.

For clarity, the descriptions provided by the IPR (HM Treasury, 2013) are built upon here to describe and elaborate on the array of available delivery systems and their respective nuances. Concentrating on the critical, leveraged and strategic responses to market as part of a portfolio approach, the more singularly focused project delivery process and

any associated delineation of responsibilities are covered within the procurement systems section.

Frameworks (Critical) - Are a procurement tool used to appoint a select group of preferred bidders who are then either directly awarded work, or must compete in mini-competitions of some sort to win work. Clients can employ either risk averse or collaborative procurement systems for projects as 'call-offs' from the framework.

Prime contracting (Critical) - Commonly adopted across Ministry of Defence contracts, requirements are in output form with the contractor and associated supply chain tasked with finding innovative solutions to the defined outputs. Value is sought through improved supply chain management, economies of scale, partnering, incentivised payment mechanisms and continuous improvement.

Delivery partner (Leveraged) - Can bring programme management, design and an array of construction abilities as required to what can often be temporary client organisations, such as for the London Olympics, Crossrail or the Thames Tideway Tunnel. The client maintains a high degree of risk, but a greater influence over the outcomes compared to a delivery consortia for example.

Partnering (Leveraged) - Also known as strategic partnering, whereby organisations engage across multiple projects. Through the creation of mutual benefits between both client and supplier, strategic partnering is about building trust between the supply chain and procurer, whereby through working together rather than against, they reap the benefits of cost reduction and improved working relationships.

Delivery consortia (Strategic) - An approach often adopted in sectors such as the regulated utilities where clients seek to transfer high value performance based contracts to first tier organisations over a defined period with values in excess of £300m. Constituting less risk than a delivery partner approach, the consortia undertakes design and solution development through to completion against an

output specification, providing programme management alongside a build capability.

Alliancing (Strategic) - Often a confusing term, especially with regard to partnering, an alliance relationship is a direct business to business engagement between client and supplier. In a partnership, depending on the terms and handover point, one party can still be worse off as one party takes advantage of the other. In an alliance, in essence, either both client and supplier lose, or both win. While inherently a serial relationship, it is more relational in nature than strategic partnering.

Integrated project delivery (Strategic) - IPD and alliancing share similarities such as shared savings and losses, the joint management of projects and a limitation on damages, but the contracts are often multi-party, hence its suitability and orientation towards the BIM environment.

Joint ventures (Strategic) - Are distinct business to business agreements, often in the form of special purpose vehicles whereby committed resources and equity correspond to returns based on contributions. While an alliance impacts firms based on the performance of the works, such that firm A is in an alliance with B and C, with C in profit as a business. In a joint venture (X) between firm Y and Z, firm Y is distinct from joint venture X in terms of exposure and equity, irrespective of the Y business.

PF2 (Strategic) - Typified by their use of private finance (both debt and equity usually), these commonly form a single contract with a single entity which is in itself a consortium or JV of delivery / consultant / contracting organisations, often with other private relationships. The contract between client and supplier is a long term service contract based on the provision of a service and a capital asset in accordance with an output based specification, thus transferring risk to the private sector.

Included also are the 'new' construction procurement models (delivery systems) presented by the Cabinet Office in 2014. No argument is made here as to how new these in fact are, or whether they are in fact just new to the UK government.

Cost led procurement (Critical) - Is based on selecting a number of integrated project teams, likely under a framework agreement to deliver a series of projects. Working below an established cost ceiling, teams work collaboratively to reduce cost whilst maintaining quality standards.

Two stage open book (Critical) - Is based on inviting suppliers to bid on the basis of an outline brief and cost benchmark, with the first competitive stage focusing on supply chain capacity, stability, experience, supply chain strength and fee (plus company overhead). The second stage is then two fold with an element of solution development and the maintenance of commercial tension between bidders.

Integrated Project Insurance- (Critical / Leverage) - This relationship is somewhat of an agreement rather than a system, insofar as the client and supplier effectively share an insurance policy. They then respectively apply when a loss is incurred to them due to the works.

Also of note...

Dynamic Purchase System (Transactional / Critical / Leveraged) - The DPS is not yet typically considered a construction relative vehicle through which to procure, primarily due to its previously cumbersome administration and lack of relevance to more complex works. However, recent changes to the public contracts regulations (see Regulation 34) mean that while it must be a completely electronic process, using the restricted procedure and with no limits on entrant volumes, it is essentially an electronic framework to which suppliers can join at any time, removing the issue of entry barriers associated with most frameworks. Irrespective of this, the DPS is oriented towards more simplistic services, such as items and their replacement or installation, rather than services and broader projects.

To put some of these delivery systems into context, Table 2.5 outlines the use of some of the more prominent delivery systems in the infrastructure sector.

| Approach | Examples | Indicative applications |
|--|---|---|
| Delivery consortia | Southern water, Thames water, United Utilities | Long term capital investment programmes of low to medium value projects |
| Development / Delivery partners | Network rail, Crossrail, London 2012, HS2 Ltd. | Publicly procured mega-projects and major infrastructure enhancements |
| Alliancing | Anglian water, South west water, HA managed motorways | Long term capital investment programmes of low to medium value projects |
| Frameworks | BAA, Northumbrian water, Environment agency flood defence programme | One-off projects and call-offs to major projects |

Table 2.5 - Common infrastructure delivery systems

(Source - Adapted from HM Treasury, 2013)

2.7.3.3 Procurement systems

While the provision of infrastructure can involve the delivery of a multitude of project variants by a single client organisation across multiple project needs, it becomes important to further understand the relationship between ICOs and their relevant delivering organisations (or contractors) via the delivery system selected. This process is herein referred to as the procurement system (McDermott, 1999), which, in various guises, reflects the particular set of agreements and circumstances that apportion responsibility and roles for a specific project. The traditional procurement system, which

has drawn such negative press as the most basic yet widely used of the procurement systems can be characterised by Figure 2H.

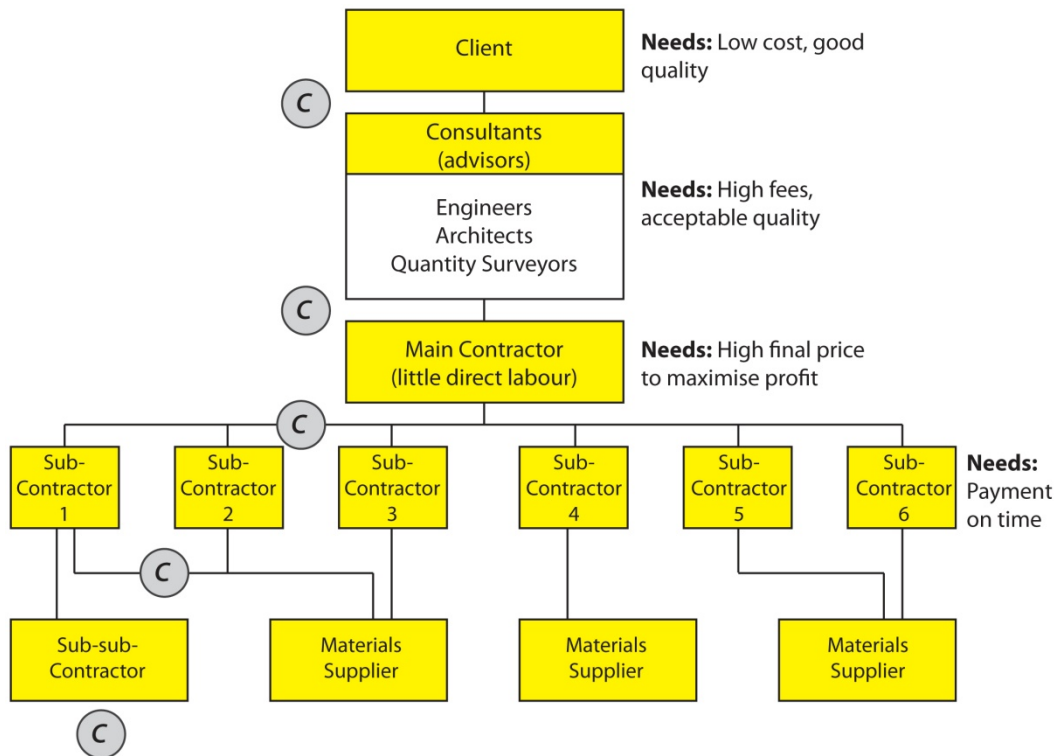


Figure 2H - The traditional procurement system and its varying needs

(Source - Adapted from Cox and Townsend, 1998)

Note: 'C' represents a potential point of conflict and additional cost; and, this structure is re-assembled on a project by project basis.

Typically one off in nature, the above structure is disassembled at project closedown and reassembled for each new project. More broadly, Love et al. (1998) define a procurement system as an organisational system that designates specific responsibilities and authorities to people and organisations, and thus defines the array of elements involved in a project. A view shared by Konchar (1997), who sees that project delivery (procurement) systems look at delivery in a systematic way, defining roles, relationships and the sequencing of activities. Such processes can be described through the use of a

continuum from Design-Bid-Build to Alliancing. The essence of the procurement system is to set the boundaries between client and market, whilst also defining the process through which projects will come to fruition.

In essence, while the Delivery System dictates the nature of a package of works and responds to packaging and aggregation strategies, the procurement system dictates the terms for projects within that system. Consequently, a strategic alliance relationship will likely employ relational / alliance forms of procurement, while transactional / traditional forms will focus on separation in procurement. Thus, while delivery systems dictate the differentiation between works and market approach, procurement systems dictate the specifics of how this will be achieved for each project. For example, a delivery system may dictate the use of a framework for maintenance works in a particular geographic area to aggregate market value on behalf of 4 local authority clients based on the nature of the works. The procurement system to coincide with this (the process of realisation) may then be D&B for each project as a call off, with some having target cost approaches to contract, the others lump sums etc. The categorisation of procurement approaches include, but are not limited to, the following (see Cox and Townsend, 1998; and Masterman, 2002):

Separated (traditional – master & servant relationships) - Its key characteristic is the separation of the design and construction process and the lack of integration across these boundaries.

Integrated (design & construct – risk allocation models) - The design and build approach is characterised by the single point responsibility offered to the client by the contractor and the opportunity for overlapping the design and construction phases.

Packaged (management – separate packages including turnkey and DBFO) - The key principle in this form is the separation of the managing and operating systems. The project organisation is overarched by a managing system. This managing system is generally provided by a management contractor or a construction manager or a project manager.

Relational (collaborative – partnering and alliancing) - Key issues here focus around the sharing of common goals, while the nature of the process can take numerous forms ranging from partnering / alliancing to Public Private Partnership (PPP) and joint venture (JV) (Yueng et al., 2012).

What is important to note here is the interdependence between the construction process and its corresponding organisational structure in terms of responsibility allocation (Rowlinson, 1999; Akintoye and Main, 2012). Adapted from the ICE's 'Creating value in engineering' (1996), Figure 2I highlights the dichotomy between control and release with regard to stakeholder involvement and cost control across the delivery cycle. The idea being here, that traditional methods do not allow for contractor input into cost / scope reduction as they do not enter the process early enough (for example).

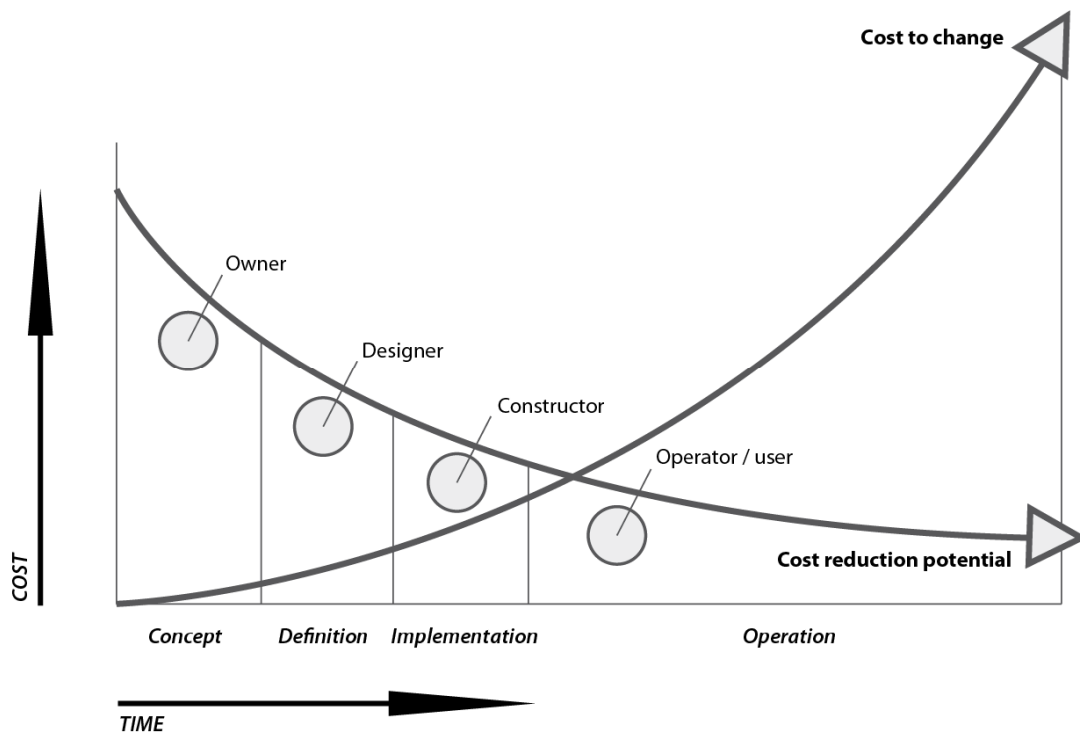


Figure 2I - Control and release against time and cost

(Source - Adapted from ICE, 1996)

A range of procurement system options consequently exist under the aforementioned categories, each with a differing approach to finance and the provision of various project phases by the marketplace. Pakkala (2002) asserts that such systems include design-bid-build (DBB), design-build (D&B), design-build-operate-maintain (DBOM), design-build-finance-operate (DBFO), build-own-operate-transfer (BOOT), construction management (CM), program management (PM) and pure operations and maintenance (POM).

In contrast, partnering organisations, or more aptly, relational contracting organisations, must set out clear (common) goals for their operation and understand the extent to which they are to be relational, and thus understand the relative objectives. Relational and collaborative contracting (RCC) is thus focused on win-win scenarios for the parties and their operating out of mutual benefit opposed to the creation of adversarial scenarios (Alsagoff and McDermott, 1994; Walker and Hampson, 2003; Yueng et al., 2012).

With foundations in the work of Macneil (1978) who categorised contracts as either transactional or relational, Joskow (1987) discussed the importance of the relationship between contract length and ex-ante terms & conditions based on relationship-specific investments. This focus on relationships, building on Williamson's Transactional Cost Economics (1985), puts an emphasis on collaborative working to reap mutual benefits between contracting parties. RCC can thus be said to be a mechanism to remove transaction costs, the economic equivalent of friction in physical systems (Williamson, 1985). As serial contracting methods (alliancing and strategic partnering etc.) form long term multidisciplinary teams, there is an importance placed around innovation and passing knowledge from project to project (Pryke and Smith, 2012). Such approaches may be said to be more strategic and effective, seeking to maximise each participant's resources based on trust. They also seek to maximise competition and streamline work definition, enhance the incorporation of the project organisation with commercial terms and develop the ability to formulate a vision that deals with an (1) increase in customer sophistications, (2) the development of new technologies, (3) the need to reduce the time to market for new products, and (4) the need to optimise resource management (Cousins et al., 2008).

2.7.3.4 Contract strategy

Section 104 (p.60) within the Housing Grants, Construction and Regeneration Act 1996 defines a construction contract as an agreement for:

- a) The carrying out of construction operations;
- b) Arranging for the carrying out of construction operations by others, whether under subcontract to him or otherwise;
- c) Providing his own labour, or the labour of others, for the carrying out of construction operations.

While contractor competitiveness can be more likely based upon dedicated contract size range opposed to contract type, it remains important to outline the nature of the contract itself and the resultant strategy that encompasses its application. The nature of contract results from the appropriate resolution of delivery strategies that effectively define procurement systems to be adopted for projects. The nature of the contract and the relationship between parties will be heavily dependent on the nature of the relationship and approach to market defined above. The NBS (2012) identified the main types of contract as being lump sum, re-measurement, cost reimbursable, target and management. While there is any number of bespoke contracts, general contract strategies also include partnering, with Walker and Hampson (2003) highlighting the risk relationship between typical contract strategies via Figure 2J.

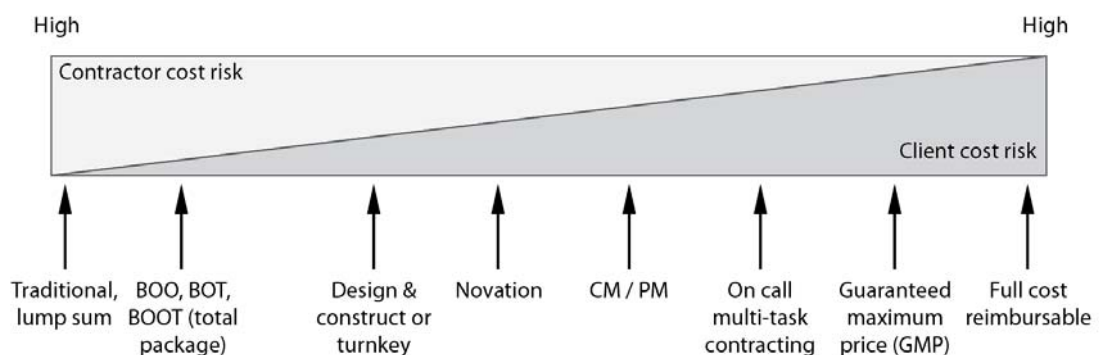


Figure 2J - Contract risk profile

(Source - Adapted from Walker and Hampson, 2003)

Key features of any contract strategy revolve around the nature of the relationship between the procuring organisation, the deliverer of the works, and any external characteristics (Love et al. 2010). Potts and Ankrah (2014) identify that the selection of an appropriate payment system (contract strategy) depends on the completeness / readiness of the design and the nature of the works. While contract strategies are largely price or cost-based, Seeley (1997) identifies that lump sum (price based / re-measurement) methods (more akin to traditional procurement methods) are based on low trust and consist of a number of accuracy issues, namely actual costs, variations and valuations, resulting in a claim based, uncertainty focused industry. Perry and Thompson (1982) by contrast, identify that cost based payment methods (target cost / cost reimbursable) have many advantages to both parties that include change flexibility, fair allocation of risk, potential saving in time and cost of tendering, open-book accounting, and a reduction in resources expended on claims. These contracts by their nature include specific mechanisms such as incentives, performance targets, time targets and cost targets (Potts and Ankrah, 2014).

Cost based methods therefore represent a larger relational aspect than price based methods, but then also place a large onus on the client / management side to administer and maintain such relationships. Another feature of selection is that of certainty. Price based methods transfer risk and maintain costs (assuming completeness of specification or design), while cost methods may result in cost escalation for the client without an apportionment of blame, so appropriate matching of organisational skillset to payment method and procurement methodology is required (Kumaraswamy and Dissanayaka, 1998), consideration of supply chain relationship maintenance, low with price based and high with cost based (Nicolini et al., 2000), the use of price based contracts with low risk and low complexity work and the use of relational / collaborative methods on more complex / valuable projects to save cost (Zimina et al., 2012).

2.7.3.5 Selection methods

An important sub-component of procurement strategy, and potentially more of a facilitative component for delivery, procurement and contract systems is that of selection methods. Masterman (1996) identified the failure to select an appropriate procurement approach as the primary reason for project dissatisfaction, while Gordon (1994) suggests that appropriate procurement selection can reduce construction costs by up to 5%. Newcombe (1994), building on socio technical principles, argued that selection represents more than just the establishment of a procurement path and instead defines a set of social variables, interest groups and power structures that influence the success of construction projects. As client satisfaction becomes a more pivotal factor in ascertaining project success, with Masterman (2002) identifying that this satisfaction is increasingly dependent on the appropriate selection of procurement strategies, Murdoch and Hughes (2002) present that selection criteria should address:

- The level of client involvement in the construction process;
- The level of separation between design and management;
- The reservation of the client's right to alter specifications;
- The level of clarity of the clients' contractual remedies;
- The complexity of the project;
- The required speed from inception to completion; and
- The level of price certainty.

The systematic selection approach of NEDO (1985) suggests a series of generic priority criteria can be used for project selection which include time, certainty of time, certainty of cost, price competition, flexibility, complexity, quality, responsibility and risk. Skitmore and Marsden (1988) through the use of their multi attribute technique developed from the NEDO procurement path selection chart (NEDO, 1985), found client (and advisor) procurement selection to be illogical at best. The underlying assumptions upon which this work is based is challenged by Luu et al. (2003), with Kumaraswamy and Dissanayaka (1998) adding that their work failed to incorporate aspects of

procurement sub systems (such as work packaging), project variables and participant selection.

Luu et al. (2003) suggest that limiting selection to a series of specific parameters (NEDO 1985; Skitmore and Marsden 1988) may lead to sub-optimal procurement selection. In identifying a series of factors (in rank order) for procurement selection, they identify (1) external environment, (2) project risks, (3) client's long term objectives, (4) project's physical characteristics, (5) client's short term objectives, (6) client's characteristics, (7) client's involvement and risk allocation, and (8) aesthetics and complexity. Of these, their results show the highest communality between external environment and project risks, such that understanding the interplay between the respective parameter groupings within these two factors should strongly affect selection. Love et al. (2010), in a follow up to their 2008 work, assert that while Luu et al. (2003) may have highlighted a more extensive list, that such lists are cumbersome in their opinion and that more generic criteria are required to produce consistent decision making processes, an expansion of the view that there is no one best way for procuring building projects.

Luu et al. (2005) in their proposition of a case based reasoning approach to the selection of procurement systems, interestingly (in a slight divergence from Masterman and Gameson's 1994 taxonomy) categorise client types into primary experienced / inexperienced, and secondary experienced / inexperienced. Primary clients are those whose main business is construction related activity, while relative expenditure is low for those categorised as secondary. Importantly, the model separates the underlying factors that influence procurement selection into (1) client characteristics and objectives, (2) project characteristics, and (3) external environment. This is an important element of the procurement system selection debate, in that understanding one's own capability and requirements, the specifics of the project and the market into which those works are to be procured is of the utmost importance. They add further that reliance on engineering (designer) judgement based on experiential knowledge of solutions based on client needs, project requirements and the makeup of the external environment, often based in opinions rather than rationality, has led to the poor implementation of procurement practice.

Indeed, while UK selection practice has grown out of a focus on the central construction professional, historically the Architect as a fulcrum for knowledge as a result of a combination of both legal and social systems, in France for example, the different regulatory regime, placing an onus for construction in the remit of the contractor, makes their traditional system much more akin to UK D&B focusing on outline design. However, their use of standard terms across the industry allows for repeat learning and relationship management in a broader sense. In Germany, their emphasis is on trades and the utilisation of managing architects or contracting organisations, but with tendering still focusing on sub lots and trade/skills areas (Morledge and Smith, 2013).

The issue is that whether it be legal differences or formation of industry sub-sectors, procurement and delivery systems are concerned with the formation of routes to market that reduce the overall management cost and ensure effective delivery. The matter becomes more about integration vs. separation, and cooperation vs. competition, in that the process of delivery is concerned with party management, their respective drivers and the aggregation of demand and spend where appropriate to suit client needs. The more prevalent issue is thus around the impact a wider procurement strategy has on the delivery of infrastructure and the usefulness of one procurement system over another to suit specific circumstances.

2.7.4 The impact of procurement strategy on the delivery of infrastructure

Eriksson and Westerberg (2011) assert that cooperative procurement processes such as soft parameters in bid evaluation, joint subcontractor selection, incentive based payment, joint specification, direct negotiation, collaborative tools and supplier self-control have a positive impact on project performance when measured against time, cost, quality, innovation, work environment and environmental impact. Importantly, these latter three measures, beyond the 'iron triangle' of time, cost and quality, are highlighted as becoming more valuable for organisations seeking sustained competitive advantage via the delivery of multiple projects, with those projects becoming important from a corporate perspective. In the case of infrastructure delivery, which is brought

about heavily within a MPE by large scale repeat ICOs, this viewpoint of measuring success beyond just TCQ becomes vital.

Additionally, Eriksson and Nilsson (2008) investigate the relationship between a client and contractor who had previously cooperated, but not via a strategic partnering relationship. Bygballe et al. (2010) assert that this probably had an effect on the relationship, so even if focused on project partnering and its success, the relationship was more likely based around a more long term cooperative relationship. Nevertheless, the results do indicate a shift towards a more collaborative formation of relationship, such as joint specification to facilitate the effective delivery of highly complex and somewhat uncertain projects. The authors attest that the application of an appropriate governance framework modifies the manner in which a relationship is formed. In this instance, a client shift from authority and price towards trust and cooperation facilitated a successful outcome. The authors do however identify that there is scope for the building of a longer strategic vision for the relationship in order to improve processes, but the underlying view is that procurement procedures, their governance, formation and management of contractual practices need to be appropriate to the project type in order to be successful.

Importantly, the research of Bowen et al. (1997) found that few construction industry professionals were completely aware of the differences between the multitude of procurement systems, with most unable to make plausible recommendations as to appropriateness of procurement for specific projects. Thus project success in this regard would be more akin to good luck than judgement, and with a high degree of project initiation being instigated by clients (especially in infrastructure), Love et al. (1998) argue that no client is necessarily 'experienced', as client experience continually changes with every 'unique' project. Knowledge and understanding may be acquired in this regard, but its application can still be somewhat detracted from the end result. The impact however is clear, a lack of understanding and a clear competency framework has led to underutilisation of delivery, and a mismatch with more strategic views of delivery, a concern exacerbated and continued by modern guidance such that the issue remains

inappropriately addressed in practice (Pakkala, 2002; Miller et al. 2009; HM Treasury, 2013).

2.7.5 The underutilisation of delivery systems

With an understanding that delivery costs are higher within the UK context, and following elaboration of the structures and processes that support delivery, it becomes clear that delivery systems are neither being optimised or fully utilised, primarily by ICOs. These organisations that represent the knowledge owners for billions of pounds of assets that make up the fabric of our everyday life, have clearly failed to understand the value and inherent differences across procurement methods. From scaling up contract strategies into organisational approaches to failing to adopt programme views or serial scenarios, the previous sections have highlighted the broad array of issues facing the delivery of infrastructure and its respective components.

As risk and uncertainty play a significant role in the delivery of infrastructure projects (Kraljic, 1983; HM Treasury, 2013), managing the overlap and adaptation of cultures and trust issues is pivotal to the effective use of delivery systems. Thus, understanding that one particular delivery method is not better than another, and they are in fact appropriate in suitable scenarios, moves away from collaboration being an end goal, instead focusing on needs and alignment to procurement systems, rather than use of a particular system as a norm. This view is inherently strategic, centring on the application of a strategic approach to market to leverage maximum value. The problem however is that ICOs within the water sector lack the adequate management structures, skills and general know-how around how to deliver their associated critical resources (Urban Land Institute and Ernst and Young, 2007). Coupled with the suboptimal performance outcomes argument of Worch et al. (2013), the lack of a holistic strategic approach to the delivery of infrastructure and the associated continuation of barefoot empiricist practices towards delivery, there is a clear need to address the lack of strategic improvement in delivery, and the failings of previous attempts to address this issue.

2.8 Implementing a strategic approach to the delivery of infrastructure

As construction industry supply chains are typically converging and made-to-order (Vrijhoef and Koskela, 2000), Arbulu and Tommelein (2002) suggest that one needs to understand their relative supply chain in terms of its structure, function and behaviour in order to be effective. To do this we must understand that the management of tactical (or traditional) relationships varies significantly from the management of strategic (or supply chain) type approaches (see table 2.6).

| Traditional Managerial Approaches | (New) Supply-Chain Managerial Approaches |
|---|--|
| Project-based management | Supply-based management, leveraging needs for multiple projects |
| Separation of design, fabrication, construction and ops functions | Total life-cycle management |
| Uniquely engineered facilities and components | Assembly of unique facilities for standardised modules and components |
| Liquidated damages | Target costing and problems solving through strategic alliances for key products |
| Competitive bidding | Emphasis on long-term working relationships |
| Information hoarding | Extensive use of communication and information technology to create information visibility so that the value chain supports the supply chain |
| Late payments and retainers | Prompt payment to minimise cost of capital (Time value of money is and inventory cost) |
| Long and uncertain lead times | Short and reliable cycle times |
| Early delivery of all materials to the site | Phased delivery of materials to the site to match installation rates |

Table 2.6 - Traditional versus Supply Chain Management approaches

(Source - Adapted from Arbulu and Tommelein, 2002)

Essential then is the consideration of the role that procurement plays within the wider organisation and consequently giving consideration to ones' procurement competency level to match such a position, especially with regard to integrated processes where procurement is a constituent part of delivery (Green and Lenard, 1999). Cox (1999) presents that competence in procurement and supply is premised on knowledge of three elements, (1) the full range of tools and techniques available, (2) the significance and value of contingent circumstances, and (3) the application and understanding of appropriateness linked to organisational strategic vision (see Figure 2K). The underlying principle of this strategic view is not the application of either a collaborative or adversarial approach as a business goal, in so much that any business to business relationship is potentially adversarial, but the application of either a collaborative or more arm's length approach to leverage maximum value from the supply chain to attain one's strategic goals.

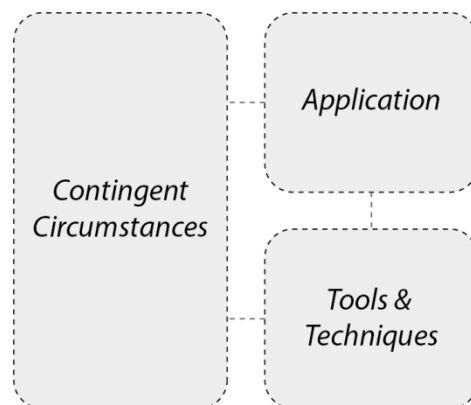


Figure 2K - Procurement and Supply Competence

(Source - Adapted from Cox, 1999)

In review, the opposite to adversarial approaches are non-adversarial approaches and not collaboration, with integration or arm's length being the fundamental foci. In addition to this, one must consider the assessment of static vs. dynamic efficiency within procurement, so far to say that static efficiency concentrates on cost reduction and skills

improvement, with dynamic centring on supply chain alignment and procurement. Indeed, when one considers the management of change within a delivery environment, are we considering the extent to which an existing set of relationships will be economised, or new relationships formed to correspond to a strategic vision and corresponding sets of contingent variables?

Cox (1999) presents further that a major error in procurement related academic research activity is the inclination towards the use of 'generalising' empiricist type vantage points. In essence, using a number of discrete and unique sources to explain an entire market, and in Cox's view, this does not consider the concept of appropriateness. The underlying principal of appropriateness being that because one tool or approach worked for situation A, it will not automatically be appropriate for situation B and so forth. Indeed Chen et al. (2004) emboss the view that there is a link between strategic purchasing, supply management and firm performance. The authors argue that sustainable competitive advantage can be brought about by enabling firms to:

- Foster close working relationships with a limited number of suppliers;
- Promote open communication among supply-chain partners; and
- Develop long-term strategic relationship orientation to achieve mutual gains.

Accordingly, Cox suggests that three major competencies are required for private sector business success, inclusive of marketing and sales ability (managing demand), procurement and supply ability (appropriating resources) and transformation ability (changing inputs into more valuable outputs within the boundary of the firm). In the case of construction project delivery, this transformative capability would be inherently required within a design focused world for example. What this highlights is that to consider a strategic approach, one must of course make linkages through to the core business vision, but also manage demand, control required resources and be able to accrue more value from a transformative process, a core attribute of project delivery (from need to realisation within the concept of TMOs).

Importantly, Cox (1999) presents that SPM is based on the combination of a number of approaches inclusive of electronic data interchange, network sourcing, partnership and

lean supply. Importantly, such components of the strategic approach ran the risk of becoming fads as organisations failed to understand the specific circumstances under which such approaches were successful (Cox, 1996). Cox and Ireland (2002) add that industry problems have been compounded by government-sponsored industry reports which advocate genericism. Such failures of application and understanding make a clear linkage to the foundation of Joan Woodward's (1965) view of there being no one best way to organise a firm from a contingency perspective, thus, there is no best way to either organise a project or procurement process (Murdoch and Hughes, 2002). In light of this difficulty, a number of attempts have been made to highlight the value of a more strategic approach to project delivery, and espouse the components of a strategic approach that a procuring organisation should consider.

2.8.1 Attempts to present a strategic approach to infrastructure delivery

A strategic approach essentially consists of the tools (the knowledge of what is on offer), the situation (what is happening in a specific context) and the ability to link tools to the situation to suit a firm's goals. What the following presents is a number of attempts, if not directly espousing a SPM approach, then at least displaying its principles.

Beginning with a non-construction specific perspective, but one of ideology rather than process, is the work of Cardell (2002) in assessing the value of strategic collaboration. Often passively referenced as a text on the value of collaborating to achieve business success, it in fact outlines the framework within which collaboration is appropriate, and the relative skills required to achieve a successful use of more collaborative approaches within any business. As part of Cardell's route map for collaboration he presents that collaboration should be considered (not automatically enforced) if an organisation can ensure that the business objective of the collaborative relationship is strategic in nature (aligns to business goals) and that there are external parties with greater resources and market power who would be able to deliver the business goal more easily.

Within an infrastructure MPE such constructs are easily perceived in many facets. Cardell adds that there are four models of collaboration, and one can glean easily that the supply chain model is most apt for the infrastructure delivery sector. Importantly,

one should consider that Cardell advises that characteristically, this model would have the same scope as pre-collaboration, and concentrate on efficiency of goals though collaboration not expansion of market share. The collaboration focus is thus on cost, the typical number of parties is two or three, with the risk of failure low and the importance of a cultural fit high. An organisation should then consider the operation of collaborative forms of relationship and be concerned with a four stage process of (1) choosing the right partner, (2) creating shared goals and visions, (3) establishing an integrated planning process, and (4) implementing a common measurement model for ongoing performance.

Cardells' overview of collaboration reinforces the concept that collaboration is not the *raison d'être* of strategic management thinking, but a tool that facilitates natural progression of relationships in certain circumstances. This leads to an important consideration when one looks at the work of IUK (HM Treasury, 2014b) in the creation of the Project Initiation Routemap (PIR), building on its predecessor the IPR from 2013. The PIR is essentially an improvement framework that builds on a three step process of *assess complexity*, *assess capability* and then *align for success*. The merits of the socio-technical approach adopted are discussed elsewhere within this thesis, but the inherent concern of the PIR is a strategic one, albeit differing slightly from the parameters highlighted by Cox. Of note here, is its focus towards the utilisation of 'modules' that address requirements, governance, execution strategy, organisational design and development, and procurement.

What can be gleaned from this suite of documentation is its broad brush array of information for interested parties who, skilled or not, can utilise the PIR to assess areas of value for their own organisations. Importantly, however one breaks it down, the PIR follows a path of assess and align in the strategic sense, making clear that differing approaches require differing alignment strategies in accordance with the contingency approach. Case study application of the Routemap at Anglian Water, Surrey County Council, Thames Estuary Phase 1 and Crossrail (albeit using material from the preceding IPR (2013)) identify gaps in organisations' change programmes and alignment to delivery models. Whilst linkage to action as a direct result of the routemap's application is

tenuous to some degree, there can be no denying that the route map (in either IPR or PIR form) has been able to identify gaps in 'holistic' delivery approaches. By that, it defines a somewhat macro scale view of there being an issue to address opposed to actionable processes that address it.

Watermeyer (2012) identifies that as part of a strategic approach one must consider the works and their appropriate delivery make-up before embarking on design. In essence, confirming the manner in which one engages with the market and external sources as part of a wider delivery strategy (traditional or relational etc.) before delivering infrastructure works. This then impacts the building of works packages, much akin to the Cox view of commodity and process spend, as well as the underpinnings of category management. This is a sentiment reflected in the PIR (2014b) in so far as organisations must aim to avoid sleepwalking into procurement and delivery options, or continue to design traditionally for example and then fail to employ more collaborative delivery methods, an underlying principle of the contingent strategic approach.

Cox and Townsend (1998) present that there is indeed no such thing as best practice, only better practice. This stems from the basis that if such a thing as best practice existed, that it would have been 'discovered many centuries ago'. They add that the assumption of a sort of end game that presumes a state of management behaviour to achieve success in all circumstances is intrinsically flawed. In essence, they focus on appropriateness, not best practice, in choosing from the array of options available, especially with regard to their own specific situation and circumstances. As a result, attempting to copy the inimitable characteristics of another organisation can only lead to failure. Appropriateness links directly to the expression of competence as outlined by Cox (1999) previously, with the authors arguing that one must first espouse and recognise one's own situation and the specific issues that face them. They must congruently understand the plethora of tools, techniques and approaches that are available to achieve strategic advantage. Once completed, Cox and Townsend (1998, p.4) identify that one must link their:

Strategic goals with the operational reality that faces them....this is, by definition, what a strategic approach to construction procurement always looks like. It is not a particular practice at all; it is a way of thinking about what is appropriate under specific circumstances.

An important component of Cox and Townsend's work, although not staunch or complete, is their rejection of the main conclusions of Latham's 1994 Constructing the Team report that single-handedly represents a solution to construction industry woes. Specifically, they take umbrage to the premise that *'the'* way to solve the industry's problems *'is'* a more collaborative *'win-win'* approach. A strategic viewpoint in this context would argue that this approach would only be suitable given the right circumstances for client, contractor, users and sub-contractors etc. As the industry has experienced a less than meteoric improvement in performance, it would be prudent to conclude that this all encompassing 'answer' is not the one the industry needed.

The view is taken that the Latham conclusion over-simplifies the industry's issues, and merely proposes an antithesis to the problem of an adversarial culture. An issue the authors have, is the premise that collaboration *'is'* beneficial, opposed to assessing *'who'* collaboration benefits. Thus, the lifting of automotive supply chain thinking with broad application to construction suggests a misalignment and drive to assess the underlying issues with construction supply chains (such as complexity opposed to complicated issues). The work of London and Kenley (2001) makes clear how such production level thinking misaligns with issues of TMOs and complexity, with the literature greatly misunderstanding the ability to merely replicate such processes to construction in a holistic manner. An apparent application of the associated benchmark type thinking creates a fallacy of performance at best; but more likely, creates a perpetuation of catch up and failure when compared to the industries to which that solution is suited. Cox and Townsend go on to identify better practice in construction as spanning risk management, supplier appraisal and development, standardisation and modularisation, strategic cost management and performance measurement. With these focal areas addressing construction related issues identified within their case studies spanning:

- (1) Demand issues, specifically low and discontinuous demand, frequent changes in specification, inappropriate selection criteria and inappropriate allocation of risk;
- (2) Supply issues, specifically poor quality, inefficient methods of construction and poor public image; and
- (3) Common issues, specifically poor management, inadequate investment, adversarial culture and a fragmented industry structure.

Important to the delivery of infrastructure (especially with regard to clients) is the management of assets. Too et al. (2006) present that a strategic approach to asset management, bringing together strategic choice, strategic analysis and strategic implementation, represents the optimum balance of aspirations, needs and requirements, and the whole life costs of an asset. Too et al. add that a strategic approach can be categorised through common themes of systematic management, the use of a whole life cycle approach, appropriate resource allocation practices, service provision of the asset base, and the implementation of a long term strategic view.

With linkages to Johnson et al.s (2008) strategic management framework, the authors build the strategic infrastructure asset management (SIAM) framework spanning analysis, choice, implementation and performance management. In essence, the SIAM framework provides the structure through which one assesses an asset network, identifies gaps and puts in place plans to address such gaps in service provision. The key point here is that Too et al. present the need to understand the strategic use of capital delivery to facilitate broader organisational goals and thus 'fill gaps' as part of a wider service provision. This places strategy at the business level, but within a framework of how one might identify the programme (or portfolio's) of capital and maintenance works required to enhance or preserve the infrastructure network. Importantly, procurement aligns directly to the implementation of strategy and is in itself, strategic. Perhaps more appropriate, Too (2010) presents that for improved performance through the management of infrastructure assets, three inter-related issues require attention:

- The implementation of a strategic approach toward the management of infrastructure assets;
- The adoption of a strategic process to guide decision making; and
- The development of competency across core capabilities in order to develop and implement the above.

In a development from Too et al. (2006), and much in accordance with the wider strategic literature (see Wheelan and Hunger, 2012 or Langford and Male, 2008 for example), there is a need to develop competency and understanding in the use and implementation of the strategic view. As such, one can take a strategic view in identifying programmes to facilitate a service function, and also 'step into' the strategic delivery of that programme of works as part of a wider integrated delivery process (Green and Lenard, 1999). Thus, in accordance with Too et al.s (2006) view that infrastructure asset management exists at two levels, operational and strategic, Too's SIAM framework (2009, 2010) exists at the strategic business / asset management level, and not that of operation and delivery.

What is clear is that outside of the PSE model of Mead and Gruneberg (2013), the identification of better practice by Cox and Townsend (1998), and the assessment guidelines of the IPR and PIR (HM Treasury, 2013, 2014b), there is a gap in knowledge and understanding of actually how to implement a strategic approach beyond its mere identification. When we consider the capability perspective of Worch et al. (2013) for example, it becomes clear that ICOs are surrounded by a plethora of advice on what should be done and that they have a problem, but a clear understanding of what it actually means to be strategic, or indeed how to go about it is missing.

2.9 Chapter summary and linkages

What the preceding chapter has highlighted is the culmination of three underlying themes of concern to which this study is related. First being that infrastructure is important and that there is indeed an issue with its efficient and effective delivery by ICOs. The second being that there are a multitude of components that contribute towards the delivery of infrastructure, with the ICO at the fulcrum of the wider process. And thirdly, that barefoot empiricist practices (among others) have led to not only a lack of understanding around what needs to be improved, but also failed to provide a medium through which to communicate improvements, or indeed a vehicle through which to do so.

The culmination of this chapter is therefore the identification of the strategic approach as a resolution to an array of ICO centred issues in the delivery of infrastructure, specifically with regard to competency levels within such organisations. And, the need to focus on how to address such issues, rather than merely identifying them which is where previous efforts have fallen short. This requires the study to 'step into' the study of the organisation, in this case the ICO, and begin to consider how one improves such organisations and the most appropriate methods of doing so.

CHAPTER 3 THE THEORETICAL CONSTRUCTS OF INFRASTRUCTURE ORGANISATIONS

3.1 Chapter introduction

With a number of fundamental issues with the delivery of infrastructure having been discussed in the previous chapter, one can summate that there is little doubt in the need to address the clearly sub-optimal situation, with the scale of the responsibility lying with the Infrastructure Client Organisation (ICO). What the following section attends to is the matter of managing change within such ICOs. Attention is consequently given to the following:

- The identification of joint optimisation within the temporary project organisation as a response to complexity in infrastructure delivery, predicated on Socio-Technical Systems (STS);
- The creation of the Three Phase Change Approach (TPCA) built on the principles of Unfreeze, Move and Refreeze;

In seeking to simultaneously build a change model as well as conduct change, I sought to take action in the social world, finding STS the most appropriate theoretical foundation upon which to explain observed issues. Such a vehicle through which to espouse a model for change, would serve to act as a theoretical contribution to the field of strategic procurement management (SPM), whilst testing its use and formation. Readers may consequently wish to refer to the methodology chapter at times, as significant congruence is made between the two chapters as they were cyclically created, with specialist literature unearthed and explored during the research process. Whilst created cyclically, the rationale for the change and methodology sections maintaining a separation is the manner in which they either contribute to, or focus on knowledge creation. This chapter positions the context for intervention within ICOs, the methodology (chapter 5) frames how such intervention can create knowledge that can

be considered valid within the context of academic research, with the theoretical basis for intervention being discussed in chapter 4.

3.2 Foundations of change and the theoretical constructs of infrastructure organisations

The following discusses a number of primary components to frame the remainder of this chapter, namely, the project organisation and its impact on infrastructure delivery systems (IDS), its temporary nature, its positioning within the multi project environment and its structure being a response to organisational and situational complexity.

3.2.1 Infrastructure delivery by the project organisation

IDS invariably involve the organising, formalising and operation of organisations. These organisations are subject to sub-decisions with regard to an overall organisational approach (Murray et al., 1999). Organisations were historically the function of more mechanistic and structured Taylorist vantage points of their operation (Burnes, 2004), focusing on the 'one best way' of organising. Scott et al. (2011) help outline how the developmental study of organisations began to consider the temporality of organisational existence from the late 60's / early 70's as being akin to 'tents' opposed to 'palaces'. Coinciding with the development of contingent arguments around the formation of organisations, it is suggested that these temporary, post-industrial organisations deal with great complexity and high levels of uncertainty through the application of more flexible coordination approaches represented by projects and related teams. Such coordination structures were presented through Mintzberg's (1979) codification of the 'adhocracy', characterised by its organic structure, low levels of formalisation, grouped specialists for 'house-keeping' purposes with associated market type deployment across projects, horizontal job specification, project focused work organisation (opposed to process) and the mutual adjustment of activity coordination.

Research into the understanding of organisations spans the development of contingent approaches to complexity (Lawrence and Lorsch, 1967), the markets and hierarchies framework of institutional economist Williamson (1985), the 'intermediary' network

forms of organisation presented by Miles and Snow (1992), operating between the 'markets and hierarchies' of Williamson and the study of the human and non-human interfaces of organising presented by the Socio-Technical Systems theory of Trist (1981) and Emery (1959). Project based organising can be seen in the study of larger (mega) projects engaged across complex system type interactions involving multiple actors in the form of individuals and organisations, but not necessarily within wider organisational study. Scott et al. (2011) present that projects focus on unique or customised singular products and are conducted over considerable periods of time. They require various contributions from a diverse set of entities (some specialised) and confront complex and challenging environments.

Importantly, and in opposition to the more classical forms of unified hierarchy and structured control mechanisms, the project form of organisation must consider the interplay between a wide array of actors with differing goals, requiring the application of a range of governance mechanisms (inclusive of mediation and adjudication) that must be 'enhanced' by encompassing governance systems (Scott et al., 2011). As highlighted by Espejo (1994), one must always consider that the organisation, in whatever form, is a series of interrelated parts and not independent. In the field of large project organising, Scott et al. (2011) identify that two main theoretical approaches have been applied, namely the contingent approach to organisational design based on complexity (and thus the systems view) and the Resource Based View (RBV) of project organising based on features of inimitable resource maximising etc. Also, the emergence of the institutional perspective highlights the context within which these approaches are applied and operate. An issue held here with the application of the RBV in the study of infrastructure organisation is that the study of the inimitable at the strategic level inherently suggests the identification, use and accumulation of the unique to create value. For the delivery of infrastructure, it is presented that in seeking efficiency, the contingent systems approach presents (and allows) for indistinctive strategies to be implemented as long as the parameters for their application are both understood and appropriate. Ideologically, the RBV would not support the use of 'the same' deployment under a strategic approach.

Hobday (2000) presents an enticing debate around the value of the project based organisation (PBO) and its merits in comparison to the traditional matrix structure. His work presents that PBOs are intrinsically innovative, creating and recreating organisational structures in response to customer and project needs. Its value is in the integration of knowledge, dealing with uncertainties, coping with project risks, responding to emergent properties and responds flexibly to changing client needs. Contrastingly, PBOs are weak at performing routine tasks, achieving economies of scale, coordinating cross project resources and facilitating organisation wide technical development and learning. Hobday argues that scale, composition and nature of product (focus of the project) has an important bearing on the chosen organisational form, akin to a contingent approach. Irani et al. (2001) identify that an appreciation of the human and organisational factors prevalent when enacting a project are intrinsically linked to its success or failure, with much relying on the ability of managers to understand the organisation as a complex whole having a major impact on organisational performance. Carroll and Burton (2012) add that organisational structure is vital to the success of a project, such that the design of organisations consider the alignment of activities to a common goal to achieve success. Daft (2009) importantly advises three elements of organisational structure as being fundamental to the achieving of organisational success, inclusive of resource allocation, operations management and strategic decision making.

Weiss (2007) advises that in the design of organisations, one must consider both the strategy and the purpose of the organisation, components of which a sub-system (project) would correspond. He adds that the configuration of systems as a whole, with regard given to path dependencies is pivotal in achieving efficient and effective organisational design. Organisational design should therefore give credence to the configuration of the wider system, the elements within that system (sub-systems), the related structure and relationship between them (boundary definitions), information and knowledge transfer, power and authority amongst those components, incentives and motivation among the wider system, the co-ordination and co-operation of the wider system, governance mechanisms for the organisation, specific investments, stakeholders and ownership.

3.2.2 Infrastructure delivery as a temporary endeavour

As teams go (the so called project team) it really is rather peculiar, not at all like a cricket eleven, more like a scratch bunch consisting of one batsman, one goal keeper, a pole vaulter and a polo player. Normally brought together for a single enterprise, each member has different objectives, training and techniques and different rules. The relationship is unstable, even unreliable, with very little functional cohesion and no loyalty to a common end beyond that of each member coming through unscathed.

Denys Hinton (1976) (in Bingham, 2011, p.2)

Packendorff's (1995) presentation of the project team as a temporary organisation in contrast to the more scientific management oriented forms of project management highlights a fundamental issue in the study of organisation. Project management by its very nature aims to control the sequential activities of planning, controlling and evaluation of the project, such as that represented by the Project Management Body of Knowledge (PMBOK). Opposed to the view of process delivery and consideration of a number of parts in stability is the focus on outcome delivery through temporality. The main source of information about action within a project setting should be the individuals forming the project organisation, representing the subjective realities of individuals and groups (Packendorff, 1995).

The Temporary Multi Organisation (TMO) was first identified by Trist as a Socio-Technical System whereby social and interpersonal relationships are inherently conditioned by the task at hand and in return. Stringer (1967) presents that a multi-organisation is the union of several organizations' parts, with each part representing a subset of the interests of its own organisation, and is defined by the performance of a distinct task through the interaction between people. De Blois and Lizarralde (2010) in their classification of TMOs identify that procurement systems are the organisational 'archetype' of the construction industry and as such dictate the 'formal' arrangement of TMOs. They identify that TMO characteristics include effective communication, are conditioned by particular tasks in pursuance of project specific goals that relate to an

organisational mission, that participants have interests apart from the specific project (with completion representing the end of the reason to collaborate), and legal frameworks and procurement strategies describe only the 'formal' system, and thus do not supply a full expression of the dynamic network of TMOs.

De Blois (2013) presents that the TMO is intrinsically 'self-organising' and consists of a number of components, including the project variables that constitute the foundations of the initial project intentions, all the interacting elements during the project process, inclusive of actors and their relative actions, and informal communications, external factors, and context variables. Building on the project specific foci of TMOs, De Blois (2013) investigates the dichotomy between the informality of decision making within such TMOs and its impact on formal organisational structure and processes. Packendorff (2014) brings attention to the proclivity of firms in organising as 'project-based' organisations (with permanent structures representing more administrative forms of support), as a way of exerting control and avoiding the perceived classical problems of bureaucracy. However, De Blois (2013, p.9) identifies a number of decisions and behaviours as part of TMO reorganising in response to project specific variables that manifest as:

The displacement of decision centres in response to project reorientations; the emergence of inter-organisational work constellations; the appearance of new unplanned processes; and the emergence a new organisational unit responsible for addressing specific strategic and tactical development objectives.

Contrastingly, Packendorff (1995) identifies that the prevalence of project management thinking towards the application of a general systems theory approach has led to the identification of projects as tools, serving the goals of higher system levels. Studying projects as tools leads to the misalignment of their study and the failure to identify the issues that exist and persist within their operation. Packendorff highlights further that projects can be initiated for unclear reasons, focusing on the process rather than the purpose and pursued irrespective of organisational changes. This proclivity toward using the project as a tool 'of' organisation rather than 'an' organisation misaligns to the

principles dictated by Stringer (1967) as to what constitutes an organisation at all. Namely, it has a number of goals applicable to all its parts, it establishes means for pursuing those goals, has an expression of the organisation's authority and has a durability which transcends tasks. The linkage of parts in pursuance of common goals supports Packendorff's (1995) focus on the on temporary systems in creating the definition of the temporary organisation as one that:

- Is an organised (collective) course of action aimed at evoking a non-routine process and/or completing a non-routine product;
- Has a predetermined point in time or time-related conditional state when the organisation and/or its mission is collectively expected to cease to exist;
- Has some kind of performance evaluation criteria; and
- Is so complex in terms of roles and number of roles that it requires conscious organising efforts (i.e. not spontaneous self-organising)

This linkage to systems can be seen in the defining of purpose, primarily, the system as defined as a set of elements used to satisfy a need or requirement, the system as an array of components designed to accomplish a particular objective according to plan, the system as a value delivering object and the system as a representation of togetherness . Importantly, the description presented by Miles does not exclude temporary contracts between permanent systems. Representing that the formation of a number of relationships across a project environment (such as an infrastructure delivery context) is an important focal point for research.

3.2.3 Infrastructure delivery through a multi-project or programme approach

The delivery of infrastructure is not limited to the completion of single projects, but (predominantly) linked to the delivery of multiple projects across a number of disciplines and abilities to serve a common purpose. While the issue of common misconceptions around programme management being essentially project-based has been highlighted previously, the nature of infrastructure delivery results in programmes or portfolios representing a number of projects grouped together to enact effective management to

meet a strategic business need. Oyetunji and Anderson (2006) add therefore that procurement systems define the roles and responsibilities of the parties involved in those specific projects, and thus establish an execution structure that defines the sequencing of design, procurement, and construction.

By proxy, the efficient and effective execution of programmes managed through a framework of project delivery systems as TMOs requires both the structuring of formal programme structures and informal project level processes. Koppinen and Lahdenpera (2009) identify that project delivery (procurement) systems are pivotal to the success of infrastructure delivery, specifically in the achieving of client goals. And as one can glean from the classifications of TMOs presented by De Blois and Lizarralde (2010) that TMOs are so intrinsically affected by such systems, is that the study of effective infrastructure delivery exists across the TMO, Operator, Procurement Organisation and User levels of institutional configuration found in the construction industry.

3.2.4 Projectification in response to complexity

What the previous section highlights is the extent to which organisational design and efficacy is influenced by the impact of complexity. An issue however, as Bertelsen (2003a) identifies, is that a unified description of what constitutes complexity is missing. Baccarini (1996) in reference to construction projects, defines complexity as consisting of many varied and interrelated parts, while Bertelsen (2003b) adds that complexity is more concerned with moving away from seeing the construction project as an ordered, linear process. With system complexity increasing over time in response to internal sub-factors and external turbulence (Mason, 2007), Sargut and McGrath (2011) present that understanding complexity requires us to step away from complexity being used as a synonym for complicated. They present that complex and complicated scenarios in fact differ, with the mismanagement of complex organisations potentially resulting in 'expensive mistakes'.

They identify that simple systems (such as a light switch) have few interactions and thus are extremely predictable. Complicated systems (such as a commercial airplane) involve many interconnected elements, but if one were to follow predetermined steps you

would (and do) find that they are predictable (and in this instance safe). Contrastingly, complex systems are imbued with observable patterns, but the interactions may be continually changing, thus predictability based on inputs and processes is highly unlikely (Bertelsen 2003b). A simple way to define this difference between complex and complicated is that when knowing the starting conditions, one can predict a complicated systems' outcome, whereas that same starting condition for a complex system, can produce differing outcomes based on the interaction of system elements (Sargut and McGrath, 2011). The PBO is intrinsically a response to complex scenarios.

Environmental complexity for a system comes in the form of the number of (potentially) interacting components, the manner in which components are incongruent or heterogeneous and the level of connectivity between system components. With Sargut and McGrath arguing that unintended consequences and difficulties in making sense of particular situations are the commonly faced problems in the management of complex systems. Sense making of a situation is then subject to the issue of (1) vantage points: through which no-one individual decision maker can (or is unlikely to be able to) make sense of a complex system, (2) cognitive limits: and our understanding of the impact of others decisions and actions on ourselves, and (3) focusing on one thing can prevent us from seeing others: such that task blindness can stop us from seeing pivotal changes in our surrounding environment. The consequence is that complex systems pose three areas of challenge to managerial activity via (1) future forecasting, (2) risk mitigation, and (3) making trade-offs.

Both Gidado (1996) and Baccharini (1996) recognise that project complexity within the construction industry can be identified from two perspectives, namely, the managerial (or organisational) and the technological (or operational). Gidado adds that construction projects have been subject to ever increasing complexities over time and that practitioners have come to overlook, or subjectively assume their effect on objectives. Baccharini (1996) augments this argument that project complexity can be operationalised through differentiation (of tasks, components and specialists etc.) and through the interdependence / connectivity between such elements. What Baccharini does suggest is that the espousing of complexity through the variables of organisational, technological

and integrative complexities is the tool through which one can safely categorise a project as complex or not, a view shared by Sargut and McGrath (2011).

Gidado (1996) considers that construction project complexity has resulted from the widespread fragmentation of the construction industry and continuous demands ranging from technological advances to reduced construction times. Gidado adds further that sources of complexity originate from a number of sources, inclusive of the employed resources, the environment, the level of knowledge required (scientific and technological) and the interactions between the constituent parts. The components of these complexities are outlined as being (1) inherent (within the product or process), (2) uncertainty (within the project and its environment), (3) the number of technologies involved, repetition and their dependences, (4) the rigidity of sequence between the main operations, and (5) the overlap between stages or components. Indeed Wood and Ashton (2010) are in agreement with Gidado (1996) in that their modelling of project complexity identifies the main attributing factors as being (1) organisational (inclusive of brief, structure and stakeholders), (2) planning and management (inclusive of project coordination, programming and information), (3) operational and technological (inclusive of technology, new methods, inherent difficulty and project size), (4) environmental (inclusive of physical and project environment, as well as location), and (5) uncertainty (inclusive of existing structures, planning and uniformity).

3.3 IDS as complex systems

Whilst the factors facing and causing complexity have been outline here, what can be understood is that the IDS is in fact a complex system, consisting of complex and complicated sub-systems. To make such a statement, opposed to alignment to obvious views on temporality and extensive human interactions across a programme environment, alignment is made to the definitive characteristics of complex systems as set out by Lucas (2000). Bertelsen (2003a), in defining construction as a complex system, takes these characteristics and identifies that the construction project should be seen as

a complex and dynamic endeavour by summing the characteristics into three groups of autonomous agents, undefined values, and non-linearity.

Brockman and Kahkonen (2012) (expanding on work focusing on complexity in megaprojects by Brockman) define contextualising project complexity across five dimensions of task, social, cultural, operative and cognitive complexity. What one can glean from this in relation to IDS, is that definition and exploration of an infrastructure project must be from a number of perspectives and definition of issues and wider complexity cannot merely be done in terms of task definition (Gidado, 1996). The result is the exploration of these complex delivery systems through the use of a deeper understanding of complex systems theory, and the application, definition and understanding of the governance structures for those delivery systems.

3.3.1 Dealing with complex delivery through project teams; their expectations, action and learning

Packendorff (1995) presents that project research should consider components such as culture, environmental relationships, conception and longitudinal processes rather than as goal fulfilling subsystems of a strategically aware super-system. He adds that researching the temporary organisation (opposed to the tool) must be perceived across three levels of (1) expectation: based on previous knowledge of project types for example and therefore perceiving projects as institutional constructs, (2) action: of humans within a project leading to outcomes, and (3) learning: such as how work and action leads to both organisational and individual learning, in contrast to the plan, control, evaluation foci of considering projects as tools. Importantly, he identifies that studies into the action component of a project can be divided into longitudinal case studies habitually employing action research, and case studies focusing on the completion of projects. Studying the project as a system of action facilitates study on what is actually happening rather than what is meant to happen.

In the study of action activities within project organisations, Packendorff highlights that investigation into the paradox of project culture is needed. Specifically, the contrasting views of emotional affiliation with permanent structures outside of the project team,

and the enhancing of participation and workplace democracy through the structuring of temporary organisational settings leading to the departure from ordinary structures. Additionally, Sodergren (1994) identifies that the removal of people from usual routines and setting them to an unorthodox task with unknown individuals facilitates change within the permanent organisation.

Cicmil and Hodgson (2006) identify that the project as a focal unit of organisational operation is considered a suitable medium through which to control endeavours in a turbulent environment. They also act as an appropriate way of stimulating learning environments and enhancing creativity in the delivery of complex products. Indeed, the 'projectification of society' has focused on the rationalising of organisational activity and has had significant impact on issues such as workplace identity, inter-subjective interaction and increased control over individuals through efficiency and performance. Undeniably, the summation of the Scandinavian School of thought by Packendorff (1995) highlights that the universal belief in the foundations of project management thinking is fundamentally flawed, and that there is a distinct need to move away from the project (as a tool) and focus on the temporary organisation. The narrow application of conventional approaches to the management of projects is commented upon by Alvesson and Deetz (2000, p5-6) who advocate the adoption of a more critical stance incorporating an array of theoretical lenses:

There is considerable agreement that conventional, universal statements of what management is about and managers do – planning, organising, coordinating and controlling – do not tell us very much about organisational reality, which is often messy, ambiguous, fragmented and political in character.

Huczynski and Buchanan (2001) identify that conventional approaches to organisational and management research have exposed management techniques directed toward empowerment, teamwork and flexibility to in fact be operating 'covert tools of manipulation and exploitation' in order to deal with problem solving and decision making issues. As an organisation inherently requires the design of operations by a group of people serving a particular goal (Weiss, 2007), the alignment to and design of

that goal is in accordance with the definitional thinking of TMOs by Packendorff, De Blois, Cicmil and Hodgson and Stringer. Daft (2009) identifies that organisations are social entities, goal oriented and designed (deliberately) in connection with their external environment. He advises that the design of Socio-Technical Systems (the inherent structure of TMOs) is dependent on three components, the social system, the technical system and the design of their joint optimisation.

3.4 The management of change within complex environments

In pursuance of the study aims, we must now consider the manner in which one changes such complex scenarios and how that is managed. Change management is an important process that aids in the facilitation of an organisations' transition to a desired future state. It can focus on a number of levels from the individual, to the team, or the whole organisation (Kotter, 2011). Within a construction context, it can focus on organisational or project changes (Erdogan et al., 2005), or within a construction project change management environment (Fernie et al., 2006). However, 70% of change management programmes fail according to Balogun and Hope Hailey (2004), as Todnem (2005) suggests it may be as a result of the lack of a suitable framework through which to implement and manage such change. To combat such misunderstandings of appropriateness, the following is predominantly focused on change management within an organisational context, but will touch on some of the factors mentioned above.

3.4.1 Managing change, its purpose and underpinnings

Building from the contingency approach, Burnes (2004) makes three assertions about organisations in contradiction to the classical approach, adding that knowledge comes from real world managers opposed to unworldly academics. He states that:

- Organisations are not machines but cooperative systems. To operate effectively and efficiently, they require the active cooperation of workers;
- People are motivated by a range of rewards, including social esteem; and

- Motivating factors change over time.

This complex view of the organisation, as an ever changing an emergent whole draws from the move away from the classical mechanistic approach to the formation the Human Relations and the Contingency approaches. As the Human relations approach sought to challenge the Classical approach as being the 'one best way', Contingency Theory asserted that there was no one best way for all organisations; the main contingencies including environmental uncertainty and dependence, technology and organisation size. This resulted in one best way for each organisation and the key deviation from previous theories that in fact organisations are not closed systems but open systems, subject to personnel and resource flows (Scott, 1987). Managing change, whether it is at a personal or strategic organisational level, is about moving from one state to another. There is a common misconception however, that change is the transforming of inputs in outputs, this is the function of organisation. In fact, change is about affecting that process and changing the organisation. To put this into context, the difference between Lewin's three phases of change and the three phases of transformation are outlined below:

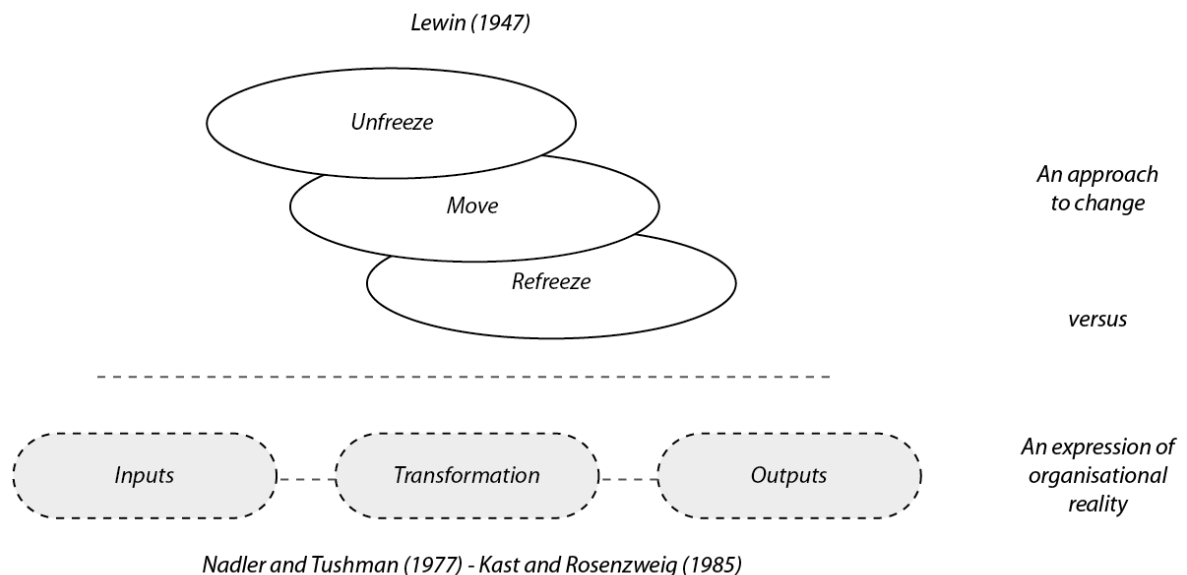


Figure 3A - Change process versus organisational process

(Source - Author)

In support of the basic systems principles of organisations as transformation systems (Kast and Rosenzweig, 1985), one must consider the environmental and organisational systems, as well as the optimisation of the social and technical systems to align to an organisational strategy. Nadler and Tushman's (1977) congruence (or fit) model is a prime example of the integration of inputs in forming a strategy that is applied across organisational socio-technical parameters that lead to outputs. Congruence is then the identification of gaps or differentiation between organisational components that do not serve the broader purpose of optimisation. Addressing such incongruence however has often been dealt with via benchmarking processes, such that if A worked for B, then A surely works for C and so on, a basic premise of the need for an informed change management approach in the delivery of infrastructure. It is important furthermore to outline the difference between an expression of an organisational process (model) and the general approach to changing it. The work of Lewin and other leading change authors are concerned with the change process / or approach, with the need for change existing within the organisation which represents a transformative process.

When we consider change in respect of TMOs in the construction industry, Murray et al. (1999) add that the prevalence of the construction industry is to identify with the classical (mechanical) school of management, expecting participants to act in a unitary manner, ultimately leading to conflict. This consequently ignores the human and cultural issues within complex project environments, and the issue of social integration between a multitude of firms acting across more modern management and relational procurement types. When seeking to maximise the efficiency and efficacy of TMOs, Sidwell (1990) focuses on the (in)ability of teams to manage communication and coordination across large complex projects, and their lack of understanding of the range of organisational structures and their appropriate use. A fulcrum of focus then is the management of stakeholders who impact on change processes, and their understanding of the appropriate concepts and mechanisms.

3.4.2 The management of stakeholders

While some debate has existed around the definition of who constitutes a stakeholder, little disagreement is commonly found with the term encompassing any party, individual or organisation, that either affects or is affected by a process, action or operation of an organisation. Indeed the PMBOK guide (PMI, 2004) chooses to consider a stakeholder to be a party affected (positively or negatively) by a project or indeed involved within it. Mitchell et al. (1997) adds that there are primary and secondary stakeholders, with PMI (2004) identifying stakeholders as being either internal or external. A different approach can be in the mapping of stakeholders, with Newcombe (2003) doing this via two matrices, the power / predictability matrix, and the power / interest matrix. Such matrices are commonplace amongst off the shelf management guidance, and consequently fail to ever point towards efficacy or best interest.

Little literature exists around the identification of helpful others, active participants and knowledge owners, with almost all matrices and approaches seeming to involve power, such as Mitchell et al.'s (1997) stakeholder typology. Whilst power is an integral element to any change process, with much change management literature focusing on the issue, it is understandable that stakeholder power makes its way into management tools. Pessimistically, it is more likely that having a good understanding of power relations for consultancy purposes has a greater impact on repeat commissions.

Power in participatory research however takes on a different form. Identifying power, especially its negative impacts and overcoming them, is central to much of the literature (see Lewin, 1947; McNiff, 2013 and Herr and Anderson, 2014). This puts the essence of stakeholders in the delivery of infrastructure in a unique position, and merely identifying the relevant stakeholders and their impacts on infrastructure delivery will do little to impact delivery, other than to point it out. To understand those that have an effect on delivery, where they have an impact, as well as how to enhance their efficacy and working practices, begins to put stakeholders into a new perspective.

3.4.2.1 How stakeholders influence infrastructure delivery

Stakeholders exist across the delivery chain, from governmental powers and regulatory organisations, to the project team and the trainee. Broad classifications would categorise such stakeholders into the personal (boss, co-worker, family, customer etc.), the organisational (suppliers, shareholders, lenders, business partners etc.) and the environmental (government, trade associations, regulators, the public etc.). When discussing infrastructure delivery however, we are concerned with the personal decisions that lead to the structuring of delivery chains (Ling et al., 2014), inclusive of the group ones that sometimes provide more appropriate outcomes. Organisational and environmental factors then become influences (inputs) into the process as appropriate, but the essential ingredient is the agglomeration of individual decision makers, such as the adoption of relational contracting approaches being inhibited when there is a lack of top management support or drive. As decisions and actions are undertaken by the individual, either alone, in a group or via an outcome created by a decision (such as something automated), then the concern is how to manage stakeholders associated with change effectively, especially those that may not be directly involved in the actions of change processes.

3.4.2.2 How we manage stakeholders effectively

Turkulainen et al. (2015) identify how communication methods in project stakeholder management varies between impersonal, personal and group modes, depending on the nature of the project phase and the those involved. This study, again calling on prominent authors in the building of their framework, such as on projects via Pinto and Slevin (1987), stakeholder salience via Mitchell et al. (1997), the bounded rationality communication issues of March and Simon (1958) and project stakeholders as a focus via Cleland (1986), their application fails in providing an appropriate basis from which to draw conclusions as to whether certain approaches suit certain phases more than others. It does however, give some credence to the (albeit tacitly known to most) view that unplanned ad hoc informal communication works best with internal close working groups, and that formalised, structured and planned approaches work best with external

groups, especially those that hold sway over the project outcomes (such as the planning department for example).

Instead of working on conceptual tools and frameworks for the analysis and management of stakeholders as has been the norm in the literature, especially towards the front end of projects (Aaltonen et al., 2013), it is posited here that effective engagement comes from the appropriate use of tools. In essence, the preparedness to try something different, but also to work with colleagues to gain an understanding of what is needed and also what could help. Across an industry that has been largely unable to show any signs of change or improvement as a whole over the past 30+ years, it stands to reason that stakeholder management approaches could benefit from a more contingent approach, such that one is armed with informal, formal and group modes of communication, but no pre-conceived idea as to which is more appropriate in a given situation in advance.

3.4.2.3 The use of visual material in managing stakeholders

There is a growing body of literature that supports the use of visual material in the management of change, such as the Visual Literacy programme (see Dell et al., 2016 for example) for teaching professionals or the work of Eppler et al. (2011) in the creation of new business models through collaborative idea generation. The principle aim being to communicate complex ideas visually to individuals or groups in such a manner that they can input, feedback, conceptualise and in time, actualise. As an Architect, I find this an important concept with regards to change. I spent the majority of my adult education learning how to communicate a version of reality, either practical or conceptual. From seminal works such as Alexander et al.s (1977) 'A pattern language' or even the 'Principles of urban structure' by Salingaros (2005), to more conceptual examples by Koolhaas et al. (2007) in the form of 'Mutations' and a personal favourite of mine, MVRDV's (2005) rather epic tome (at over 1400 pages) 'Excursions on capacities'. Architecture is littered with works that aim to realise concepts for mass consumption.

When we consider impacting delivery practices, the extent most will be used to is process mapping, cut and paste clipart communications or some form of activity

scheduling at best. Whatever the format, the communication of ideas and principles, especially being able to compare different states, is vital to the effectiveness of change practices. One need only look at Checkland's (1981) soft systems work that builds from pictures and the successes of that to warrant the importance of visual communication in not only finding consensus, but also in challenging ideas. In a world of reports and contract terms and conditions, visual communication will be a cornerstone to this project and the actions of the researcher where appropriate. One such representation is through the medium of models.

3.5 The concept of models

Wilson (1990) highlights the importance of making the distinction between 'real world' and 'intellectual world' views of a situation. This is where one steps out and looks in on a situation and is able to make 'defensible' claims about a situation, which is important from a qualitative perspective. A researcher change agent must be able to make explicit that from vantage point X on particular construct Y, that Z is true. This brings about the situation of appropriateness opposed to correctness. One's particular vantage point cannot be supplanted onto another, but to make clear the relationship between one's vantage point and approach is to make clear and defensible the actions taken and thus the results. Consequently 'answers' or 'solutions', although hopefully shared in the most part with those to whom those results relate, are of a specific nature and could be viewed contrastingly by another. Leading to an important conclusion about the process of 'modelling', or moreover, representation of a situation under analysis. Wilson (1990, p.8) elaborates on this point insofar as:

A model is the explicit interpretation of one's understanding of a situation, or merely of one's ideas about that situation. It can be expressed in mathematics, symbols or words, but is essentially a description of entities, processes or attributes and the relationships between them. It may be prescriptive or illustrative, but above all, it must be useful.

Moving away from more constrained definitions of modelling, Wilson intentionally makes this definition broad to encompass the expanse of possible management situations that may arise. Consequently, an expansive understanding of what modelling constitutes must be appropriately capacious to be able to respond and reflect appropriately to such situations. Wilson makes a clear split in the derivation of Conceptual and Analytic models. While hard systems may be more appropriately linked with analytical type modelling, concentration is given to the formation and use of qualitative conceptual models which have four kinds of use, namely (1) as a clarification of thought on an area of concern, (2) as an illustration of a concept, (3) as an aid to defining structure and logic, and (4) as a prerequisite to design.

As one then begins to consider that the formation of positivistic world views is inadequate for the generation of knowledge about organisations as Susman and Evered (1978) suggest, one need reflect such opposed (soft) positions in their forming of organisational models, such that they view that:

- Organisations are artefacts created by human beings to serve their ends. Organisations obey laws that are affected by human purposes and actions. In this sense, they do not exist independently of human beings.
- Organisations are systems of human action in which the means and ends are guided by values.
- Empirical observation and logical reconstruction of organisational activities are not sufficient for a science of organisation because:
 - Organisations are planned according to their members' conception of the future.
 - Organisations can be understood experientially by organisational researchers so that the truth of many propositions about organisations need not be supported empirically or validated logically.
- Organisations can be legitimate objects of scientific inquiry only as single cases without considering whether such cases are subsumable under general laws.

In essence, in the study of organisation, one can model adequately the given scenario, but without inference to its relevance outside of the focus context as a matter of fact. The result is models of human and social interaction in the local sense, and thus models for the purpose of this study are taken to be a reflection of the context as described above within the setting as transcribed and translated by those concerned within the given setting. Such that those that say it is are right because it is construed that way by them in a solipsist manner, or from a point of fallibilism or even deterministically if one so believes and so forth.

In effect, if one is to model a human system of action, one needs to make clear the analytical or conceptual basis upon which it made, the positivist or realist basis from which it can be interpreted and then formulate a structure. Much as the basis of Nadler and Tushman, Kast and Rosenzweig and Lewinian type models of input, process and outputs, Naoum (2001) goes a little further by defining that such modelling need consider inputs as independent variable sub-systems that induce change, outputs as dependent variables which are acted upon in effect, and processes as intervening / moderating variables that act as conversion or transformation processes between the two. For the purpose of this work, modelling will take on the following two purposes:

- It will be used as a communication tool to explain the focus organisation that is to be changed, at the project outset and at project close. As such, that modelling exercise will be conceptual and will aid in defining structure and logic in the delivery of infrastructure; and
- The formation of a change model premised on enhancing SPM competence, utilising the concept of transformation within the organisational context.

At this juncture it becomes important to espouse the theories of change that will underpin the creation of a new change model, with the situational modelling being scenario and people specific.

3.6 Theories and models of change

When we consider the application of change management approaches, it becomes important to review the main theories that have contributed to the fields of organisational development and change management. One note here however is that while Pryor et al. (2008) break the Action Research model for change from Lewin's Model of change, Kritsonis (2005) for example focus' just on the theory. For this study, Lewin's theory is intrinsically taken to include Lewin's model and thus there is no separation here, with Action Research as an approach to problem solving addressed within the methodology section of this thesis.

Lewin's Three-Step Change Theory – Kurt Lewin introduced the three step approach in 1951, giving specific focus to the balancing forces for and against change within the workplace. This approach is predicated on three phases of unfreezing, moving and refreezing. When unfreezing one addresses the status quo and this can be done via three methods (Kritsonis, 2005). Either increase the driving forces that will move the organisation away from the status quo or decrease the opposing forces to change. Thirdly, one can combine the two by addressing change relationships with participants, or actively participating in recognizing problems. The second phase, moving, is concerned with transition of the target system towards a new state, involving either the persuading of employees to agree the status quo is not beneficial, or the encouragement of them seeing it from a fresh perspective or work together and to quest for a new resolution. The third phase, refreezing, is concerned with the sustaining of change into new behaviour through informal and formal mechanisms, as well as integrating new values into the existing set of arrangements.

Schein's extension of Lewin – Schein's expansion on Lewin's outline approach is to focus on the psychological aspects of change, such as experiencing dissatisfaction with the status quo, and needing to feel safe in order to facilitate change and moving. Schein takes the three steps a little further by segmenting the refreeze stage into two parts, namely that of self and one's relations with others. This is

about reflecting how one has responded to and implemented change in a permanent manner, but also confirming that such changes align to the new system.

Lippitt, Watson and Westley's Phases of Change Theory – In an expansion of Lewin into 7 steps, focus is more towards the responsibility of the change agent rather than the change itself. Importantly, Lippitt et al. see changes becoming more stable if they spread into neighbouring elements of the focus system, much in accordance with the systems view of change in general. The idea being that the more widespread the imitation of change becomes, the more such change will be considered normal.

Prochaska and DiClemente's Change Theory (transtheoretical) – Concerned more with changes in health behaviour from a medical perspective, it has however experienced usage beyond that context. Focusing on a more spiral form of development rather than a linear process due to persons relapsing on progression, the stages move across pre-contemplation, contemplation, preparation, action and then maintenance of those actions. The model allows for participants to leave and re-address the contemplation phase repeatedly for example, making this model more of a framework for realisation than planned action.

Social Cognitive Theory – Suggests that the implementation of new behaviour, while predicated on some form of learning, is in fact based on observing that new behaviour in action. In many ways, lead by doing. This requires for there to be a positive outweighing of the behaviour over its negative aspects for people to follow suit. A number of types of processes are proposed that either aim to change or modify behaviour, but the aim is generally to set expectations that are attainable.

Reasoned Action and Planned Behaviour Theory – It is postulated that there is a differentiation between an individual's desire towards enactment of a particular behaviour, specifically how positive they feel towards it, and the impact of environmental variables. Perceived control over the opportunities, resources and

skills necessary to perform a desired future state is important from a change perspective, similarly, a link to the idea of self-efficacy is important here. Not only in terms of how much I want to, but how much I can do.

Socio-Technical Systems (STS) – Focusing on participation as a core value to the implementation of successful change, especially the design of the outcome, the STS approach suggests one needs to understand the social and technical elements of any process or change programme. Essentially, the focus is on joint optimisation (primarily of ‘work’), rather than in isolation of either, with the premise being that improvements in one area will be under-utilised if not understood or amalgamated with change in the other. Building on basic systems principles of holism and reciprocity, this approach begins to suggest that success of one element can only be viewed in light of the whole in response to unique influence factors from the environment, as well as organisationally both technically and socially.

Kotter’s Eight Steps – This eight step model primarily focuses on the strategic aspects of decision making. By changing the vision for example, the aim is consequently to transform the rest of the organisation. This model centres on the rationale for change and its communication to be effective. The 8 steps are often communicated as being concerned with three distinct phases of change, action and communication as follows:

- Phase 1 - Creating a climate for change includes:
 - Step 1 – establishing a sense of urgency
 - Step 2 – creating the guiding coalition
 - Step 3 – developing a change vision
- Phase 2 – Engage and enable the whole organisation:
 - Step 4 – communicate the vision for buy-in
 - Step 5 – empower broad based action
 - Step 6 – generate short-term wins
- Phase 3 – Implement and sustain change:
 - Step 7 – Never let-up

- Step 8 – Incorporate change into the culture

Kanter et al.'s Ten Commandments – In suggesting that the typical three phase Lewin model is too simplistic, Kanter et al. (1992) suggest a change model that addresses organisations as in fact being unstable, and that the Lewin model is predicated on the stability of organisations. The model is akin to that of Kotter in defining a shared vision and aligning political sponsorship, but is much more concerned with dictated change. Its inclusion of an analysing phase is of note compared to Kotter, but the manner in which the change is defined and implemented is glossed over in favour of dictatorial direction forming.

Luecke's Seven Steps – Another prominent proponent of the emergent school of change management, Luecke's model has commonality with the work of Kanter and Kotter, but suggests that sustained change is more about an element of reflection on the outcomes of change and their efficacy. Rather than change being the aim, the focus here is on the implementation of something new, followed by measuring and modifying that strategy once in place.

Senge's Fifth Discipline – Contrastingly to Luecke, outlined in 1990, Peter Senge presented that we are all learning individuals, with the aim of any change being to enhance an individual's ability to change themselves and by proxy build the learning organisation. He premised this view on the use of five disciplines, inclusive of systems thinking (the integrative fifth discipline), personal mastery, mental models, building shared visions and team learning. It is via development and focus within these elements that competence is enhanced via generative learning where the organisation is continually building towards a future state.

3.6.1 Critical analysis of change models and theories

It is posited here that the change models above largely find commonality with the Three Phases of Lewin. While some align more with a strategic top down approach (Kotter and Kanter et al.), or more behavioural level approaches (Social Cognitive Theory and Senge), you can in fact present them within a framework of Lewin. They all in some fashion

address the situation as is, with a view to either creating something new or changing it, and then ensuring that a modification endures. There is no doubt that some models attend more to change readiness (Senge and Kanter et al.) than a change process (Kotter and Luecke), but the idea of those being subsets of a wider change approach best outlined by Lewin is argued here. With concern given to an improvement in practice predicated on an enhancement of Strategic Procurement Management Competence (see Chapter 4), the Lewin approach sets the research 'terms', with a differing 'application' framework being required. This then asks, which of the change methods best outlines a reasoned approach to the research issue and represents an appropriate application. Primarily, which focuses on the improvement of understanding between social structures (professionals) and the practical (procurement) constructs they utilise?

To put this into context, Prochaska and DiClemente's single person view is predicated on sole change, rather than more wholesale practice change. Its application in a business setting is therefore inappropriate and unsuitable, if nothing more than because its method allows one to leave the change process whenever one wishes to. In essence, suggesting the change itself is not particularly worthwhile, but the realisation of something to address is. Thus the ability to constantly re-address the contemplation phase and not actually 'do' anything. An issue with Social Cognitive Theory for example, is its focus on behavioural change, specifically aligning to something 'dictated', rather than collaboratively formed. This provides an element of guidance rather than creation, and also predicates the focus being on change itself, rather than change towards something competence, process or skill based.

Conversely, the Kotter model, whilst lauded in many management circles for its impact, its use can be easily blurred and fail to embed within the organisation. The approach, which heavily draws from a Lewinian view of planned change, instead focuses on a top down level approach, an area more appropriate for high fee income creation for consultancies (potentially) and therefore unsurprisingly apt in application and championing. By relying on 'telling' rather than creating, the Kotter approach suggests that the top down view has all the necessary know-how and knowledge to impact and develop the change appropriately. In essence, do something because the CEO says so.

And while that is appropriate for direction setting for example, how such actions and attitudes are translated into activity is where this high level management consultancy approach has fallen short. Kanter et al.s (1992) view that the Lewin model is predicated on the stability of organisations is challenged here also, insofar as it typically focused on smaller units, and while lauded in such smaller situations, it still presents a framework through which to address diagnosis in other scenarios. The Kanter et al. view, somewhat similarly to that of Kotter, avoids complementing Lewin but with a strategic focus, and instead aims to supplant Lewin while only focusing strategically, or top down. It is therefore akin to Kotter in this regard, which is by proxy akin to Lewin, and thus their rejection of the Lewin approach is somewhat short sighted.

The Socio-Technical Systems school of thought however, focuses on the improvement of work, not the implementation of either behavioural change or a strategic vision in isolation. The focus here is the improvement of the action and the resultant outputs / outcomes. This is more advanced in application than Luecke for example, and suggests that one be armed with Senge's five disciplines rather than attempt to use them as a change approach. Furthermore, the socio-technical approach is born from the Lewinian body of knowledge and as the centre of this study is premised on how to change an ICO, the framework begins to lend itself towards a three step approach process (research approach), while applying socio-technical principles of joint optimisation (for intervention), only requires an appropriate definition of theory to be applied (see Chapter 4) prior to action.

Representing the start-middle-end of a process (the activity elements of this participatory study), the culmination of this process is where we would communicate to others that we indeed enacted some form of change, and that an impact of whatever degree can be related to this project. The methodology sections will deal with this topic in more depth, specifically in what manner such an approach has relevance to academic endeavour. At this juncture, the application of a strategic approach towards the delivery of infrastructure will be explored, specifically the manner in which this project will aim to intervene within the focus ICO to improve the delivery of infrastructure. This will be done within an application framework of Socio-Technical Systems (STS).

3.7 Socio-Technical Systems

Pasmore (2006) presents that the study of the workplace through the socio-technical school amalgamated the work of Kurt Lewin (1951) and action research, with Bion's theories on leaderless groups and von Bertalanffy's work on systems thinking to focus on organisational effectiveness. Lewin's early work had been enhanced by Coch and French (1948) as they showed that participation was a core tenet of reducing organisational change resistance. This work, building on that of Alex Bevalas with Alfred Marrow's Harwood manufacturing (Bradbury et al., 2008) showed that participation and the learning organisation of today, encompassing the involvement of workers into practice design showed that larger improvements could be made in performance.

As Lewin's (1951) field theory presented (flying in the face of Freudian psychology) that behaviour can be influenced by environment, the underlying principle came to bear that one could change behaviour through environmental modification opposed to focus on the individual (Bradbury et al., 2008). This core tenet would come to bear as Eric Trist (who would join the Tavistock Institute) met Kurt Lewin in 1933, and having been greatly influenced by Lewin (Pasmore, 2006) would later seek to focus his future activities around a Lewinian type concern where one seeks to abridge academia and practice rather than be a captive of either (Bradbury et al., 2008).

3.7.1 The Tavistock Institute and the origin of Socio-Technical Systems (STS)

While early work of the Tavistock Institute would focus on utilising a framework of Action Research with mixed success (Bradbury et al., 2008), the concern continued to focus on the use of practical interventions to address organisational issues. A core piece of work undertaken by Trist and Bamforth (1951) into mining practices would however provide grounding for the future formation of the STS approach. In understanding the differences between high and low performing mines, Trist and Bamforth identified that in highly productive mines, leaders turned to their staff opposed to implementation of the technical guidance. Lower productivity mines concentrated on taylorist driven technical specifications and so forth that did not take into account mine specificities amongst other things.

A key element was that highly productive mines promoted multi-skilled and self-directing practices in opposition to (the low performing) job specialisation of the other mines; making it far easier in the multi-skilled scenarios to adjust to changing dynamics and environmental conditions (Bradbury et al., 2008). Furthermore, whilst performance was higher due to these differences, the social system was also differentiated between the two performance extremes as workers felt detracted, powerless and separate from the system there were involved with in the low performing mines opposed to high levels of ownership, responsibility and control in the high performing situations. The result of this was the underlying focus of STS that the social and technical systems of operation are inextricably linked with performance and are thus interdependent. This joint optimisation principle whereby one assesses and considers the whole view and the attainment of optimisation between the two (Fox, 1995), opposed to optimisation in isolation would become the foundation of the STS theory.

3.7.2 The application of STS

Trist (1981) presents that the analysis of STS is conducted at three levels of analysis:

- The Primary Work System: concerned with the design and orientation of activities that make up a 'whole' piece of meaningful work within an organisation;
- The Whole Organisational System: and the definition of all its constituent parts, from location to vision and size; and
- The Macrosocial System: and the relationship between them, such as an organisation's interrelationship with customers, markets and regulators etc.

Fox (1995) highlights that the formation of an organisation's general management system should consider the adjoining organisational systems and environment if one is to be effective. Indeed in the designing of work, one should consider its organising to be compatible with the organisation's objectives, leading often toward the deployment of participative approaches involving employees. Furthermore, one only defines the features that are specifically required for task implementation, leaving situational specificities, both technical and social, to be managed accordingly in a contingent

fashion. Fox (1995) presents that the success of the STS approach comes from its reliance on a structured process involving a systems scan, a technical analysis, a social analysis, and a quality of working life consideration. In effect, what is it and where does it operate, what are the two systems and how will they work together and jointly optimise.

Applebaum (1997) presents that in order to analyse or diagnose the STS, or more aptly form intervention strategies, one can build on the six question themes presented by Zobrist and Enggist (1984). More recently, we can see the development of STS analysis by Davis et al. (2014) in their representation of the interrelated STS hexagon of analysis for the organisational system embedded within an external environment; with the external environment consisting of regulatory frameworks, stakeholders, and financial and economic circumstances. A comparison of which is presented in Table 3.1.

| Zobrist and Enggist (1984) | Davis et al. (2014) |
|------------------------------|--|
| Environment | <i>Culture</i> |
| Goals / tasks | Goals |
| Structures | <i>Buildings / infrastructure</i> |
| Leadership procedures | <i>Processes / procedures</i> |
| People | People |
| Technologies | Technology |

Table 3.1 - Differences in Socio-technical approach descriptions

(Source - Author)

STS analysis as presented by Davis et al. (2014) has a relationship with the Leeds University Socio Technical Centre. Building on Clegg’s (2000) Socio-technical principles for systems design and other work, notably culminating in the 2009 formation of the ‘hexagon’ (without the external environment reference added in 2014) by Challenger et

al. (2009) for the study of crowd behaviour. Importantly for the study of infrastructure in the UK, this focus on environmental scanning, with social and technical analysis, coupled with the application of the Challenger et al. hexagon is fundamental to Infrastructure UK's (IUK) IPR (HM Treasury, 2013). A major contributor to this work was the University of Leeds. Within the IUK IPR the socio technical hexagon is used to assess and highlight organisational complexity issues, while again, the IUK IPR hexagon differs in terms of make-up, and is again modified through the work of Hagan et al. (2011), as highlighted below:

| Zobrist and Enggist (1984) | Davis et al. (2014) & Challenger et al. (2009) | IUK IPR (2013) | Hagan et al. 2011 |
|------------------------------|--|--|--------------------------|
| Environment | Culture | Culture | Decision - making |
| Goals / tasks | Goals | Goals / Visions / Values | Goals |
| Structures | Buildings infrastructure | / Work organisation & practices | Resource |
| Leadership procedures | Processes procedures | / Processes procedures | / Process |
| People | People | People | People |
| Technologies | Technology | Technology / assets | Product |

Table 3.2 - Further differences in Socio-technical approach descriptions

(Source - Author)

3.7.3 Socio-technical modelling for change

Espousal of the STS framework can in fact be traced back to the work of Bridger (1977) and his STS 'pentagram' that built on the work of Leavitt's Diamond (1965). Bridger's model, drawing on the foundational principles of von Bertalanffy's General Systems Theory, is seen by Leonard et al. (2013) as the only articulated model of the STS to be formed from the pioneering work of the Tavistock Institute. Importantly, there are two key characteristics of these STS models, so far as they distinguish between organisation and environment via a semi-permeable boundary, and that interaction across STS elements is done via some form of optimizing / balancing managerial activity. Modelling organisations in this manner depicts them as open systems, subject to energy, information, people and resource transfer. Furthermore, the socio-technical school is premised on the idea of integrated sub-systems of organisation, and is thus responsive to systemic management over systematic processes. Such that something systemic considers the whole and the integration of processes, whilst something systematic is linear, closed and predictable, and by proxy cannot be complex.

If one considers open systems in respect of Nadler and Tushman's (1977) congruence perspective, such a model of the open system defines the 'process' element and would be the focal point for any activity. Kast and Rosenzweig (1985) take this a little further in defining such a socio-technical model as the organisational system itself (Figure 3B). In essence, the organisation under study is the transformation system (Naoum, 2001) and responds to independent variables from the environment as inputs, and pushes back following transformative actions on dependent variables in the form of outputs.

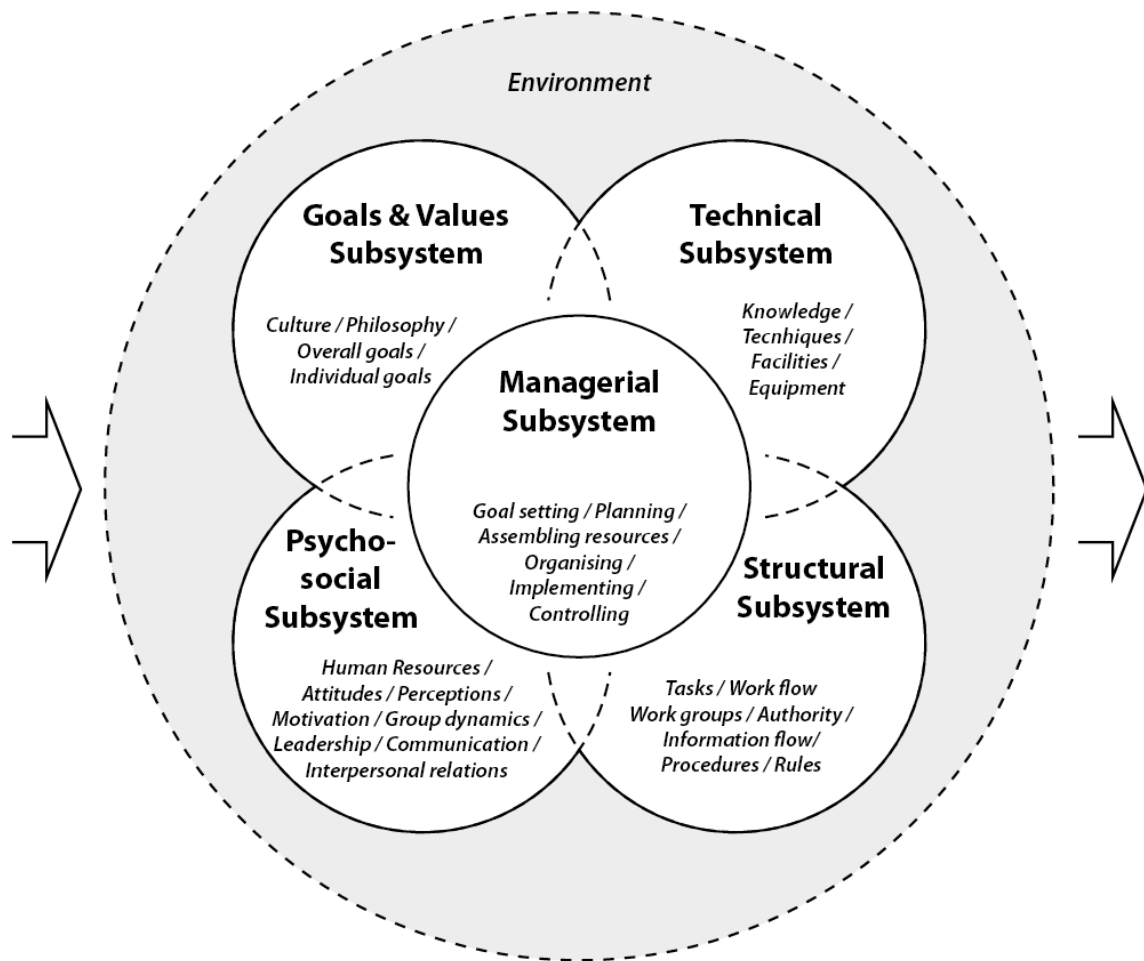


Figure 3B – The Organisational System

(Source - Adapted from Kast and Rosenzweig, 1985)

A rationale for refocusing on Kast and Rosenzweig’s (1985) development of the foundational work of Bridger for example, is the manner in which STS espousals by Davis and Challenger etc. have failed to clarify the importance of the managerial subsystem. In constant flux, essentially responding to ever changing variables, this is the focal area that would bring technical and social elements together to create a jointly optimised and effective delivery environment. The managerial subsystem essentially owns this process, and this is the rationale for going back to ‘first principles’ here in the building of an associated change model. A further rationale for building on Kast and Rosenzweig rather than Bridger however, is the manner in which Bridger separates out leadership procedures. In principle, the models are largely the same otherwise, but the researcher

considers leadership an integral part of both the managerial and goals & values subsystems, not something standalone.

3.7.4 The premise of Socio-technical application

An additional feature of applying a socio technical approach to organisational intervention is understanding the nature of the organisation. In effect, the manner in which it transforms inputs into outputs. As we are intrinsically concerned with change within a social setting, specifically amongst people, a change approach needs to consider the nature of the industry (or technology) that is under study, and the corresponding social structures. In 1984, Charles Perrow investigated the near meltdown of the Three Mile Island nuclear facility, he challenged the management belief that there was a universal way to structure effective organisations. An important contributory study to contingency theory, he proposed that technology was an important basis from which organisations could form effective structures. Whilst somewhat structurally deterministic, the basic premise of Perrow's work serves as a useful guide for the analysis of organisations and their respective delivery environments. His four technology typologies were based on two variables of interaction and coupling. Interaction ranges from linear to complex and denotes the extent and nature of working relationships, while coupling outlines the nature of the organisations involved and the associated working relationships. His four typologies were:

- *Routine* - characterised by a lack of exceptions and a depth of comprehension. Examples include traditional manufacturing technologies such as assembly lines;
- *Craft* - characterised by a lack of exceptions and unpredictable outcomes with poor comprehension. Examples include construction work that demands the creation of new designs to resolve unique issues;
- *Engineering* - characterised by many exceptions and its depth of comprehension. Examples include standard and accepted working methods, such as accounting, laboratory technicians and many engineers or analysts; and

- Non-Routine - characterised by many exceptions and poor comprehension. Problems may appear frequently with no existing solutions. Examples include commercial space flight or the Large Hadron Collider at Cern.

3.7.5 Using STS to improve the delivery of infrastructure

As initially touched upon above, the Leeds foundation of STS is easily traceable into infrastructure delivery through the IUK IPR (2013), but also through the work of Hagan et al. (2011, 2012) for example. Other vantage points such as Ogwu and Kumaraswamy (2007) and Farber and Pietrucha (2014) for example are relevant to the study of infrastructure, but also the work of authors in alternative study areas such as Baxter and Sommerville (2011) in systems integration and development, Ottens et al. (2006) in modelling intelligent transportation systems, and Pahl-Wostl (2007) in the management of transitions. What is presented here is an insight into the use of STS in the study of infrastructure delivery, highlighting the need to go further into the management of change within ICOs from an STS perspective.

In an attempt to address deficiencies within the delivery of UK infrastructure, IUK (Infrastructure UK, a department within HM Treasury) was formed to investigate the delivery of UK infrastructure and in 2013, formed the initial IPR - a guide to improving delivery capability via engagement with infrastructure clients, the wider industry and academics. Primarily aimed at large scale sponsors and ICOs, the IPR aims to help clarify and identify required improvements in strategic delivery. Containing a series of assessments focusing on capability and complexity, inclusive of a 'Socio-Technical assessment', the process is intended to take up to 8 weeks and aims to work with key stakeholders via workshops and individual interviews to identify levels of competency and understanding of delivery to aid an organisation frame a strategy.

The IPR is helpful in identifying gaps and understanding barriers, especially with regard to a more strategic approach to procurement, as expressed by its high profile case studies, but is by no means complete. A more specific and dedicated set of tools to suit each sector might be more appropriate as a 'next step', but as an initial assessment, the IPR is helpful in forming a comparison and gap analysis if nothing else, especially around

the ability to understand an organisations capabilities to deliver the works ahead. It thus essentially serves as a capability / maturity checklist, replacing silo vantage points with a rational and objective system that realistically positions an organisation.

Fast forward to 2014, and following a series of test cases using the IPR in industry (collaborating between IUK, the University of Leeds and the Infrastructure Client Group), IUK published the Project Initiation Routemap (PIR) for 'Improving Infrastructure Delivery'. A more finalised version of the IPR, the PIR comes with a suite of additional modules that begin to focus on requirements, governance, execution strategy, organisational design & development and procurement. Following a similar process to the IPR, the PIR suggests a procurer should assess complexity and capability, and then align for success, in essence, an abridged STS approach. As with the IPR, the PIR fails to present how one might actually put the observations into practice, or present a rationale for why and how the embedded tools will present relevance to most ICOs. Furthermore, future reports (such as the Improving Infrastructure Delivery: Alliancing Best Practice in Infrastructure Delivery report (2014a)) point towards a general proclivity of IUK guidance being akin to barefoot empiricist principles. Thus, whilst an important piece of work, it can be argued that the PIR suite fails to address the 'how' of implementing change within open systems, or address the nature of MPEs. Little attention is drawn toward TMOs (although one could claim the governance module relates to this body of knowledge), and there is an underlying ideology from the whole exercise, beginning with the IPR, then the IPR and then the more recent Alliancing advice, that the focus is on collaboration as a goal, rather than an appropriate means.

Hagan et al. (2011) in the study of complex projects within MPEs consider the role of the contractor in the successful delivery of projects and present the concept of maximizing the effectiveness of organisations through STS. A number of themes (and their factors) are then integrated into a socio-technical framework of inter-related factors. A key issue of this framework is the analysis of 'live' projects and their interaction from an operational delivery perspective. In effect, it identifies what is affecting the delivery of projects and the fact that multiple projects (singular) exist across a multi-disciplined and multi project delivery environment.

Hagan et al. (2012) then develop their 2011 framework through a pilot case study and 21 expert interviews. From the interviews, the main feedback concentrated on the identification of risk and organisational culture, topics deemed by the authors to be covered throughout the original framework. The case study of a major construction contractor identified the applicability and validity of the STS approach toward interpreting the complex project environment. In revising their original framework in response to their data collection phase, they identify that risk needed to be espoused as spanning across all six inter-related factors of people, process, resource, goals, product and decision-making of their original socio-technical model. Indeed one of their interviewee's identified that 'complexity drives risk which is also at the heart of each factor of complexity'.

A key output of this piece of work is highlighting the value of the STS approach towards assessing complex delivery within a MPE. In moving away from the single project paradigm, and by viewing projects as part of a wider system, the management of both social and technical project aspects facilitates fruitful efficacy. The work however does not address application or competence in delivery, it fails to address the interplay between some of the components identified, such as goal definition and its impact, or the appropriate usage of procurement routes and their influence on the makeup of this environment, especially with regard to desired aims and economy across the delivery chain.

In a slight divergence, Ogwu and Kumaraswamy (2007) utilise the STS approach in identifying the critical success factors in ICT project deployment in the AEC (architecture, engineering and construction) sector. Whilst they develop their approach into the study and application of complex adaptive systems, building on previous studies, they assert that those organisations that hold onto neo-mechanistic models and theories of scientific human resource management (such as Taylorism) are more likely to experience higher failure rates in the (present day) knowledge economy.

The key concern here is the identification of appropriate management approaches to help mitigate against (likely contingent) project risks, not merely implement a

standardised approach to all scenarios. Again, the authors highlight that the STS approach can aid in the study of projects, and that understanding the interplay between social and technical aspects facilitates effective delivery environments. Similarly, Baxter and Sommerville (2011) assert that it is widely acknowledged that the STS approach to systems development 'leads to systems that are more acceptable to end users and deliver better value to stakeholders'.

Faber and Pietrucha (2014) consider STS in their analysis of interdependent infrastructures at a regional level. So if one were able to identify that the work of Hagan et al. (2011, 2012) were operating at a meso-system level, then the work of Faber and Pietrucha (2014) is more a 'level-up' at the exo-system level, looking at the 'system of systems' vantage point, but working with individuals at the micro-system level (the people themselves but as a group). Their work focused on identifying potential research projects and STS represented an important framework from which to identify project interdependencies and to better make decisions on 'wicked' problems.

What this review has highlighted is that the study and use of STS in the delivery of projects and consequently infrastructure is a fruitful field of study, while there is a gap in knowledge between the identification of issues affecting the delivery environment and the study of how to change and improve that delivery environment.

3.8 Addressing ICO delivery competence as a focus for study

The reductionist method, focusing on items in isolation (and subsequently connected singularly), has been the predominant, almost dogmatist, problem solving methodology in western society to date (Leonard and Beer, 1994). This cause and effect view of the world has been more than successful in providing many of the answers and descriptions of our natural world, but such thinking has struggled to see such fruitful returns in the social domain, especially within the inherently temporary and complex world within which projects exist. A heralded method of dealing with complex organisational scenarios however has been the systems approach (Amagoh, 2008; Kast and

Rosenzweig, 1972; Katz and Kahn, 1966; Checkland, 1981; Weiss 2007; Potts et al. 2015b).

A key component of the systems approach is that it considers the holistic picture and the whole array of interdependencies and interrelationships that make up the greater organisational whole, especially through the identification (and modification) of emergent properties. Leonard and Beer (1994) present that the systems approach does not focus on 'parts' under the assumption that stitching them back together will result in the same outcome, but instead on 'wholes', in a highly contextually specific configuration and with more cyclical type causality relationships. As project complexity in the construction industry has been born of the wider fragmentation of the industry (Gidado, 1996; Wood and Ashton, 2010; Potts et al. 2015a), the systems approach represents an appropriate lens through which to study and optimise the ICO.

It now becomes important to consider the operational components through which one economises. In procurement and delivery, as highlighted, this can be summated as taking a strategic approach, differentiating one from taking a tactical approach (Emmett and Crocker, 2008; Potts et al., 2016). Watermeyer (2012) considers that a strategic approach to infrastructure delivery spans the planning and management of the wider delivery process. According to Johnson et al. (2008), strategy is characteristically the direction of scope an organisation takes over the long term, achieving advantage through its configuration of resources within a changing environment to meet the needs of markets and stakeholder expectations. A strategic approach is thus concerned with the maximisation of an organisation's market presence to leverage long term value from its supply chains. A strategic approach to construction procurement is in effect, the linkage between a businesses' strategic goals and the contingent operational reality that faces them (Cox and Townsend, 1998). The issue however, such as with the work of Eriksson and Westerberg (2011) or that of Eriksson and Nilsson (2008), is that work in the procurement field is yet to consider strategic decision making, or tiers of strategy, or at least, the effects of a sourcing strategy, and how such variables may in fact create an amalgam between the competitive, coepetitive and cooperative elements of procurement procedures.

Decision makers are embedded in the decision making environment, not detached from it and thus strategies emerge from learning and compromise rather than grandstanding (Kochan et al., 1984). Strategic decision making is focused on long term implications for firms in terms of market structure, focusing on capacity and product characteristics for example, with tactical decisions representing more short term price or output foci (Emmett and Crocker, 2008; Potts et al., 2016). Historically, delivery practices within the construction industry were concerned with singular transactions between buyers and sellers to suit the needs of specific projects (Arbulu and Tommelein, 2002). This led to the forming of boundary definitions between firms through specialisation (Dubois and Gadde, 2002), in turn leading to the wider fragmentation of the construction industry and its supply chains as a whole.

Previously, construction organisations sought to organise through the definition of internal boundaries based on functional specialism. This began to change as construction and engineering firms sought to integrate both internally and externally to economise and streamline processes and first tier supplier access. The modern result of this is the step beyond integration between a smaller number of firms and into the wider adoption of a Supply Chain Management (SCM) approach (Arbulu and Tommelein 2002). It is important to note however that Cox (1996) argues that the *raison d'être* of the firm is to make profit (a margin), and that many researchers have focused on defining supply chain structures in terms of relationships (being the goal) rather than their fit for purpose nature.

In the study of organisations, Kast and Rosenzweig (1972) identify three levels of study when considering effectiveness, namely the organisational environment (within which it is located), the social organisation of the system itself and the people focused subsystems operating within the wider system structure. One prevalent issue here is the focus on 'effectiveness' and its linkage to an external vantage point, with 'efficiency' focusing on more controllable internal economic and technical activities (Katz and Kahn, 1966). It is therefore relevant to break down focus into the effectiveness of an organisation's external relationships in modification of its environment, something achieved through strategic management and the efficiency of its internal processes at

achieving organisational goals, achieved through the application of the systems approach.

Improving organisational efficiency is a major rationale for the participation of the private sector in water supply, with the underlying idea that a drive toward profit making within a competitive market place would lead to operational streamlining. The aim of initiatives such as privatisation focused on raising competitiveness through the use of lean supply, partnership, network sourcing and outsourcing methods (Lamming and Cox, 1995; Cox et al., 1999). Cox et al. (1999) argue that following privatisation, efficiency gains may depend upon the effectiveness of state regulation, with monopoly supply, highly regulated state owned enterprise considered the least satisfactory structure from an economic viewpoint. Changing the ownership to private however, only intermediary improvements are achieved (Cox et al. 1996), with such issues prevalent within the UK water sector.

As a more entrepreneurial managerial approach is considered necessary for firms of all sizes to prosper in a competitive environment, the modification of organisational behaviour and attitudes becomes paramount when considering organisational efficiency. Daft (2009) identifies that organisations are social entities, goal oriented and designed (deliberately) in connection with their external environment. Consequently, Martin and Parker (2003) identify a variance of organisational characteristics between public and private organisations in terms of management, employment, internal architecture, nature and location of the business, mission and goals and internal communications. One key component would be 'reactive' public management styles versus 'pro-active' private sector management. As a strategic approach is concerned with leveraging long term value, it can be concluded that a pro-active approach is a subservient requirement of one's' strategic aims when considering procurement as a scientific discipline (Cox, 1996).

Dobler and Burt (1996) assert that there is a transition underway from a transactional to a supply chain management approach, focusing on value-added benefits instead of internal process, and strategic management instead of tactical approaches. What this

allows us to ascertain is that one must consider the pro-active strategic management of one's delivery organisation in order to achieve the intended efficiencies and reforms under which the industry was privatised.

When considering a strategic approach, a key component is the focus on goals and goal setting. Martin and Parker (2003) present that market (private) oriented goals focus on commercial, consumer oriented, adaptable, market priced and output/outcome focused principles. To achieve such goals, one must consider that Mahoney and Weitzel (1969) give reference to the use of efficiency as a determinate criteria for the assessment of organisational effectiveness, and thus the efficient achievement of one's organisational goals can be said to be effective. With such high level goals defined by the focus ICO as a 65% reduction in project concept phases, 40% quicker overall delivery times, 20% CAPEX reduction and a 0% OPEX increase, the successful delivery of infrastructure is thus concerned with managing organisational transitions toward achieving such goals in as efficient a manner as possible.

The aforementioned transition is the fulcrum of this project, the move from a reactive tactical organisation towards one that is strategic, customer engaged, market effective and process efficient. The identification of the appropriate vehicle through which to do this however is both missing in the body of literature, as well as an appropriate definition of the associated competencies required to do so. This therefore represents the core of the problem discussed in the previous sections.

3.9 Chapter summary and linkages

What this chapter has presented is both the nature of the project organisation responsible for infrastructure delivery, but also the complexity such structures aim to mitigate. The issue however is the level of delivery competency within ICOs responsible, and their ability to transition from one state to another. This chapter has identified STS as a vehicle through which to facilitate this, but the need to both define the extent and nature of SPM competency, and the change process through which one can facilitate an

increase in efficiency requires espousal and is consequently dealt with in the following chapters. It is anticipated that readers at this point understand the context within which infrastructure services exist, the management processes that add, modify, maintain and remove elements of that service, the wider nature of delivery, the organisation and the vehicles through which one can affect change within such organisations. To then lead from this understanding, the following two sections primarily address:

- Defining the nature of **Strategic Procurement Management Competence** currently lacking definition within the literature as a theory upon which to improve the effectiveness of ICO infrastructure delivery practices; and
- The creation of a **Strategic Change Model** predicated on **Socio Technical Systems** as a vehicle through which to jointly optimise social and technical aspects of ICO delivery processes to facilitate efficient infrastructure delivery.

Following this, the thesis will move towards defining the manner in which one intervenes as part of a knowledge creation strategy for the purposes of a PhD, and then onto the activity elements of this study.

CHAPTER 4 STRATEGIC PROCUREMENT MANAGEMENT COMPETENCE AND THE CONCEPT OF THE STRATEGIC CHANGE MODEL

4.1 Chapter introduction

The following chapter represents the authors' attempt to respond to the issues highlighted within the previous chapters. The primary aim being to formulate (and communicate) a direction of travel for the study in conducting action in the real world. Chapter 5 deals with how such efforts relate to the provision of knowledge in the context of research, at this juncture however, and pursuant to the study aims, this chapter primarily addresses:

- A framework for Strategic Procurement Management Competence;
- A continuum of Strategic Procurement Management;
- The five principles of Strategic Procurement Management Competence;
- The concept of the Strategic Change Model and a rationale for intervention;
- The emergence of the Three Phase Change Approach (TPCA); and
- The managerial subsystem as a focus for competence.

This chapter represents an espousal of the theory to be adopted 'in action', the nature of the model applied 'in action' and in an abstract sense, the contributions to knowledge that are 'tested' in the real world. The nature of this project somewhat differs from this expression however, so the term test is used in a very loose manner purposefully. It is envisaged that at the end of this chapter, readers will appreciate what separates the researcher from the research context, what was 'applied' to the context, irrespective of participatory action, and the nature of the content being left behind in terms of research. It is important therefore that readers prepare to refer back to this chapter at later stages in the thesis to recap on that which was 'applied' versus that which was

'created' with participants, as this has a significant bearing on the warrantable assertions discussed in Chapter 7.

4.2 Addressing competence as a response to the need to change, and operational reality in delivery

Strategic Procurement Management Competence (SPMC) as a concept is presented here to largely respond to two issues, the need for ICOs to improve delivery practices and thus approach their delivery environment strategically, and the concept of why such practices have manifested in the first instance, and thus what SPMC as a concept must overcome.

The first of these issues is the need to change. Cox and Townsend (1998) argue that short-term operational drivers force practitioners into a corner whereby they simply don't have the time to think about first principles (inputs / strategy etc.). Instead, they search for quick fixes proved in other situations, by other successful organisations and seek to merely apply those solutions to their own circumstances in a bid to solve their own problems. While benchmarking is not a complete wrong, by its very nature, benchmarking negates the drive to seek sustainable business success. By this, the authors argue that benchmarking as a norm seeks to catch up to others with superior performance by replicating their processes. The essence of the argument in support of benchmarking avoidance for change, is that the replication of another's strategy or the mere use of 'how they did it', risks not understanding the reasons why particular processes were appropriate, or indeed implemented in light of the specific reasons facing the organisation / company being copied.

The effect is twofold, an organisation may either implement appropriate practices but fail to understand their underlying assumptions and thus be unable to mitigate changes in circumstances. On the other hand, the practices may be wholly inappropriate for the given situation (being copied into) and thus be no longer relevant. Either way, one can become locked into outdated approaches in delivery. Cox and Townsend add that reactive procurement strategies are born from low alignment to delivery practices and a

low change force, with the opposite being true of strategic procurement competence and a proactive approach towards delivery.

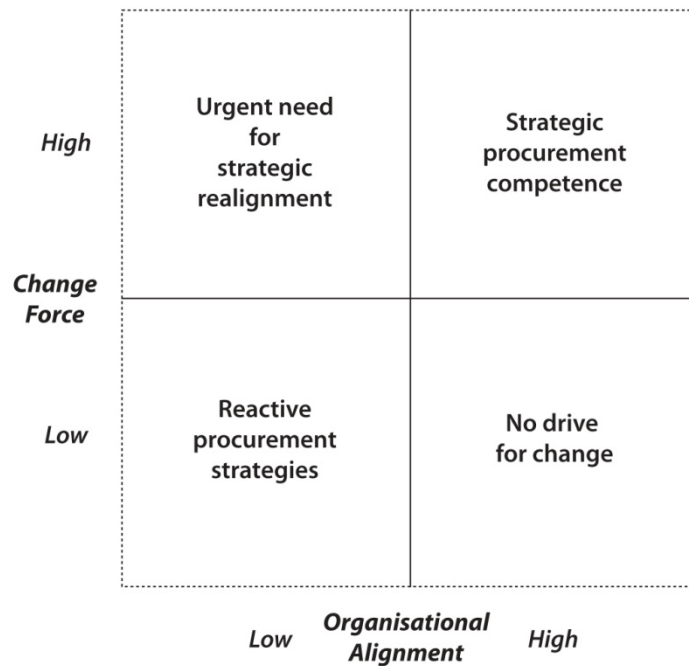


Figure 4A - The need for change and the organisational response

(Source - Adapted from Cox and Townsend, 1998)

The issue is thus that in focusing on SPMC and the enhancing of delivery practices within ICOs, one needs to address and stimulate both change forces and associated organisational alignment. Green and Lenard (1999, p.51) observe that:

The most problematic areas in the procurement process lie at the interfaces between organisations at different stages of the construction supply chainthe interface that remains most problematic, and the least managed, is that which exists between client’s organisation and the project.

The concern however is that traditional approaches toward these boundaries are embedded within the industry, and the underutilisation of strategic approaches can be said to be linked to the concept of reverting to type, or more aptly, the normalisation of

deviance in complex delivery, the second issue of concern here. A term originally coined by sociologist Diane Vaughan (2004) in her study of the events leading up to the NASA Challenger disaster, the normalisation of deviance as a concept is equally valid to the construction industry, especially with regard to changing it. The concept is predicated on the basis that counter-productive behaviour within organisations becomes normal, or is so hidden, that actors believe it to be normal (Pinto, 2014). A prominent concept within medical care for example (see Banja, 2010), where approved patient care principles are supplanted by workarounds whereby unfavourable outcomes are consequently blamed on other influences rather than the initial deviance, the more recent Costa Concordia cruise ship crash in 2012 represents the idea well. The cruise line's Directors were fully aware, and even promoted the deviation from approved courses to go closer to local islands as part of a ship salute, a sort of unofficial marketing ploy. In essence, there was nothing wrong with the deviation to the point where it became the norm.

The relevance of this argument here, and for construction / delivery activity in general, is the industry's proclivity towards cost over-runs, defects, disputes, single project approaches and more traditional / adversarial behaviour. It has happened for so long that taking such incidents into account and mitigating them, rather than solving the source of the problem is the norm. While opportunism is commonplace in large projects or contracts in general, Pinto (2014) discusses how a wide array of issues within construction can be understood by the concept, specifically the manner in which they continue to take place, such as via strategic misinterpretation, principal - agent problems, client / contractor relationships, and planning and scheduling dynamics across projects.

The deviance concept across such factors is interesting, because from a change management perspective, the extent to which approaches to procurement deal with such normalised situations, especially if one considers barefoot empiricism, then a strategic approach to complex delivery represents a significant step change. Potentially, to the extent that those 'in delivery' would look upon such shifts as either counter-productive or counter-intuitive. The issue is then to challenge such embedded deviances, and for the purposes of this work, this is via a framework of SPMC.

4.2.1 A framework for strategic procurement management competence

The delivery of infrastructure is beset by uncertainty and complexity. Complexity exists across the multitude of interactions across the delivery process and differentiates the management of construction related activity from that of complicated manufacturing type approaches. Furthermore, uncertainty exists across the many facets of delivery and interactions between projects and their external environments, clients and the broad array of delivery participants. Various delivery and procurement systems aim to mitigate against these two parameters whilst being affected by other hindrances ranging from client capability and regulatory pressures, to site conditions and planning issues.

However, what has also been identified is that a strategic approach can aid in improving the delivery of infrastructure by considering long term aims and the appropriate integration of client and their supply chain. An issue being that the approach is inherently contingent, and requires that linkage be made to the needs and objectives of the procuring organisation (or client), and that a level of competence is required in application of a wider understanding of the tools available. It is proposed here that in review of a strategic procurement approach, a contingent SPMC framework can be formed (Figure 4B). This is underpinned by a number of core principles that span across the formation and implementation of a strategic management approach to construction portfolios and corresponding delivery systems, procurement systems and contract strategies.

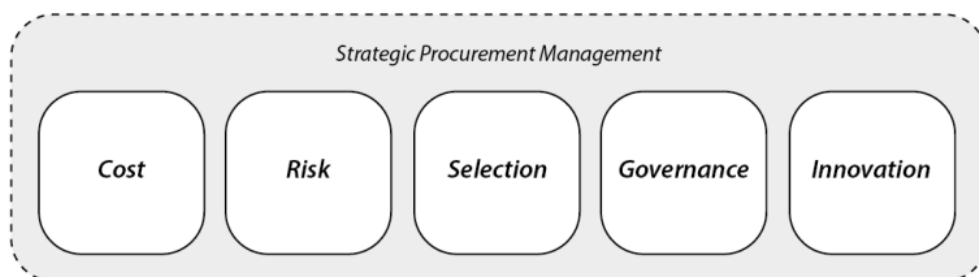


Figure 4B - A framework for Strategic Procurement Management Competence

(Source - Author)

As a focus for this project is the improvement of delivery competence, and the vehicle for this is presented here as being via a strategic approach, the above framework represents the identification of tools and techniques in accordance with the competency framework highlighted earlier in this thesis in the work of Cox (1999). With chapters 2 & 3 addressing the nature of the contingent delivery environment, primarily through TMOs, the MPE, business / industry specific factors and other generic factors, as well as the nature of application via STS covered within chapter 3, it is possible to populate the competency framework for this project via Figure 4C.

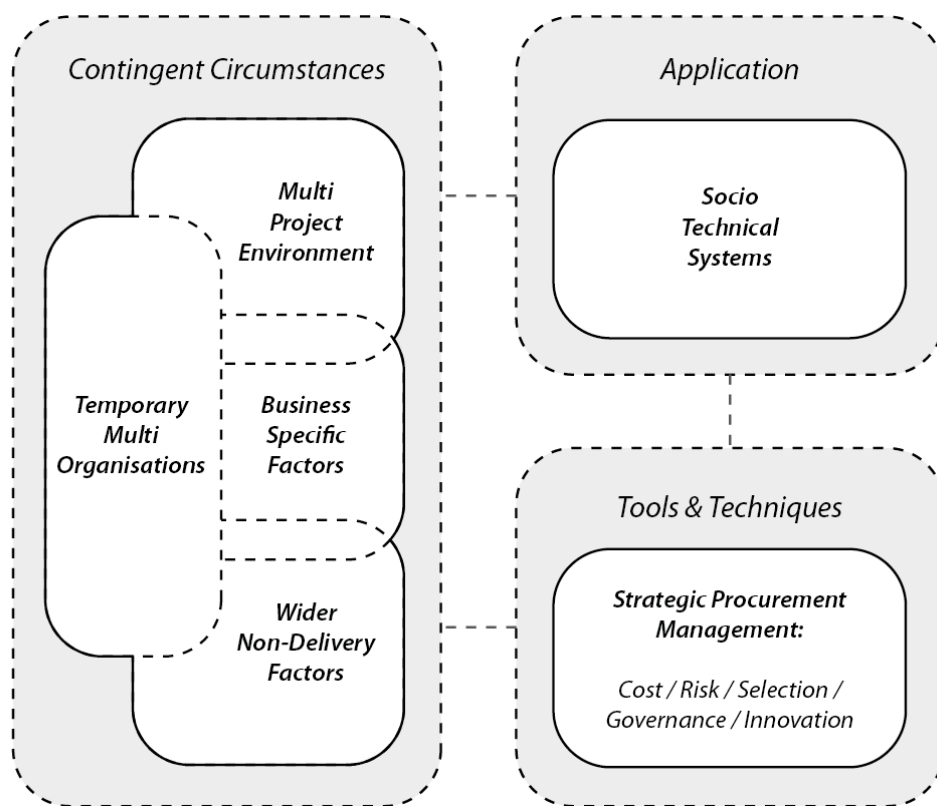


Figure 4C - Strategic Competency Framework for this project

(Source - Populated by author within the framework of Cox, 1999)

It is posited here that SPMC exists across the formation and implementation of a procurement strategy, but that little effort has been made to identify with the implementation of such an approach to improve infrastructure delivery. The following

section therefore represents the tools and techniques that underpin a SPM approach and forms the basis from which an engagement strategy for change can be formed.

4.2.2 A continuum of strategic procurement management

What the work of Kraljic, Cox, Thompson, Townsend, Emmett and Crocker, Hughes et al. and IUK (amongst others) shows is that there is a range of competences required to support the delivery of various procurement strategies, ranging from transactional and adversary, to serial and co-destiny type relationships. Furthermore, one can attest that transactional relationships are concerned with short term decision making and require a less advanced skillset, whilst longer term relational forms require alignment between clients and their supply markets. This is not to say that an array of variants may not suit a particular organisation, but that each has their right place.

From whatever vantage point one chooses, chapter 2 of this thesis addresses the multitude of approaches to delivery available that inherently address a range of complex and uncertain scenarios in delivery. The issue however is helping ICOs understand the value of longer term strategic approaches and their appropriate application, especially with regard to portfolios, programmes and projects. Furthermore, it is vital to use more collaborative and serial contracting methodologies appropriately to reap their respective benefits, such as aggregation of demand for an alliance, a streamlined assessment process for partners, or appropriate allocation of work volumes to a framework and so forth. Conversely, the differentiation that is presented among delivery variants need be understood to see the fruitful use of such methodologies in an appropriate manner, such that merely having an alliance delivery system does not constitute good delivery.

Thus, considering a strategic approach as the appropriate selection and use of delivery methodologies based on complexity and uncertainty (with coordinating components of time and cost) based on portfolio, programme and project requirements, with procurement competence as the relative understanding of their use, then one must outline the framework within which they differ from being tactical. Emmett and Crocker (2008) build on the work of Kraljic (1983) in their assessment of strategic approaches to procurement, but with a specific focus on the talents / skills required to deliver each

approach. Defined as either tactical (junior - 1/2/3) or strategic (senior- 4/5/6) procurement approaches, summarised as:

1. Adversary relationships – take it or leave it
2. Transactional relationships – normal ordering
3. Single source relationships – exclusive agreements typically fixed time and price
4. Strategic alliance relationships – working together for a specific purpose
5. Collaborative relationships – commitment with shared risk & benefits
6. Co-destiny relationships – interdependency

This difference in procurement competence can be characterised against Figure 2G identified within this report, whereby these competencies map onto Figure 4D below such that more complex and risky works with higher values require more strategic approaches to delivery with associated senior level competencies. In essence, one cannot simply expect the tactical procurement professional to be able to automatically adopt strategic approaches, and this is something that is poorly addressed in procurement literature.

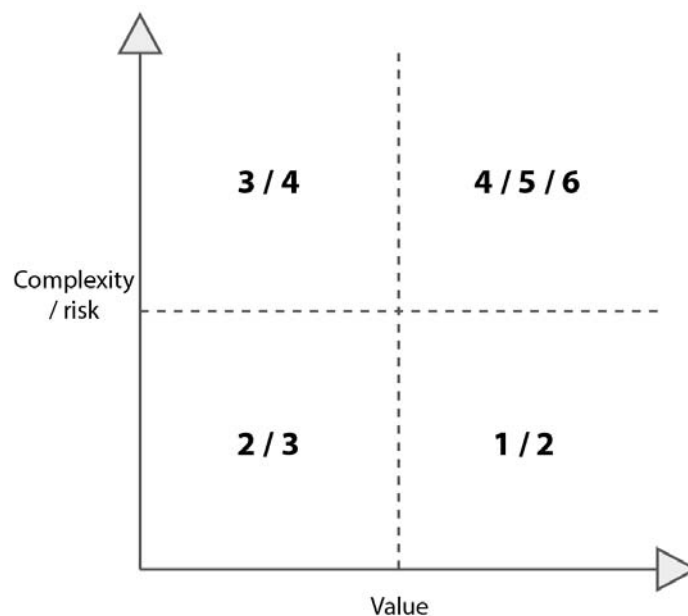


Figure 4D - Tactical and Strategic competence

(Source - Adapted from Emmett and Crocker, 2008)

As traditional procurement approaches to complex social and economic infrastructure projects are ineffective (Regan et al., 2011), and the larger and more complex the task / project, the greater is the risk that projects will not be delivered efficiently or in a cost-effective manner. It becomes important that via a strategic approach one delineates between basic / operational / traditional procurement methods and more strategic / collaborative / alliance approaches. Emmett and Crocker (2009) identify the 'great deal' of work that is required to achieve mature working relationships with partners based over a long period with a high level of relationship closeness. Emmett and Crocker (2008, 2009) form a divide between a more strategic approach to procurement and a more basic 'operational' one via the following:

| Operational Procurement | Strategic Procurement |
|--------------------------------|------------------------------|
| Transactional order placers | Value added facilitators |
| Short term | Long term |
| Cost focus | Customer / user focus |
| Internal view | External views |
| Performance statistics | Benchmarking |
| Technical processes | Business process |

Table 4.1 - Operational versus Strategic procurement competence

(Source - Adapted from Emmett and Crocker, 2008)

To help understand some of the more advanced components of a strategic approach, and consequently competence, the following section breaks down the fundamental components of the strategic approach defined for this project and the relative organisational abilities that are required to properly implement an array of procurement approaches.

4.2.3 The five principles of Strategic Procurement Management Competence

4.2.3.1 Risk

What is Risk?

Risk exists throughout the delivery process and is concerned with the apportionment of responsibility and control throughout the life cycle of an endeavour to mitigate against uncertainty. Perry and Hayes (1985) categorise that primary sources of risks to construction projects comprise physical, environmental, design, logistical, financial, legal, political, construction and operational risks; while STRATrisk (2005) identify that the management of risk spans both high level strategic, and lower level project and operational risk bands. Russill (2010) asserts that there are four main risk exposures in the form of reputation, operational continuity, financial viability and being a target for litigation. Risk applies to every stage of the building and operation of an asset, and understanding risk is about its relationship with decision making (Winch, 2003). In construction, a risk or possible eventuality must be borne by one of two parties engaging in the works; the price of the works should therefore reflect the position of this risk and the assumption of its position within the relationship.

Risk as part of a strategic approach

Risk plays a part throughout the building industry cycle, from incentive mechanisms through to privatization and across the multitude of social, technical, economic, environmental and political (STEEP) risks that impact on large scale projects. The relevance of risk to a strategic approach to delivery is the value through which understanding risk, mitigating against it and/or managing that risk is vital to business performance and effective delivery. A known risk that can be accounted for, and thus requires no contingency becomes a certainty; so in effect, Risk Management (RM) and Procurement Risk Management (PRM) is primarily about the mitigation of risks that endanger value, efficiency, reputation and profit (Russill, 2010). Risk here is therefore concerned with the identification, clarification and understanding of the impacts of risk

on effective delivery of infrastructure, and the resultant apportionment of control and cost to mitigate against those risks and ensure effective delivery.

No construction project is risk free. Risk can be managed, minimized, shared, transferred or accepted. It cannot be ignored.

(Latham, 1994, p.14)

What constitutes a strategic approach to Risk?

Russill (2010) advises that high level (top down) risk assessment utilise divergent thinking (what could happen) and low level (bottom up) convergent thinking (bound by what one knows), and that scaling up convergent project level thinking into programmes and beyond is inherently a mistake, with a harmony between the two required to be effective. Consequently, undertaking a strategic approach to risk across varying delivery methodologies requires understanding that high levels of uncertainty and risk will lead to forms of sharing, cooperation and bilateral relationships with suppliers (Cox, 1996). Furthermore, Thompson et al. (1998) suggest that contractual relations between two parties are derived from the four 'R's of Risk, Relationship, Responsibilities and Reimbursement. Indeed Cox and Thompson (1997) assert that the 'step-ladder' of internal to external relationships ranging across asset specificity types moves from adversarial (low specificity and risk) to strategic alliances (higher specificity and risk). In essence, this argument presents that the higher the level of uncertainty and risk to a particular element of expenditure, the more internal (or integrated) the arrangement becomes between client and market.

As a key focus of a strategic approach is the aggregation of demand through repeated workloads in return for preferential supply and relative economies of scale, then the management of those risks becomes ever more integral between client and supply chain as the appropriate (fit for purpose) relationship becomes more incorporated between the two. Cox and Townsend (1998) present that a strategic approach to risk management comes from understanding the full compliment and array of risks, with avoidance or minimisation not leading to business success. The management of risk

must therefore reflect the nature of the works and adopt the appropriate use of quantitative (for higher value, risk, complexity and magnitude projects) and qualitative measures (for conversely low scenarios), with a range of pragmatic approaches in between.

Furthermore, the creation of a systemic culture towards the treatment of risk, its constant identification and resolution is key to the formation of a proactive organisational environment. Indeed Taroun (2014) identifies that from 50 years of risk modelling methods, the prevailing Probability–Impact (P–I) risk model, whereby risk is generally assessed through assessing its probability of occurrence and impact, remains prevalent. Boateng et al. (2012) recognise the importance of feedback in the constant review process of risk and its effects, while Love et al. (2010) ascertain that a lack of knowledge over processes and alternatives has led to an avoidance of procurement method selection processes being enacted, and instead effectively sticking to what one is comfortable with opposed to that which is appropriate. Such conclusions drive the considerations that knowledge, change and culture are key elements of implementing an appropriate risk management strategy. Liu and Fellows (2012) make reference to the difference between short term (surface) and long term (deep) cultures and the effort required to enact more valuable deep seeded changes. Indeed driving constant improvement to the internal business process requires a proactive approach to risk whereby it is a positive, not a negative effort.

4.2.3.2 Governance

What is Governance?

Governance in a delivery setting is the framework within which management make decisions about the delivery of projects, representing a common thread throughout all aspects of successful delivery (HM Treasury, 2014b). Crawford and Helm (2009) suggest that organisational structure, management and policies are directed by an organisations' governance approach. The National Audit Office (NAO, 2011) add, as part of its guidance for initiating successful projects, that five key elements for project success, inclusive of purpose, affordability, pre-commitment, project set-up, and delivery and variation

management have governance as a principle underpinning three of them. Furthermore, the Price Waterhouse Cooper global project management study (PWC, 2012) suggests that weak governance structures are the main culprit of project failures. Consequently, what one can glean from this select set of vantage points is that the provision of governance for the delivery of infrastructure is a predicated, dedicated and purposeful act. Additionally, one is able to consider that governance is inherently concerned with the management of people and their interactions, with a focus on the formation of an environment in which those relationships have meaning, direction and a determined state of reason.

Governance as part of a strategic approach

Governance here exists across two parameters, the structure and management of delivery relationships between organisations, and the measurement of those relationships in terms of their desired aims. The structure of relationships can be attributed to the continuum of procurement relationships available between organisations and is best described by the work of Transaction Cost Economics (TCE) (Williamson, 1985) and the aim of reducing the cost of transacting. Gray and Hughes (2001) assert that transaction costs are the most important factor dictating the make or buy decision, while several researchers opine that transaction cost theory fails to address two key elements of the transaction, specifically sociological and physiological issues (Henisz et al., 2012; Awuzie and McDermott, 2012). If TCE forms a basis for the study of governance structures in a strategic environment, then the measurement and management of performance is congruent to the type of delivery arrangement employed in order to be effective. The purpose of measurement is to generate a body of knowledge that an organisation can use in a variety of situations, with Bititci et al. (1997) adding that performance measurement should be considered as a central component of an organisations' drive toward aligning functional practices with the strategic objectives of the organisation.

What constitutes a strategic approach to Governance?

As a strategic approach is concerned with the alignment of appropriate delivery relationships with market conditions, it is important to understand what is to be governed. TCE is concerned with two contributors to total supply costs, namely, production costs, transforming inputs into outputs (Winch, 2003) and transaction costs (Williamson, 1985). With two corresponding forms of governance / co-ordination for these transactions, inclusive of the market transaction, formed via spot contracts with prices set by Adam Smith's 'invisible hand', and hierarchical transactions represented by internal processes governed by the 'visible hand' of Alfred Chandler (1977) via an authority relation (Winch, 2003). Between these two extremes lie a continuum of relational contracts that form a hybrid of the two (Macneil, 1978). This best describes the discussion around delivery and the nature of integration versus separation.

Alsagoff and McDermott (1994) identify the need for a more relational approach to contractual arrangements to avoid disputes when contract incompleteness leads to opportunism, an issue similarly highlighted by Williamson (1985). Thus TCE does not provide a complete picture of the relationship between parties, but can aid decision makers in improving their design of contracts, and thus reduce transaction costs. Much work has been done in the assessment of transaction costs and procurement routes, such as Turner and Simister (2001) who suggest that transaction costs for clients in setting up and managing contracts exist across defining specifications and work processes for tender documentation, and the management of variations during delivery. Dietrich (1994) has however suggested that the utilisation of TCE as a standalone approach fails to consider the entire cost of management, and thus refreshed this vantage point by understanding the whole cost of management for forming and enforcing contracts as a means of comparison against production costs (Hughes et al., 2006).

In order to maintain price control gained through competition due to ex-post changes, control is likely to be exerted via high specificity and clear change guidelines, resulting in the favourability of the traditional method (Skitmore and Marsden, 1988; Love et al.,

1998), thus organisations are at risk of ex-post opportunism. To mitigate against conflict, organisations use governance structures to deal with the relevant market they are approaching ex-ante (Henisz et al., 2012). While each governance structure has unique attributes, Hodgson (1998) rejects the notion that relevant governance structures can be compared in terms of costs. This is primarily due to the implications of bounded rationality, with it being argued that a firm exists to manage the risk and uncertainty evaluation for each governance structure. This can be said of sustainable procurement and its effect on cost, as numerous variables may play a part in determining its value beyond merely cost.

As governance is concerned with the appropriate structuring of market relationships, a strategic outlook is concerned with pro-activity towards ones operational environment. Being pro-active means understanding implementation and the ongoing management of such relationships. Kagioglou et al. (2001) present that performance measurement manifests through the quantifiable monitoring of organisational processes to provide a reflection on organisational performance. Bititci et al. (1997) add that the performance management system is at the heart of the wider performance management process. Holt et al. (2000) infer that the traditional construction industry approach toward performance measurement relies too heavily on fiscal only measures, neglecting broader stakeholder issues. Furthermore, with the construction industry typically focusing on project performance only and using golden triangle type measures of time, cost and quality, the industry is inherently measuring retrospectively with 'lagging' tools. In review of the study of performance measurement in construction, Isik (2009) presents that traditional performance measures:

- Encourage short-termism;
- Are retrospective and hence are always to some extent out of date;
- Do not accurately reflect the interests of stakeholders;
- Fail to provide information on what customers really want and what they are actually getting;
- Do not identify how competitors are performing;

- Lack strategic focus and fail to provide data on quality, responsiveness and flexibility;
- Give misleading signals for continuous improvement and innovation activities;
- Encourage local optimization; and
- Report on outcomes but do not communicate the drivers of future performance

Such factors support a general lack of understanding about the broader competitiveness of the industry. Thus, to remain competitive and consider a longer term viability perspective, Holt et al. (2000) present that there is a need to better understand a whole host of relationships with customers, suppliers, employees, lenders and the wider community, and so incorporate components of wider business strategies and objectives into the formation of performance measurement systems (Bitici et al., 1997). Furthermore, the broader need to align to non-fiscal factors has been highlighted by Neely (1999), who advised that the changing nature of work, increasing competition, specific improvement initiatives, national and international quality awards, changing organisational roles, changing external demands and the power of information technology has led to an increased need to measure performance, but also to understand the broader organisational environment within which such measurement sits and to what purpose it serves.

Venkatraman and Ramanujam (1986) highlight that performance improvement is at the heart of strategic management, and whether one chooses to focus on theoretical, empirical or managerial dimensions of the subject, one cannot separate the importance of, in essence, doing something with what one learns. The balanced scorecard approach outlined by the PIR brings to light the underpinnings of implementing performance measurement within an infrastructure delivery setting. Whether one is concerned with a single contract, a single project with multiple contracts or variations of MPEs, the measurement and management of performance is intrinsically linked to a strategic approach.

4.2.3.3 Selection

What is Selection?

Selection is concerned with the alignment of organisational goals and supply chain capability to facilitate effective delivery. It is considered that no supply chain relationship can exist without a corresponding purchaser relationship, and thus responding to and understanding one's own supply market is inherently the basis upon which procurement and delivery strategy is based. The identification, appraisal, management, development and structure of supply markets are vital to any delivery process, and as such, the extent to which these delivery markets can influence and be shaped by the purchasing organisation must be identified. Consideration is given to the level of supply chain relationship and integration appropriate for the purchaser's needs, inclusive of the level of autonomy, competition, collaboration and resultant engagement required to achieve effective delivery. Selection consequently begins to take on a number of other elements, namely, tendering, supplier development and the number and type of market relationships required.

Selection as part of a strategic approach

However one views delivery and market engagement, and whether the desire is to engage singularly or for extended periods, the focus is essentially on selection based on competition or co-operation (Hughes et al., 2006). This is an important concept, as more competitive forms of selection focus on price via open and selective tendering practices, with cooperative forms adopting negotiation and non-cost related parameters. As Cox and Townsend eluded in 1998, there is considerable market advantage to be gained from developing relationships with a supply base. Consequently, the alignment of selection, tendering and development practices need to reflect the appropriate use of procurement methodologies. While some single project approaches exist such as two stage tendering (stage 1 based on preliminaries, profit and overheads; stage 2 based on open book negotiations, design development, coordinating final prices and often some reimbursement of costs), there is naturally going to be a discrepancy in delivery practice and performance if one does not select appropriate suppliers. Additionally then one

should monitor their performance and find optimal working relationships as part of more relational approaches, opposed to mere price (and risk) handover with transactional forms of procurement.

What constitutes a strategic approach to Selection?

Hughes et al. (2006) present that selection methods include negotiation, partnering, frameworks, selective competition and open competition. Walker and Maqsood (2008) in outlining the value of forming supply relationships, suggest that more committed forms of supply that coalesce, opposed to singular competitive types of approach experience increasing value through higher levels of trust, commitment, knowledge sharing and joint coordinated problem solving. As Miles and Snow (1992) elude, a fit between operational delivery and strategic aims is more likely to achieve organisational goals and objectives, thus the selection of suppliers needs to align to the nature of the procurement methodologies being employed. The result being the alignment of competitive price based practices for transactional forms, and non-price selection criteria for more relational forms in order to demonstrate alignment to business goals.

Cox and Townsend (1998) suggest that traditional arm's length contracting in the construction sector has led to procurers being uncomfortable with the ideas of supplier development or relational forms of tendering and selection. As Turner and Simister (2001) found uncertainty to have the greatest influence on contract type selection by clients, and with tendering contractors needing to incorporate failed bids and expensive bidding process into overheads, there is little wonder that serial and relational forms of contracting seek to minimise such actions and cost. Gunning and McDermott (1997) bring an insight into the inflation of tender prices so far as contractors will inflate bids to incorporate unknowns at the simplest level. As higher levels of risk and complexity versus value and price inherently determine selection of procurement methodologies (Kraljic, 1983), then construction procurement vehicles that fail to adhere to the basis upon which they were formed will inherently lead to low performance. In short, Hughes et al. (2006) present that tendering costs alone can count for between 0.5 and 1% of turnover in estimating alone, rising to 15% if further unnecessary costs are considered.

Consequently, with selection of suppliers to form more relational and cooperative forms of delivery to experience increased levels of productivity, one must work closely with, and develop one's supply chain. As Lamming and Cox (1995) allude to in the four dimensions of supply, being able to analyse, understand and transform power structures in supply chains is required in order to demonstrate a dynamic and proactive (effectively strategic) supply chain competence. This means being able and willing to modify supply chains to leverage value, improve performance and get a better deal as a procuring organisation, but with the goal of it working for the supply chain too. Emmett and Crocker (2008) present this idea nicely in their presentation of a manufacturer entering the supply chain to develop a logistics partner. In forming a reliable second sourcing option against a poorly performing single source relationship in existence, all three organisations experienced increased productivity, turnover and performance.

Similarly, as Liu et al. (2009) present that transactional mechanisms curb opportunism, and relational mechanisms improve relationship performance, they add that improved performance and the curbing of opportunism can in fact come from the joint implementation and improvement of both trust and contract. What this means is that the development of the supply chain across more relational forms of contract is a cornerstone to a strategic approach and vital in delivering improved performance (Cox and Townsend, 1998). To do this then one must understand clearly that transactional spot contract approaches take the market as it is, whilst strategic approaches encourage the forming and leveraging of supply power to engender improved performance and resource allocation. In fact, understanding the co-development (Van Echtelt et al., 2008) of client and supplier, as well as the co-creation (Prahalad and Ramaswamy, 2004) of products and ideas across more long term cooperative delivery forms is vital to the implementation of a strategic approach and the utilisation of supply competence.

4.2.3.4 Cost

What Is Cost?

The management of cost is inherently the cornerstone of delivery. Whether it is the actual cost of a project, or the relative costs in delivering particular outcomes, cost

should play a part in all aspects of the delivery chain. Cost though, is not as simple as it may first seem. Cost is inherently influenced by a whole array of factors ranging from culture to education, and impact to objectives. Cost therefore serves as a vital pillar in the delivery of infrastructure, but its alignment to monetary values is only one element of it. Cost as a term thus serves as an assessment framework that goes beyond fiscal ‘amounts’ and instead is concerned with relationships, the business needs, cost benefit ratios, process management, innovation and many more.

Cost as part of a strategic approach?

Fundamental to a strategic approach to cost management is the effective utilisation of resources, with Lamming et al. (1996) identifying that barriers to a strategic approach to cost include organisational culture, managerial instability and practical inhibitors. Furthermore, a strategic approach separates itself from a traditional approach in the sense that it is pro-active opposed to reactive (Cox and Townsend, 1998; Aziz, 2013; Potts and Ankrah, 2014). Indeed Cox and Townsend (1998) compare traditional and strategic cost management via the following:

| Attribute | Strategic cost management | Traditional cost management |
|-----------------------------------|---|--|
| Cost visibility | Open-book / transparent | No visibility for client |
| Pricing structure analysis | Considers contractors use of different approaches | Assumes competitive pricing for all situations |
| Management approach | Pro-active cost reduction | Reactive cost containment |
| Incentives | Considers appropriate use of incentives | No real consideration of incentives |

Table 4.2 - Strategic and traditional cost management compared

(Source - Adapted from Cox and Townsend, 1998)

The management of cost essentially breaks down into two elements, is it to be managed purely behind closed doors by a client or in tandem with the market place, and is it going to be reactive or proactive. Ramabodu (2014) highlights that inherent within a pro-active approach is thinking about value via such aspects as durability (life-cycle / whole life cost), physical (quality), psychological (relational and aesthetics), real quality (cost effective but fit for purpose), design (to cost), affordability (returns etc.) and timeliness (delivery and demand issues). Cox and Townsend (1998) however focus on process, and bringing the market relationship forward rather than solely representing market (pricing) situations. In reality, both aspects are true, as a strategic approach to the management of cost concerns both process and focus.

What constitutes a strategic approach to Cost?

Enhanced within the work of Potts and Ankrah (2014), the stages of traditional cost management across a project lifecycle continuum begin with a budget, an outline cost plan, a detailed cost plan, a cost check, a pre-tender estimate, a tender figure, financial statements and end with a final account. The issue here is the ability to reduce costs and relative account variance is heavily loaded towards the front end of this continuum, and reducing cost is a front end design and risk allocation issue, suggesting a bridge between such decisions and market engagement (Cox and Townsend, 1998). The summation of these actions is the building towards the formation, setting and control of price via agreement with the market, typically done via competitive means in the form of tendering. Traditionally, elements contributing towards a contractor's tender price exist across net cost (inclusive of direct construction costs, site overheads and company overheads), and margin (inclusive of risk and profit). A strategic approach to setting cost intrinsically concerns itself with avoiding traditional market price setting, and thus understanding the market one is in through cost benchmarking and market engagement. Essentially, managing cost via engagement can be said to be a direct response to circumstances created by decision making focused on creating agreement between client and market, best described through game theory. In essence, a strategic approach aims to reduce higher transaction costs through market engagement and a consequent

reduction in opportunistic and wasteful behaviour, applying such tools as risk management, value management and whole life costing (Potts and Ankrah, 2014).

While TCE presents the manner in which organisational boundaries and associated governance procedures can fluctuate to suit contractual demands, an additional option for ex-post relationship management is incentive creation through agency theory. Jensen and Meckling (1976, p.5) define an agency relationship:

As a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent.....the principal can limit divergences from his interest by establishing appropriate incentives for the agent and by incurring monitoring costs designed to limit the aberrant activities of the agent.

Agency costs are the sum of three types of accrued costs in the form of (1) principal monitoring costs (to manage the relationship and its performance, born by the principal), (2) bonding costs (incurred by agents who are limited by contractual obligations) and (3) residual losses (that accrue by agents decisions not maximizing the welfare of the principal through forms of divergence). Pryke (2012) suggests that the use of performance incentives has received sparing amounts of attention, with a lack of transparency and fairness shrouding pain-gain and gain-share mechanism creation. In essence however, TCE theory presents a framework through which to understand the relevant merits of IDS, while the study of institutions explains the organisational environment in which they exist (and inherit), and agency theory outlines a variant lens through which to manage and explain the performance driven actions of principals and agents. Consequently, we are discussing and focusing on the performance and optimisation of contractual relationships (and the management of their costs) across a continuum of relational contracts with purely internal (traditional) to one extreme and external (market) to the other.

4.2.3.5 Innovation

What is Innovation?

Innovation represents the creation of new ideas and processes that generate some form of improvement. Intrinsic to innovativeness is newness and betterment of something or often, somehow. Innovation in construction exists across a number of areas from new methods, knowledge transfer, sustainability, organisational culture, collaboration, BIM, standardisation and beyond. An innovation can focus on new ideas and products, or the alignment of processes, procedures and activities within the delivery chain to achieve increased profitability, productivity, reliability, quality, safety and ultimately, efficiency. It can also centre purely within the organisation. Innovation can affect all elements of the supply chain, from the use of contracts through to the types of relationships expected between certain parts of the delivery chain. Inherently concerned with improvement through either new things, or doing things differently, innovation is not limited to co-developed project level solutions in an often fragmented industry, but can be influenced in a more strategic manner to influence the wider industry.

Innovation as part of a strategic approach?

Stewart and Fenn (2006) recognise that innovation in the construction industry exists across three strands of (1) the product, (2) the process and (3) the organisation, while Aouad et al. (2010) raise concern that construction innovation is limited to the project due to the fragmented and project based nature of the wider industry. Akintoye et al. (2012) present that innovation in the construction industry can be construed as the successful development and / or implementation of new ideas, products, process or practices, generally with the aim of increasing organisational efficiency and / or performance.

Thus, innovation extends beyond the singular project and the formation and close-down of such intrinsically one-off activities. Thinking strategically about innovation is about the restructuring of supply chains around new ideas, processes and organisational approaches. It involves the standardisation of products and processes (Cox and

Townsend, 1998), the management of change and cultural attitudes (Liu and Fellows, 2012), the adoption of ideas, products and processes (Rogers, 1995), understanding the novelty of such innovations (OECD, 2005) and the value of supply chain integration to leverage (and develop) more appropriate procurement forms (Akintoye and Main, 2012) and more.

What constitutes a strategic approach to Innovation?

An underlying assumption of what constitutes innovation is the work of Joseph Schumpeter (1934) who argued that economic progression is driven by processes through which new technologies replace old (via creative destruction). Schumpeter presented that more radical innovations affect major disruptive changes, while incremental innovations are concerned more with continually advancing the process of change (OECD, 2005). Schumpeter (1934) proposed a list of innovation typologies as:

- The introduction of new products;
- The introduction of new methods of production;
- The opening of new markets;
- The development of new sources of supply for raw materials or other inputs; and
- The creation of new market structures in an industry.

Deciding to innovate often takes place under great uncertainty, with firms choosing to act as innovative 'followers' (to keep up with innovative competitors), or to act as proactive innovators into the 'unknown', creating new delivery environments themselves dependant on their position within the innovation adoption curve (Rogers, 1995). Organisational innovation literature has focused on organisational structures, learning processes, adaptation to changes in technology and the environment (institutions and markets) (OECD, 2005). The reason for such differentiation and delineation here, is that market positioning and value creation through innovation requires specific forms of procurement and delivery relationships to be formed. Specifically, for an organisation to want to influence its market place and be a leader in terms of products, ideas and market share, more relational forms of contracting will be

required (Akintoye and Main, 2012). Contrastingly, should an organisation have no desire to use its buying power to leverage knowledge and skills from the market place with a view to creativity stagnation, then it can merely place single, transactional, traditional spot contracts and be at the mercy of external market forces, regardless of buying power. In being strategic to maximize value creation Blayse and Manley (2004) identify factors that influence construction sector innovation as:

- Clients and manufacturers;
- The structure of production;
- Relationships between individuals and firms within the industry;
- Relations between the industry and external parties;
- Procurement systems regulations / standards; and
- The nature and quality of organisational resources.

Efficiencies in the management of infrastructure are seen to be around the creation of feasible competition, the facilitation of responsibility, the enhancement of stakeholder groups and the removal of bureaucracy type structures towards a more business type model (World Bank, 1994). In effect, the creation of a platform for the delivery of infrastructure services that respond to intended focus groups, drives value and innovation via competition. Consequently suffering from the competitive strains of business in order to be an effective tool for economic growth, innovation (or more precisely, being as innovative as possible) drives the need to assess one's markets and programmes of work to find the most suitable and sustainable solutions to meet strategic business needs. Egmond (2012) identifies that innovation and sustainability in construction need balance a range of competing factors, inclusive of performance metrics, capability drivers and competence building.

Gann and Salter (2010) identify clients as the driving force behind innovation in construction value chains, with Barlow and Jashpara (1998) suggesting that collaborative links between firms enhances organisational learning and more innovative practice. It should be noted however that if clients wish to be change agents, they should be aware of their internal versus external project management approaches in affecting supply

chain actors, and that organisational barriers to innovation can be perceived attitudinally, industrially, and institutionally. Panuwatwanich et al. (2008) suggest that an innovative culture (via leader selection) can contribute towards the creation of competitive advantage, with Akintoye and Main (2012) highlighting that procurement on a project by project basis can throttle innovation due to a lack of security (of supply), continuity and longer term relational working practices not allowing the development of both skills and research. This inherently links the development of innovative practices with the foundational principles of a strategic approach.

4.3 The concept of the Strategic Change Model

What the preceding sections have outlined is a series of avenues relevant to this project, whether it be content, approach or application based. What is needed is to combine these principles into a cohesive approach that both represents the project and expresses its contributions to knowledge. The basic premise of this project was to find problems in delivery, and to identify a potential solution to them. Discussed more extensively within the methodology chapter, this project develops its solutions in tandem with literature and by proxy is theory in action, with elements of testing and development as it proceeded. The Strategic Change Model discussed below was consequently created from this project, rather than before it, yet is grounded in theory and applied to validate the wider change approach. The project therefore contributes to knowledge and theory in three ways via:

- The strategic procurement management literature in the manner in which it has been rationalised into a competency framework;
- The change management literature in terms of the novel application of a three phase approach to change within ICOs; and
- The participatory research literature via the manner in which the project contributes to theory and the academic community.

Inherent within this three pronged approach is the need to do something, to intervene and to act within the social world, with such intervention being premised on enhancing competency within the delivery of infrastructure.

4.3.1 Rationale for intervention

If one considers the transformative organisation as the focal point for intervention, and for this project in particular the focus is on the ICO, then this is the fulcrum of any activity. As the premise of this project is based in the failure of the industry in implementing changes, and the lack of knowledge around the uniqueness of infrastructure delivery, then understanding and forming a structured approach to intervene within the ICO has always been of value to this work. What has emerged however is the ability to combine a contribution to both the academic community, while making an improvement in practice. This approach is referred to here as the Three Phase Change Approach (TPCA).

4.3.2 The emergence of the Three Phase Change Approach (TPCA)

The TPCA combines Lewin's three step approach to change with participatory research tools. This is the vehicle through which the project contributes to both theory and practice in identifying, changing and re-assessing the real world. The approach is premised on change with some of the rationalised tools used within it (see methodology chapter) aiding in the contribution to academic knowledge. Based in the three knowledge areas discussed above, coupled with the espousal of the competency framework for SPM, the outcome in essence needs to be tested in the real world. The idea of using a TPCA also needs an element of real world test with the end result being the creation of not only a new IDS, but a change model that expresses the manner in which real world competency was enhanced. It is this model that allows us to intervene within the social world.

4.3.3 The Strategic Change Model

The Strategic Change Model was built and tested in tandem with the literature and in action. I as the researcher began action armed with the SPMC framework, although

some of its detailed components were ill-defined. I also started the engagement process via the TPCA, but did not yet understand the full psychological impacts of some of my early planning decisions. The Strategic Change Model however grew over time. It combines facets of STS used for application, it contains the principles of SPMC and represents an open system. It is through this model that I as the researcher aided in the creation of a new IDS in the UK Water Sector. At the most basic level, the TPCA vs the Strategic Change Model are separated in the following manner:

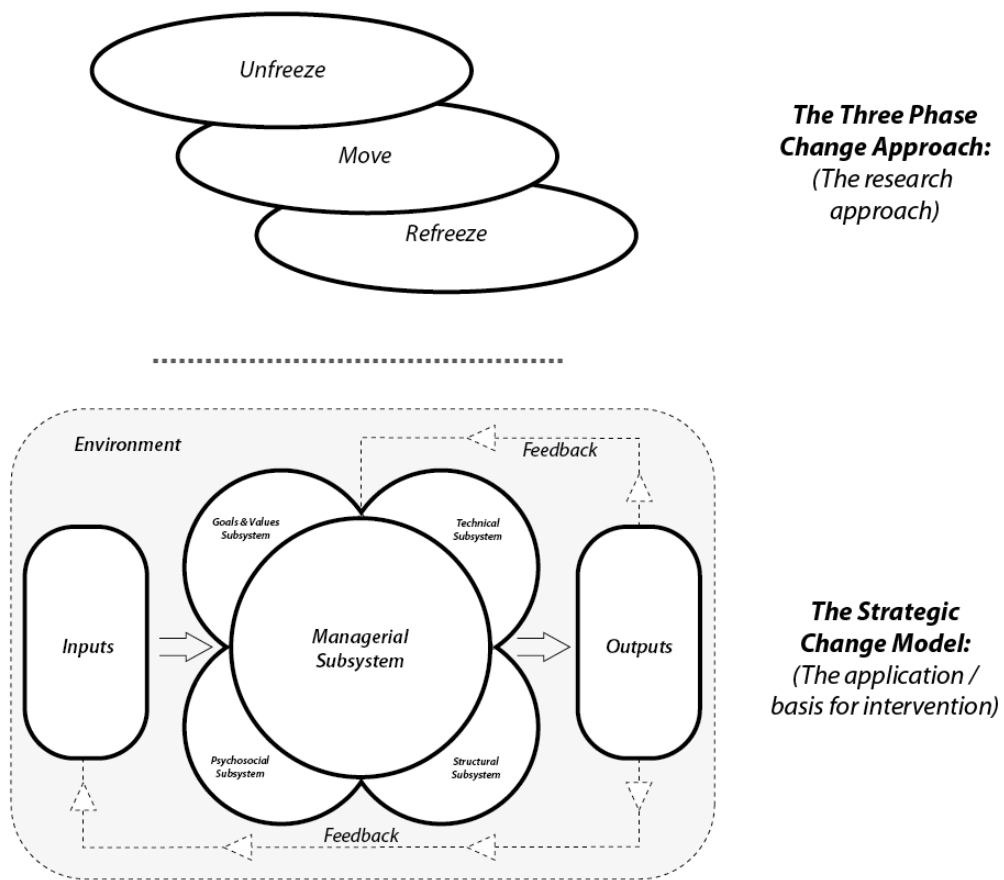


Figure 4E - The TPCA as a research approach versus the Strategic Change Model as a construct for forming interventions within the focus ICO

(Source - Author)

4.3.3.1 The makeup of the Strategic Change Model

The Strategic Change Model serves as a construct for intervention within ICOs, by this, it allows for the forming of interventions into the managerial subsystem to focus on the joint optimisation of social and technical structures in delivery to improve competence. The model however, is premised on basic input-process-output principles, with the transformative element representing the ICO under study. To populate this model, a number of decisions were made, outlined via Figure 4F below, followed by a subsequent description.

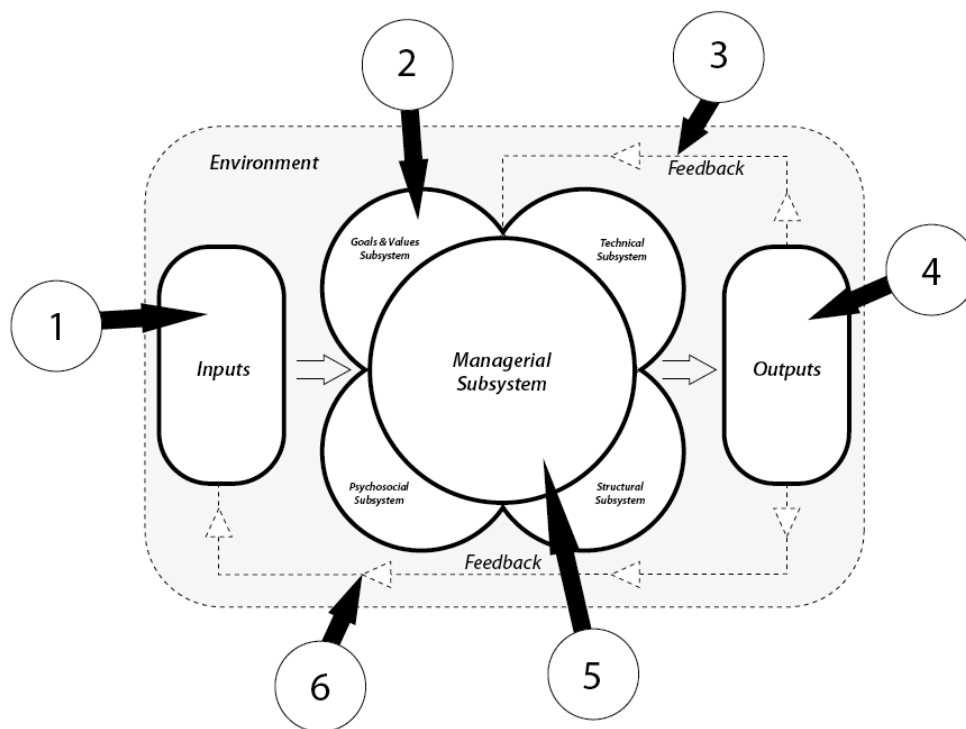


Figure 4F - The population of the Strategic Change Model

(Source - Author)

1. Inputs - This constitutes the independent variables that influence the decision making of the ICO (see Figure 4C), namely factors influencing TMOs, MPEs, business specific factors (such as assets and their ongoing use and maintenance)

- and non delivery factors such as customer make-up and potential monopolistic organisation nature;
2. Primary sub-systems - These constitute the boundary of the delivery organisation under study, its Goals & Values, Psychosocial, Structural and Technical subsystems that make up the 'whole';
 3. Delivery feedback loop - This is the direct feedback loop from delivery actions to which the delivery organisation responds, such as contract management, performance issues and communication;
 4. Outputs - This is where the design, delivery and use of facilities is undertaken. This includes the closedown of such facilities and is where an activity between client and supply base takes place;
 5. The Managerial subsystem - This is where the organisation seeks to optimise its processes and maximize its delivery arrangements in order to provide outputs that serve the asset base. This is where the concentration of Strategic Procurement Management Competence should be, encompassing all the elements of a strategic approach to delivery; and
 6. Output feedback loop - This is where the actual creation and use of facilities and services feeds back into the existing network and affects the broad array of inputs.

4.3.3.2 The Managerial Subsystem as a focus for competence

It is the managerial subsystem which is responsible for optimising the working practices of the client organisation. It is here that one must concentrate efforts at improving SPMC. To do this, the populated Strategic Change Model in Figure 4G is made up of the key components of a strategic approach to infrastructure delivery, as well as the five principles of the SPMC framework. In essence, the model outlines the stages through which one delivers infrastructure strategically, but also the core principles upon which decisions are based. This structure shares cognisance with Figure 2D that formulates the structure of Chapter 2. Notably, the process is not linear, and thus should be considered as a guideline to drive the forming of interventions, but as a reference. Working from the middle, the managerial sub-system of focus is made up of:

- The SPMC framework - The five principles of Risk, Cost, Selection, Governance and Innovation should be of paramount importance across this subsystem. As part of a systems thinking approach, intervention into each area should address the manner in which an ICO is able to optimise its delivery environment across each element and how they relate to each other. For example, a governance process should take into account the appropriate risk profile of the chosen suite of contracts (cost reimbursable etc.) and how this impacts the relevant delivery system (framework etc.);
- The nature of the works - Following from Charles Perrow, one should not only understand the nature of the industry and its requirements, but also the extent of the works required and their build, such as X miles of track and X number of stations for the HS2 programme. With some works aligning to a manufacturing management approach (standardised platform parts for example) versus craft management processes for site specific works;
- Bundling strategies and the aggregation of demand - This is where an organisation categorises its requirements to find market synergies (such as 'maintenance').
- Sourcing strategies - This is where supply chain risk and demand is unearthed, coupled with regularity of demand issues and market ability;
- Delivery systems - This is where the organisation aligns delivery strategies to segmentation approaches, such that a regular commodity spend across maintenance, with high failure risk potentially requires a single source alliance type relationship;
- Procurement systems - This is where the project phases are stipulated, such that with the alliance mentioned above, the client manages the programme of work and the contractor does the 'digging' or they share the processes and the associated risks, irrespective of the fiscal mechanisms in place dictated by the delivery system;
- Contract strategies - This is where decisions pertaining to single works are made, such as risk sharing target cost approaches versus risk transfer lump sums etc.

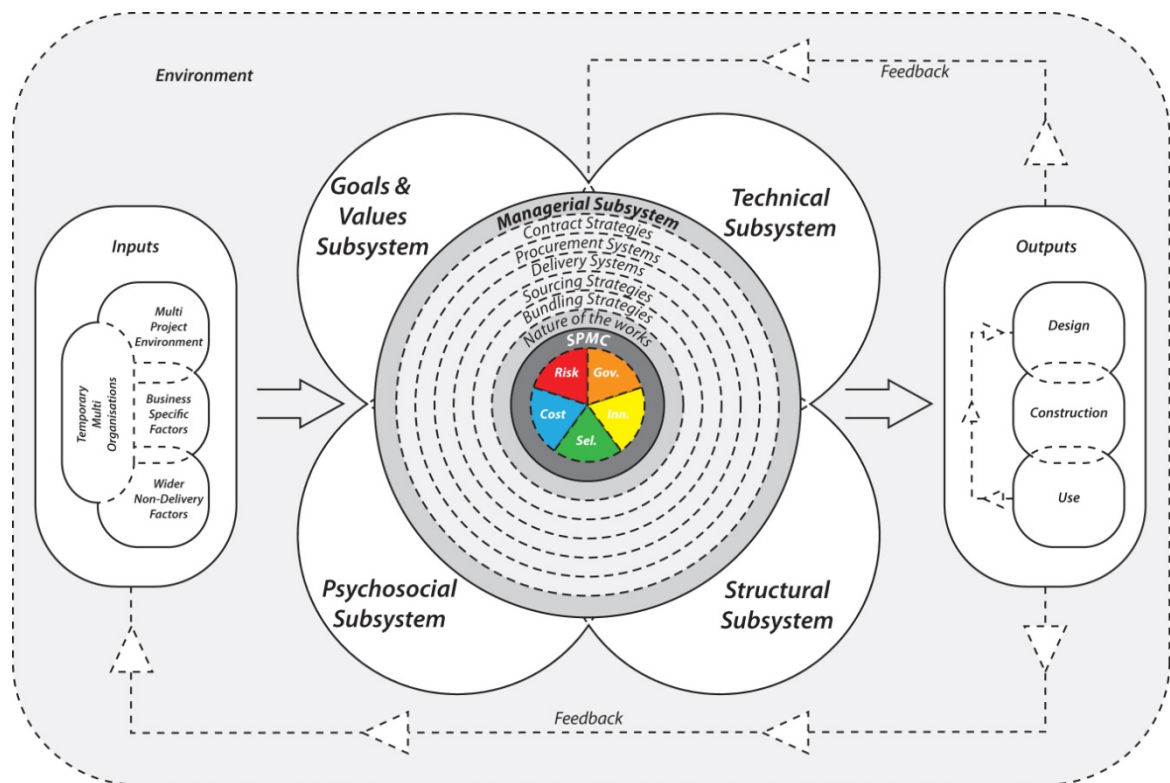


Figure 4G - The final version of the Strategic Change Model – The tool developed through this project for conducting change within ICOs, utilised as an engagement framework for the creation of the new IDS within UKWASC

(Source - Author)

It is the managerial subsystem that is responsible for ensuring an appropriate optimisation of social and technical ability is maximized across the suite of competence elements. For example, the managerial subsystem must ensure that with an alliance, there is an appropriate emotional equity buy-in between the business and its contractor partners across the psychosocial subsystem, that goals are formed between the organisations, that they are fully understood, that appropriate technical skills are in place to support the arrangement and that the supporting structures facilitate effective collaborative working. Such arrangements are required across all subsystems to be effective and must respond to the associated delivery systems.

4.3.3.3 How was it built and used

Created in tandem with action and an ongoing literature review, the outline of the Strategic Change Model began in the early action phases, with a broad overview and a general strategy, something honed and then developed through action. Far from grounded theory, but theory ground in action, tested and reformed into a revised change model. The result was the delivery of five interventions to correlate to the five principles of SPMC. The creation of this model was not in isolation from the world of action, and is not a pure reflection of it either. It is a change model born from the TPCA that led to effective change within an ICO. One could have simply asked if this was a good idea, would the reformation of literature into a tangible framework provide them any value, and by proxy, allow us to gain an insight into their world? We didn't do this, we went further, impacting the real world and challenging it. It may have taken a number of years, but during a time of economic crisis and legacy issues across our infrastructure networks, there was no time like the present to do something about it.

4.4 Chapter Summary

The above has aimed to outline the three distinct elements of change used for this project and their respective input into the project, namely in the form of:

- The approach - the Three Phase Change Approach (TPCA)
- The application - Socio Technical Systems (STS)
- The content - Strategic Procurement Management Competence (SPMC)

The following chapter will discuss how such an approach can form valid contributions to the academic community, and how the validation and quality criteria support the formation of warrantable assertions. It is hoped however that while a valid argument as to the need for change and a potential response has been presented in previous sections, this section has detailed one way in which this could be done, with the following chapter outlining how a corresponding research strategy can be formed.

CHAPTER 5 RESEARCH METHODOLOGY

5.1 Chapter introduction

The following chapter aims to highlight the specific research strategies employed for this piece of work as well as some of the philosophical underpinnings that have informed decision making. This is a reflexive document that has developed throughout the study as will be explored in some more detail below. Drawing on pragmatism, the radical humanist paradigm and the use of participatory methodologies, the following outlines the use, creation and population of the Three Phase Change Approach (TPCA) as a research framework in addressing the two primary aims of this project.

The data collection period for this study spans from November 2012 to August 2015 and focuses on a single Water and Sewerage ICO providing monopolistic services to the North West of England in the United Kingdom (UKWASC). The following outlines the processes and tools used for this piece of work, and is intended to give full credence to the extent of decision making and change undertaken throughout this project. This chapter is set out to cover the process that facilitates the creation of warrantable claims made in subsequent chapters. This is done by outlining:

- The nature of myself and research within the social world;
- The philosophical underpinnings of research within the social world;
- The formation of research within the social world;
- The structure of intervention in the social world;
- The collection of data in the social world; and
- The creation of warrantable assertions about the social world.

5.2 Basis of the study

I, the researcher for this project, am a qualified Architect and Urbanist who had come to find issue with wastage in my own practice, frustrated by the proclivity of my peers toward arguing with fellow consultants. Armed with these frustrations, as well as general interest with wider procurement practice outside of Architecture, the iCase studentship presented a unique opportunity to follow a more practical research basis in accordance with my previous experiences. The initial research premise can be summated as:

We know there is wastage, but what can we do to get rid of it?

This led to a two pronged debate of are we going to focus on defining a problem, or are we going to focus on doing something about it? The relationship with the co-sponsoring ICO (UKWASC) for this iCase award presented a 'way in' for the project, a vehicle through which to be able to do more than simply describe something, but potentially change it too. This is where the project shifts in its nature from social world understanding / awareness to social world activity. This led to the fundamental basis of this work around:

What are the problems with delivery and how can we improve it?

This offered me however with a conundrum, I knew I wanted to act in the social world, and make contributions to knowledge from it, but I needed to understand and articulate what conducting research in the social world meant, looked like, and first and foremost, how it would have relevance to both practice and research.

5.2.1 Conducting research in the social world

The basic premise of this PhD project like many others is to address a problem and to contribute to the vast annals of existing knowledge. The issue is thus that one must consider to what one contributes, as well as to what one solves. Many research projects make discoveries, many focus on proofs, but what can be gleaned with some certainty is that the basis of knowledge creation is generally positive. We don't enter the world with

a view to diminishing one's presence within it, or to restrict the understanding of others. This concern with solving, understanding and in general, creating, is inherently an issue of change. We either change our view of the world, our knowledge of it or physically change it. This then places research, of whatever format, within a structure of change, and in order to change something, we are inherently discussing the nature of intervening with something. One could then suggest that research is about discussing the extent to which one changes, and whether one is changing either the social or physical world. This project in particular is concerned with bringing about change in the social world, so we must begin to understand how the social world differs, and consequently needs to be considered differently. We must then consider the validity and application of an interventionist approach within such a social setting and where it becomes prudent to understand that the natural and social worlds are not that separate, but different.

Consider for a moment the phosphorous cycle, and human intervention within it. A base mineral supporting human life, we originally sourced it on a natural basis from the foods we ate. Those foods were in turn part of a natural cycle to which our own bodies were intrinsically an element. Today, we mine the mineral as an input for fertilizer and impact, often negatively, our own environments accordingly. Assume then that one consumes a whole host of foods such as chicken, milk, lentils and grains from any major food outlet or supermarket and our sources of phosphorus become part of a man made cycle that is inherently influenced by social decisions.

Although somewhat abstractly, the same argument can be made for infrastructure. Whilst the moon and its orbit pulls our seas and dictates tides (albeit as it slowly moves away from us), and as our population grows beyond the level of available phosphorus reserves to suit our fertilizer demands down here on terra firma, we may need to extract from the next available source, the moon. With its vast reserves of KREEP, a geochemical component comprised of phosphorus amongst other things, we may soon find our impact on the 'natural' world extending far beyond our current levels of cognition. Granted, an abstract debate, the argument here is that natural science 'only'

methodologies of knowledge creation, whilst playing a key role in our understanding of the world, especially to date, do not in fact cover the full spectrum of one's' potential understanding. Now, reflect that socially oriented methodologies are not considered appropriate by some in relation to natural science's 'tried and tested' methods of knowledge creation and it becomes interesting as to why. An argument made here is that socially oriented methods can fail in their attempts to force fit works into a traditionally oriented natural science world, whilst harder natural sciences have failed in attempting to 'measure' the complex social world and the decisions made within it. Heralded physicist Max Planck sums up this developmental nature of understanding quite well, insofar as:

A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.

Max Planck (1950. P.33)

It is thus argued that natural and social 'knowing' is intrinsically linked, but concerned with different aspects of knowing within wider cycles, however one chooses to perceive them. This focus on aspects, rather than comparison begins to suggest that certain situations require harder, measurable and generally more replicable scientific methods, while others require softer, reflexive and generally more specific methodologies. This element of suitability brings us back to the debate around intervention and into what one intervenes. If understanding the genome is 'hard', then understanding to what extent we use human cloning is 'soft'. The relationship between hard and soft essentially boils down to measurement. Can it be defined and understood in its entirety, with rigour replicable by others, then it is likely to be hard and representative of the natural sciences. If it is a version of the truth, made with either certain assumptions, or appropriate remedies and resolutions to suit the specific scenario, then it is likely social and thus, soft(er).

What has become conventional within the social sciences is to find common ground with the natural science community, finding and building processes deemed to have equality in terms of rigour that reflect such hard methodologies, and thus make their connection with the social world marry to that of the natural. Now as Jim Parsons' portrayal of the hard science focused character Dr Sheldon Cooper on the frequently aired TV show the 'Big Bang Theory' states that 'the social sciences are largely hokum', it becomes paramount to clarify why such a polarised view would exist. Albeit fictitiously in this example, but most certainly a basis upon which social science has attempted to defend. Like the fathers of science in the face of religious persecution and doctrine, the social sciences must contend with some (often more eloquently) presented challenges, such as that by Lord Kelvin:

When you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind.

William Thompson (Lord Kelvin), 1883, (in Gilbourne and Andersen, 2011, p.39)

And;

A biologist, if he wants to know how many toes a cat has, does not 'frame the hypothesis that the number of feline digital extremities is 4, or 5, or 6', he simply looks at a cat and counts. A social scientist prefers the more long-winded expression every time, because it gives an entirely spurious impression of scientificness to what he is doing.

Anthony Standen, 1950, p.151

While;

Science may be described as the art of systematic over-simplification – the art of discerning what we with advantage omit.

Karl Popper, 1988, p.44

Similarly;

It is hardly an exaggeration to say that a chimpanzee kept in solitude is not a real chimpanzee at all.

Wolfgang Kohler, 1926, p.293

This relationship between the deductive doctrines of testable truth vs. inductive rationalisation through generalisation suggests that the two avenues of discovery are in opposition, and that somehow they need be validated within the context of the other's (likely natural) science viewpoint of the world and the creation of valid knowledge within it. This misses a very key point insofar as the argument laid before readers here is that in fact the two avenues serve different purposes, and that each relates to the world as experienced, while comparison of tools and methodologies within each other's setting can only ultimately lead to failure.

Trochim (2006) discusses the relative merits and values behind deductive and inductive research, leading us to reflect on Karl Popper and Fred Dretske scenarios of swans and conductive metals respectively for example. The key issue here, as with many scholarly views, is how inter-related the two are, and the fact that they can equally serve as different parts of a harmonised cycle. Now match this focus on cycle with the natural and social context of scientific research and we begin to move towards a place of understanding within a wider context. We are now not talking about the merits of quantitative / qualitative, or natural / social, but in fact the appropriate use of one or the other for the given scenario. Are we investigating the atomic weight of magnesium, or are we seeking to understand the manner in which the allocation of magnesium mining concessions may be used to facilitate overcoming apartheid based issues of social development in South Africa. Leading us to ask, how does one position a particular study or research question within understandable research constructs, especially with regard to knowledge creation for the purposes of research in general, and especially for a PhD project. One does this through a methodology.

5.2.1.1 The nature of method and methodology

Ison (2008) presents that in thinking about method we are concerned with a given, something which is set much like a manual or recipe. He adds however that when we consider methodology, we should be concerned with specifics and the particular use of tools for a defined setting. Furthermore, Ison outlines that a methodology is not a 'thing', but something that arises from what is done, and is thus the result of inquiry where neither theory nor practice take precedence. This view is shared by Wilson (1990) who also sees the methodology as representing a set of guidelines to allow research to resolve particular problems. The methodology encompasses all the components of research however, inclusive of philosophies and techniques, with Wilson adding that methods and tools will be dependent on the methodology selected. Dainty (2008) adds that in construction management research, the research methodology in social enquiry represents far more than the methods adopted in a study, and also encompass the rationale and the philosophical assumptions that underlie that study.

The consequence of this is the design of relevant research methods to investigate problems, and thus collect, analyse and interpret that data accordingly as part of a research strategy (Wilson, 1990; Dainty, 2008; Saunders et al., 2012). To provide the following discussion with an element of consistency within what is an often conflicting body of knowledge regarding methodology in the social world, it is commonplace to give credence to a particular taxonomy, such as that by Saunders et al. (2012), Gray (2004), Meredith et al. (1989), Dainty (2008) or Blaikie (2010) for example. For the purposes here, the work of Mackenzie and Knipe (2006) who present the methodology in terms of a research process (or journey) is of value, with expansions of particular themes of that journey being expanded upon here to reflect my position in respect to explanations presented by Burrell and Morgan (1979). This framework is highlighted via Figure 5A, with its subsequent components and corresponding methodological decisions being outlined as part of this chapter.

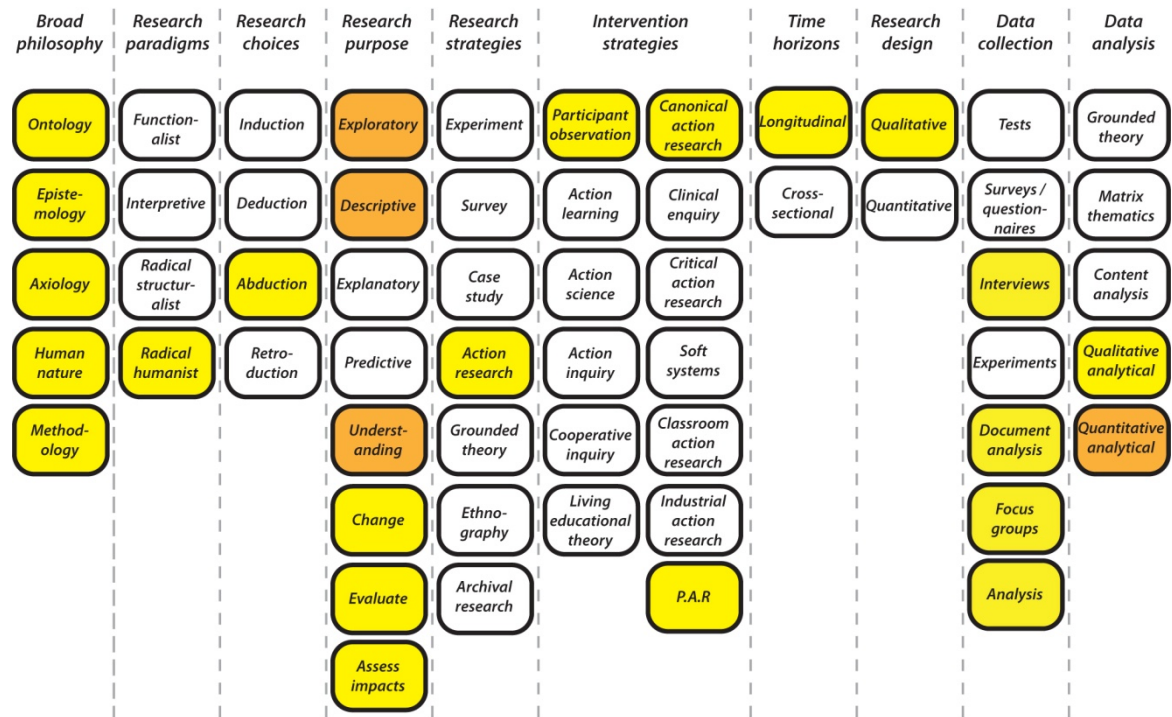


Figure 5A - Selection of the research framework

(Source - Author)

NOTE: Yellow are primary selections, with Orange representing supporting elements

5.2.1.2 Research Philosophy

The philosophy of research frames the nature of knowledge as well as the manner in which one develops it (Saunders et al., 2012). With a number of facets, a research philosophy outlines the manner in which one views and understands the world and especially sets the guidelines through which one understands it. A suitable medium through which to do this has been characterised through nomothetic and ideographic ideas about knowledge creation, characterised by Holden and Lynch (2004) who present that the modern research paradigm is polarised by subjective vs. objective approaches to science within our world. They frame this polarised view by identifying four assumptions that make up research philosophy based on ontology, epistemology, human nature and methodology. Developed from the neatly presented work of Burrell

and Morgan (1979), with an element of development in accordance with Saunders et al. (2012), Fellows and Liu (2009) and Holden and Lynch (2004) for example, the continuum between these polar views is presented via the following:

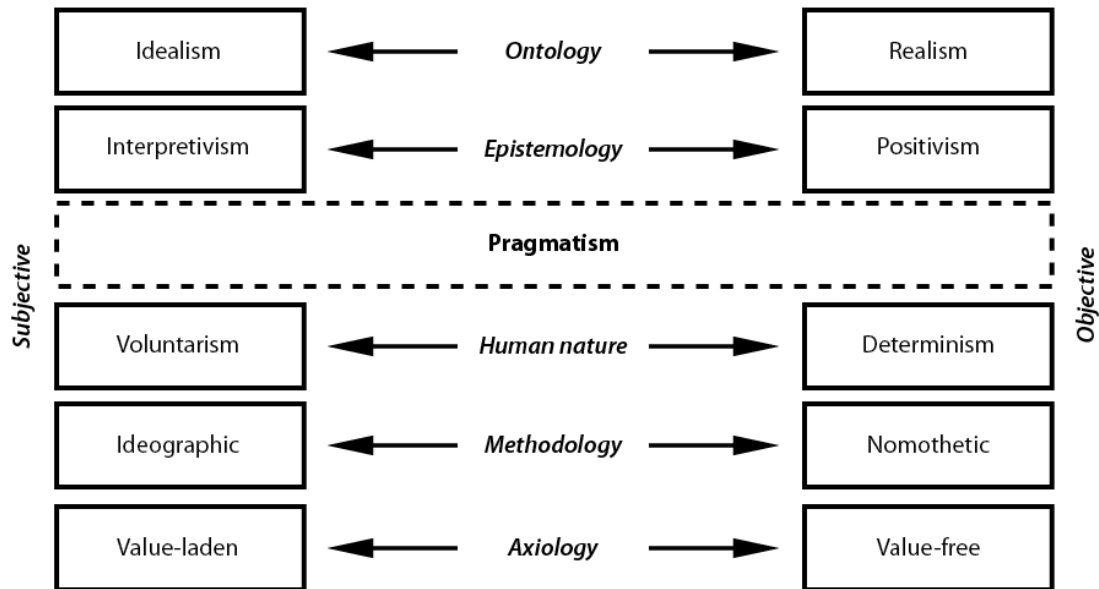


Figure 5B - Adaptation of the nature of social science

(Source - Author)

Ontology is concerned with the nature of the world (Coghlan and Brannick, 2005), whereby reality can be perceived as being objective (and a form of externality to human beings), or whether the understanding of it is via our own awareness and consciousness and thus subjective (Burrell and Morgan, 1979). Epistemology, or 'the grounds for knowledge' (Coghlan and Brannick, 2005), is polarised by Interpretive or Positivist viewpoints, and is concerned with the acquisition of knowledge. The issue here is whether one sees knowledge as an objective body of content or a more subjective experience of one's own reality (Sexton and Barrett, 2003). Epistemological and Ontological considerations are linked, as one view of the world intrinsically requires a particular claim about what exists and may be realised and made known. Indeed Scott

and Usher (1996) believed most researchers to hold these relative standpoints tacitly. Epistemology, from a more classical viewpoint, focuses on the ability to arrive at a particular conclusion through the use of objectivity. This is the basis upon which the natural sciences are built and was seen for many years as the good grounds from which to judge the validity of knowledge claims (Farren, 2005). Usher (1996) adds that more empiricist epistemologies believe that a truth can be known with no contradictory explanations. He goes on to warn of the dangers of natural science approaches to educational or social research, with the underlying ontological assumptions of order representing a stumbling block to the understanding of an array of vantage points. Burke Johnson and Onwuegbuzie (2004) present that this vantage point dichotomy is characterised by quantitative and qualitative purists, with Mixed Methods Research (MMR) and its philosophical partner pragmatism representing a more appropriate research foundation.

While Lincoln and Guba (1994) may view that questions of methodology are secondary to ones of epistemology and ontology, and with a proclivity of debates being around the polarisation between positivist and interpretivist standpoints, Saunders et al. (2012) add that an either/or debate may in fact be impractical in practice. The pragmatic view places the research question at the centre of the debate regarding research selection and suggests that certain approaches will be better than others to suit situational specifics. They add further that the pragmatic view, leading towards a mixed methods position involving both quantitative and qualitative methods is not only possible, but highly appropriate in one study. This places a pragmatic view outside the confines of the two 'poles' and instead raises the issue of the appropriate use of each given the research aims. Cameron (2011) via her presentation of the 'Five P's' of MMR in the form of paradigms, pragmatism, praxis, proficiency and publishing, suggests that MMR has begun to be considered as the third methodological movement. What this highlights, as with the use of pragmatism in avoidance of pointless concepts debate outlined by Tashakkori and Teddlie (1998), is that the pragmatic vantage point affords researchers to focus on scenario appropriateness, rather than rigorous followership of method then question. Indeed John Dewey argues that:

(pragmatism) presents itself as an extension of historical empiricism, but with this fundamental difference, that it does not insist upon antecedent phenomena but upon consequent phenomena; not upon the precedents but upon the possibilities of action. And this change in point of view is almost revolutionary in its consequences.

John Dewey, 1925 (in Dewey, Hickman and Alexander, 1998)

With regard to our human nature, the fulcrum of this debate is the 'model of man' reflected within the voluntarism – determinism discussion centred on our socio-cultural assumptions. Relating to our perceived ideas of the bonds between the environment and ourselves, this essentially ranges from active to passive accordingly. The issue here is the manner in which we gather data and understand the environment upon which our concerns relate; thus, do we initiate situations through our actions and interventions (active) or respond to external factors (passive). Burrell and Morgan (1979) argue that through either implicit or explicit means, one must make clear their views relating to voluntary and situational factors that account for the activities of people within social settings. Such assumptions it is argued are essential in the utilisation, understanding and formation of social-scientific theories about the relationships between 'man' and society. When we consider methodology however, we centre on the dichotomy between nomothetic and ideographic (often spelt with an 'idio' in psychology for example) knowledge creation. Burrell and Morgan (1979) present one of the more concise descriptions of this debate so far as it dictates the nature of how one ascertains information and creates knowledge (see Jaccard and Dittus, 1990 for example). The nomothetic approach to the social world is more akin to the application of systematic process and techniques, using protocols and testing, and is by its nature likely quantitative. One can make a clear link to the natural sciences in this arena and one might find nomothetic examples of social science knowledge creation in projects that aim to align to the natural sciences as a way of creating what is considered valid to the natural sciences.

The ideographic approach contrastingly suggests that one can only fully understand a situation by obtaining first-hand knowledge of the subject under investigation (Burrell and Morgan, 1979). The consequence is immersion of the researcher into the chosen setting, getting inside of situations, allowing one's subject to reveal its characteristics during the process of investigation. The ideographic creation of knowledge suggests however that the formation of what is known is inherently personal and based on a creation of reality subjectively held with that person. To subsequently discover something within this domain requires action within the social world, and thus one can categorise objectivity, generalisation and the creation of universal truths with nomothetic knowledge creation, while ideographic knowledge creation centres on the human and the creation of localised knowledge specific to the complexities of the human / social scenario (Dainty, 2008). An important aspect to this debate begins then to focus on the personal values a researcher in essence 'brings with them' into the research and how one translates a given scenario. This is characterised by axiology.

Axiology is concerned with our judgments about value, and while it may include the values we are embossed with, it is concerned more with the process of social enquiry we employ (Saunders et al., 2012). Kafle (2013, p.194) makes reference to how our:

Values provide the standard for the evaluation of epistemological and ontological claims. In reference to research literature, axiology also refers to the involvement of the researcher's values and opinion in the process of knowledge generation.

Thus as we challenge ourselves with regard to positioning along the subjective / objective dimension, we also begin to ask to what extent we shall incorporate and judge our interaction within the social world via our own values. The Hermeneutic Cycle begins to play a critical role in the understanding of preconceptions and prejudices, through which we understand, from the false ones we may misunderstand (Gadamer, 1976). The preconceptions of the involved parties in social research, and the views embodied by the researcher play a significant role in the judgment and structure of social research. The nature of the values form either value-free or value-laden perspectives, with objectivists taking a value-free perspective and subjectivists leaning towards the contrary.

5.2.1.3 Research paradigms

A concluding vantage point to this debate is of paradigms, specifically in the summation of views on epistemology and ontology, but in relation to one's research objectives. Paradigms represent a cluster of beliefs and direct the manner in which research should be done, with Saunders et al. (2012) finding value in the work of Burrell and Morgan (1979) in their summation of paradigms via their four box model contrasting subjectivism and objectivism, with radical change and regulation. This view of paradigms contrasts the research philosophies paradigm view presented by Sexton and Barrett (2003) that sees an alignment between subjectivist and objective approaches in a graph like continuum with interpretivism to positivism on one axis, and realism and idealism on the other. The Sexton and Barrett view simplifies the connectivity between research aims and the outlined issues highlighted by the pragmatism debate highlighted above. Consequently, the four paradigms view is adopted here as presented in Figure 5C.

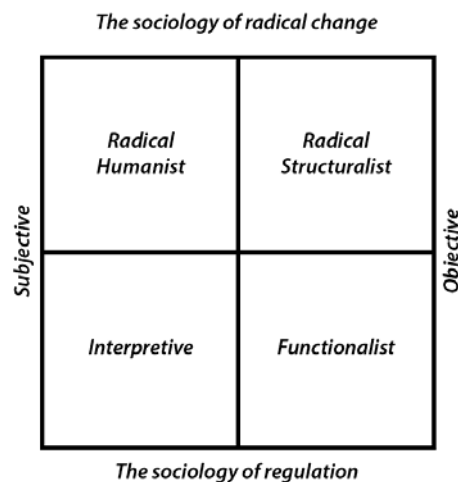


Figure 5C - The four paradigms for the analysis of social theory

(Source - Adapted from Burrell and Morgan, 1979)

The dominant knowledge creation framework for the study of organisations to date has been that of functionalism, where one takes an ontologically objective standpoint in order to make rational explanations of organisational actions. Key to this is the focus on organisations as rational entities and the search for rational solutions to rationally

defined problems. Leaning towards a realist, positivist, determinist and nomothetic position, this paradigm is characterised by its search for explanations of the status quo and for finding consensus etc. The interpretive paradigm however is concerned with the manner in which humans make sense of the world within which they live. By focusing on the attachment of meaning to organisational actions and everyday life, research within this setting is more about unearthing unknown effects of human interaction, the extent of power relations or political social life in general for example. Located still within the regulatory position but taking a subjectivist standpoint, the aim here is to understand and explain what is going on, not to seek to change that which is happening. The radical humanist vantage point adopts a critical perspective on organisational life, with this paradigm sharing much with that of interpretivism insofar as it tends to emphasise realism, interpretivism, voluntarism and be ideographic in nature.

Importantly Burrell and Morgan (1979) identify that radical humanism commits to a transcendence of existing social limitations. Here there is the relative inversion of the paradigm compared to functionalism, with the concern being the critique and corresponding challenge to the status quo. By focusing on the removal of constraints within which humans interact and exist, this paradigm is concerned with the fulfilment of oneself and any corresponding developments outside of the 'ideological superstructures' that seek to limit our understanding and growth. This paradigm by its very nature is concerned with change, action and a focus on improvement. Radical structuralism however focuses on achieving radical change through an understanding of consequent organisational phenomena such as power relations and conflict issues (Saunders et al., 2012). By focusing on structures, hierarchies and coordinating issues it takes an objective standpoint by seeing entities as external. This is more where the alignment of Marxist ideologies is relevant opposed to the understanding of social meanings via the radical humanist perspective. Radical structuralism can therefore be said to focus on the 'what should' be done, opposed to 'what is' done under radical humanism.

5.2.1.4 The philosophical position of the study

In taking a particular research position it has been argued that one should have a clear understanding of the linkages between the nature of reality one considers, the associated philosophical ramifications with those considerations and the relationship with the research aims / questions. Decisions made here inherently relate to my own views on reality and the manner in which one either chooses to engage, or disengage with a form of reality. I feel connected to the reality I understand, and feel that perceptions of what is true to others is held uniquely by them. I also feel that I am capable of understanding situations through more than one lens, and while an argument can be made for action in the social world being aligned to a radical humanist paradigm, there is in fact the ability to inform action and change outside of this definition.

I find comfort in the basis of some of the fundamental ideas of radical structuralism for example, but my more subjective view of knowledge creation and what I can best describe as 'relevance' makes me lean away from this side of the continuum. Taking a more value-laden view coupled with a primarily subjective basis, I find myself declaring a radical humanism standpoint, but again, find some relevance in the interpretivist paradigm and its value on working within the norms of regulation. Importantly then, I take a pragmatist view within the radical humanist paradigm due to the aim being on the development, improvement and on situational elaboration, as well as the inclusion of context. This idea of context is important, and I feel the pragmatic view towards change is important, because making decisions around change from an external viewpoint restricts the ability to flex, while too much flexibility can avoid either being relevant or contributing to theory. Thus the pragmatic, subjective, ideographic and value-laden view is taken here, with a structure akin to that of abduction.

5.2.2 Research choices

There are invariably two prominent avenues through which to conduct research, and each has a significant impact on the way a research project is structured. These avenues can be characterised through induction and deduction. The deductive doctrine can be

said to be more akin to the natural sciences, where developed theory is subject to rigorous testing that aims to predict, quantify and control variables. Highly related to the reductionist view of problems, deduction is associated with more deterministic views of the world and consequently positivist in nature. A result of such a position is the generalisation of knowledge from a position of reductionism. Although not restricted to quantitative data collection, this view leans more towards objectivity and thus a separation between researcher and that which is under study. An opposing research choice would be through the inductive doctrine. Here the concern is to localise focus and to build theory from a situation, attaching human value and sense of understanding of a situation. This position is consequently more qualitative, subjective, interpretive and holistic in its nature. This also makes this form of study likely localised in nature, insofar as it is less concerned with generalisation by it being more flexible in nature.

As with research philosophies, it can in fact be both impractical and illogical to restrict oneself to one vantage point, and that it is often more appropriate to focus on a combination of approaches to suit particular research questions. Blaikie (2010) in fact adds two further dimensions to this discussion, the avenues of abduction and retroduction. Sober (2001) presents abductive inference as that which presents the best explanation for an observed phenomena. Retroduction on the other hand, while closely linked with abduction, aims to build hypothetical models and mechanisms from data to build and test empirically the phenomena and thus find 'real' explanations for it. Abduction and retroduction both represent analytical tools of the critical realism approaches, while retroduction requires the researcher to bring assumptions into the formation of inferences, and thus differs from abduction in this manner significantly. While abduction can be said to present a scope of limitation through the use of theoretical lenses, retroduction does not well align to the formation and production of theory driven research. Consequently, it falls outside of the three fundamental modes of logical reasoning of induction, deduction and abduction. In taking a pragmatic outlook in this project, and in accordance with the view presented by Callaway (2007), that indeed pragmatism is by proxy an extension of the logic of abduction, with the two practicably connected, abduction is adopted in this study.

5.2.2.1 Justification and purpose of the study

Important here is elaboration as to why abduction suits the nature of the study. Later sections make clear how such a structure came to fruition, but at this juncture, the discussion is more about the purpose abduction serves. Saunders et al. (2012) highlight how in an arena of study where there is a plethora of knowledge, one might lean towards deductive reasoning, while a topic less studied, but promoting debate may in fact lean towards inductive reasoning. Our topic straddles these boundaries insofar as there is a wealth of literature on the delivery of infrastructure, the efficacy of organisations and the use of participatory methodologies, but there is little on the convergence of the three. This interaction is where this project differs, and this element of creation and more specifically, inference, is where abduction lends itself to the project. The contextualisation of Blaikie (2010) is of value here with regard to the appropriateness of particular approaches (see table 5.1).

| Purpose | Inductive | Deductive | Retro- ductive | Abductive | Types of research questions |
|-----------------------|-----------|-----------|-------------------|-----------|--------------------------------|
| Exploratory | 3 | | | 3 | What |
| Descriptive | 3 | | | 3 | What |
| Explanatory | 1 | 3 | 3 | | Why |
| Predictive | 2 | 3 | | | What |
| Understanding | | | | 3 | Why |
| Change | | 1 | 2 | 2 | How |
| Evaluate | 2 | 2 | 2 | 2 | What and why |
| Assess impacts | 2 | 2 | 2 | 2 | What and why |

(3=major activity; 2=moderate activity; 1=minor activity)

Table 5.1 - The appropriate contextual application of research approaches

(Source - Adapted from Blaikie, 2010)

Whilst challenge is made to no research approach representing a major activity in the realm of change, commonality is found in this representation as a whole, especially the manner in which abduction is valuable in explaining, describing and understanding a scenario. Alignment can be found here with the paradigms of Burrell and Morgan for example, with a broad philosophical agreement made with Blaikie's research question types.

This study is also centred on a component of change and improvement in a longitudinal manner, which by its nature constitutes evaluating and assessing the impacts of change over time (Gray, 2004). Furthermore, in the creation of a change programme, specifically concerning the how and the what to change, that by consequence drives a step back into theory, the abductive approach aligns to exploring a particular setting (organisation), describing what is going on and generating a structured understanding. This study is broad in the sense of asking how, in terms of both how to change and how to improve the delivery of infrastructure. To do this however, the study begins by asking what is going on and why is that happening, and while this study evolved somewhat, the underlying principle of stepping into the real world and returning to theory has not changed from the outset. The consequence of this is the alignment of the study to the **abductive** approach, as it is initially concerned with **exploring, describing** and **understanding** the problems affecting infrastructure delivery, finding potential solutions that 'best explain' such issues and then primarily seeking to **change** the given scenario, and **evaluate** and **assess the impacts** of the given change solution.

5.2.3 Research strategy

Saunders et al. (2012) and Gray (2004) summate research strategies to include experiments, surveys, case studies, action research, grounded theory, ethnography and archival research, with them setting the framework for research application. With a number of philosophical decisions being made already within this chapter, it becomes important to frame the nature of change and specifically, the relationship between a radical humanist standpoint and that of critical theory. Critical theory does not accept the world as given, and challenges perceptions and connections between social actors

and relative power relations, historical conditioning and how people perceive their personal and social realities (McNiff and Whitehead, 2006).

This connects a radical humanist standpoint with action based strategies, and thus we are invariably talking about the involvement of the researcher within a social setting who is thus concerned with both action and research. More embedded forms of action based research can be found via grounded theory and ethnography, but these are not aligned to a project of this nature that has a problem and a desire to connect with theory. Other forms of social based research, such as case studies for example continue to promote an element of objectivity and thus remain interpretive and generalisable. Focusing on localisation, the use of abduction, and consequently a connection between pragmatism and action research (AR) as discussed by numerous authors inclusive of Reason (2003), this project is focused on an AR based research strategy. AR however is more of an umbrella term for a host of intervention based research strategies. To be able to build an appropriate research strategy, we must first understand the extent to which interventionist strategies differ.

5.2.3.1 The fundamentals of Interventionist strategies

Action Research (AR) is widely attributed to social psychologist Kurt Lewin, whereby through the Human Relations work of the Tavistock Institute it first gained prominence. Fox (2003, p.88) presents that AR as a term was coined by Lewin to describe a process through which:

Theory would be developed and tested by practical interventions and action; that there would be consistency between project means and desired ends; and that ends and means were grounded in guidelines established by the host community.

Specific focus was given to the iterative shift between action and reflection by participants and researcher, known more commonly now as the cycle of action (Kindon et al., 2007). Importantly, Herr and Anderson (2005) present a valuable typology for research positionality in relation to AR, in that they outline along a continuum relationships between a researcher and their given situation, ranging from insider to

outsider. The value of understanding this relationship is vital when making clear the decisions one has undertaken throughout a research project of an AR nature. Does the research originate within an organisation, by an employee about their own practice, or is one studying the operation of an organisation from an outsider viewpoint. Susman and Evered (1978) present a useful framework through which to understand the nature of action research in comparison with the positivist sciences via table 5.2.

| Points of comparison | Positivist science | Action research |
|--|--|---|
| Value position | Methods are value neutral | Methods develop social systems and release human potential |
| Time perspective | Observation of the present | Observation of the present plus interpretation of the present from knowledge of the past, conceptualisation of more desirable futures |
| Relationship with units | Detached spectator, client system members are objects to study | Client system members are self-reflective subjects with whom to collaborate |
| Treatment of units studied | Cases are of interest only as representations | Cases can be sufficient sources of knowledge |
| Language for describing units | Denotative, observational | Connotative, metaphorical |
| Basis for assuming existence of units | Exist independently of human beings | Human artefacts for human purposes |
| Epistemological aims | Prediction of events from propositions arranged hierarchically | Development of guides for taking actions that produce desired outcomes |
| Strategy for knowledge growth | Induction and deduction | Conjecturing, creating settings for learning and modelling of behaviour |
| Criteria for | Logical consistency, | Evaluating whether actions produce |

| | | | |
|---------------------------------|--|--------------------------------------|--|
| confirmation | | prediction and control | intended consequences |
| Basis for generalisation | | Broad, universal and free of context | Narrow, situational and bound by context |

Table 5.2 - Comparisons of Positivist Science and Action Research

(Source - Adapted from Susman and Evered, 1978)

The issue with AR as a concept however is the range of applications that fit under its umbrella. A non-exhaustive list of the more prominent interventionist strategies are highlighted below, compiled by the researcher:

Participant Observation (PO):

PO can be described as the systematic description of events, behaviours, and artefacts, enabling researchers to learn about the activities of people under study in their natural setting through exposure to, or involvement in, the day-to-day or routine activities of participants (Kawulich, 2005; Schensul et al., 1999). PO serves as an important explanatory tool for a natural setting of study. Considered a staple for anthropologists (DeWalt and DeWalt, 2010), it is participatory in the sense it requires a researcher to enter a situation, using elements of deception and impression management to be effective, requiring the researcher to then step back and be objective. Essentially a data collection method (DeWalt and DeWalt, 2010), Schensul et al. (1999) identify a number of situations in which the use of PO can aid research:

- to identify and guide relationships with informants;
- to help the researcher get the feel for how things are organized and prioritized, how people interrelate, and what are the cultural parameters;
- to show the researcher what the cultural members deem to be important in manners, leadership, politics, social interaction, and taboos;
- to help the researcher become known to the cultural members, thereby easing facilitation of the research process; and

- to provide the researcher with a source of questions to be addressed with participants

DeWalt and DeWalt (2010) add that PO can be used to improve the validity of qualitative research, and that multiple sources are used to improve validity, inclusive of interviewing, document analysis, surveys and questionnaires. Importantly, Laurier (2010) presents how PO 'casts' the researcher into a category (in the most part) at the outset of the process. Whilst there is no set pattern for the activity within a PO exercise, one should expect to be seen as a greenhorn, beginner, new or worse still, as incompetent, a tourist or an outsider. Laurier argues that whilst negative in outlook, this serves a purpose as not to place too much requirement on the researcher and thus allow them to progressively become one of the team. This adds to the argument that PO serves as a tool within a wider research approach, allowing a researcher to both explain and explore a situation to find norms.

Action learning:

Action learning focuses on the coming together of a number of people, possibly regularly, in order to learn from one another, predominantly focusing on experience. Talking of the influential work of Reg Revans, who implanted and described it as being used across different organisations, the aim is to share experiences, and more often identify with one's own naivety or ignorance, and learn from others who have applied, both successfully and unsuccessfully, ideas in slightly differing areas. The primary goal here is to share and learn around at least generally common themes or issues.

Action science:

Based in the work of Seng, he advises that action science is a field of inquiry that aims to explore the 'reasoning and attitudes which underlie human action', producing more effective learning as a result in individuals, organizations and social systems. Developed by Chris Argyris and Donald Schon in 1974, action science focuses on development of reasoning behind our actions, and thus, the development of the 'theory in use' (what we actually do) and 'theory in action' or 'espoused theory' (what we say we would do).

Resulting in the identification of single and double loop learning, action science is a reflective self-enquiry, and to a degree, is a supplementary process to such areas as action learning, action research and participatory action research. Put simply, action science may not be wholly focused on getting to a result, but towards how one would normally get to a result, or indeed, how one has historically gotten there and thus changing that behaviour, a key contrast to other methods.

Developmental Action Inquiry:

Associated with the work of Bill Torbert, Developmental Action Inquiry is seen as a form of scientific inquiry, but is conducted as part of 'everyday life'. With a focus on ego development, Torbert identifies that the latter stages of development lead to reflection on one's own behaviour in action. Such reflections and changes, lead to the modification of others and thus has implications for both leadership and power, as well as the formation of communities of inquiry.

Cooperative inquiry:

Reason's cooperative enquiry (or collaborative enquiry) emphasizes that research should be with, not on participants and that they should be fully involved as co-researchers. Originally developed by Heron, cooperative enquiry focuses on the deepening of knowledge and experience about an initial proposition through a cyclical approach that addresses four different types of knowledge, namely, propositional knowing (such as with contemporary science), practical knowing (born from actual doing), experiential knowing (created through interaction and feedback with our surrounding world) and presentational knowing (such as the rehearsal process from which new practices are made).

Living educational theory (LET):

LET somewhat transform the concept of AR, suggesting that application of AR methods is more than their use, with the researcher needing to reflect on their own practice and interaction with the study area. LET moves away from the 'how' type questions toward

undertaking research, and instead gives focus to a researcher's existential and spiritual beliefs, especially those that are espoused and challenged. LET in this regard brings forward 'I', and a focus toward practice and personal development.

Canonical Action Research (CAR):

CAR is a formalisation of the work (and models) proposed by Susman and Evered (1978), with 'canonical' following from its wide adoption within the social sciences. Iterative in nature, and possibly more akin to 'traditional' in formation, CAR is aligned to the work of Lewin (1946) and French and Bell (1999) in focusing on organisational development through problem solving and simultaneous knowledge building. CAR requires agreement on a series of principles (Davison et al. (2004) propose five) that aim to deal with the conflicting aims of addressing organisational problems and contributing to scholarly knowledge through research. CAR in this regard is prescriptive, somewhat closed and a more widely recognised form of AR, with Susman and Evered proposing the five stage model of (1) diagnosis; (2) planning; (3) intervention; (4) evaluation; and (5) reflection. Kemmis and McTaggart (1988) quite famously proposed the evolution of this cycle to a spiral of action, with each cycle moving ever closer toward an end goal or solution. Additionally, McKay and Marshall (2001) suggested that a juxtaposition of research and client problem solving cycles through CAR can in fact be more helpful in solving the issue of AR effectiveness in practical terms, and usefulness to knowledge creation through research.

Clinical Enquiry:

Schein (1999) emphasis the value of employee participation in the AR process. The idea being, that change is more likely when created by those through which it is to be implemented. Schein sees that there are two focal points for AR in this manner, through the fulfilment of the researcher's relevant agendas, and the involvement in the sponsor's issues, involving the researcher in such issues, rather than the other way around. Working from the analogy of clinical enquiry by a clinician, researcher consultants are involved by client sponsors in the diagnosis (AR) of a sponsor's issue.

Critical Action Research:

Critical AR can be seen as an evolution from the dissatisfactions that arose in relation to classroom focused AR represented within educational research literatures. It is seen as a divergence from such work that fails to take a broad view of the relationship between education and social change. With a focus on improvement and self-reflective collective self-study of practice, Critical AR acts as an extension to more traditional approaches, even participatory ones by combining critical theory with the AR paradigm. Special focus is given to the removal of the 'professional' researcher, research 'subject' power hierarchy, and thus, promotes an element of collaborative discovery and definition.

Soft Systems Approaches:

With its origins in organisations utilising 'hard-system' types of engineering, soft systems methods represent the 'human systems' that have emerged in conjunction (or opposition depending on viewpoint) with information and production development. Heavily developed by the work of authors such as Checkland, Scholes, Flood and Jackson, soft systems is distinct from positivistic science with its emphasis on hypothesis testing (Kemmis and McTaggart, 2005). Typically requiring an outside consultant, the aim is to generate systems that represent a real world problem and define new ways of working or courses of action.

Classroom Action Research:

Typically involving qualitative interpretive modes of data collection and inquiry by teachers, either as the practicing academic or with the help of academics (Kemmis and McTaggart, 2005). The aim is to make judgements about (and thus improve) a teacher's practice. Rather than with a self-reflective focus, or concerned particularly with actions and decision making, measurement and proof of action is required and thus testing either side of a particular action is common. This form of AR is more about what 'I do', rather than necessarily what 'I think' about it. The aim is the betterment of a group who in many ways have no say over what is good for them, the idea being that they will 'see the benefit' in the future.

Industrial Action Research:

Characteristically consultant driven, it practices the need for multiple organisational levels to collaborate together, and with various forms of social scientists (Kemmis and McTaggart, 2005). Differentiated from action science, it seeks to use reflection as a tool for broader organisational change. Considered more humanistic and individual focused, it fails to adhere to more critical forms of AR, yet its goals focus on the improvement of employee relations, social systems and organisational effectiveness.

Participatory Action Research (PAR):

This is typically an approach within communities that requires both participation and action, using action as a means of understanding. More simply, it requires both researchers and relevant participants to either explore / examine a problematic situation, or take action to improve it (Kindon et al., 2007). Born from the workings of Paulo Freire and his community based research, by the 1990s, PAR had begun to blend with AR (such as with Whyte, 1991) and not solely focus on developmental, minority and community based situations. Kindon et al. (2007) maintain that AR, PAR and Action Learning are the most common terms used to describe participatory, democratic and worthwhile research, bringing together action and reflection, theory and practice (Reason and Bradbury, 2008).

Kindon et al. (2007) provide a useful distinction between AR and PAR, in that politics plays a part in the research process itself. With this, while AR can form an enquiry into one's own practice or professional life, it does not necessarily engage participants directly in the research process. Contrastingly, PAR strives to embody research and knowledge creation outside of the monopoly of professional research. This distinction brings to the fore of whose knowledge it is, how it is created and for what purpose, such that it may be simplistically put that AR is more for my own knowledge, while PAR is our knowledge in whatever setting that may be. Reason and Bradbury (2008) add that within a PAR process communities of investigation and action evolve to address questions and issues of significance to those acting as co-researchers. Chevalier and Buckles (2013)

propose a Venn diagram of three interconnected components that include (1) Participatory - life in society; (2) Action - experience and engagement; and (3) Research - thought and growth of knowledge. It is important when considering this interlocking view to make clear the positional nature of any PAR work with regard to its focus and aims. Such that, review of such projects can be clear, as in was it for more practical purposes and thus need be judged on practical efficacy, or have an extensive research requirement and little actual action in a practical sense needs be judged.

5.3 The development of an intervention framework

With a view to intervening and creating change in the social world, it becomes important to frame that change in terms of a process, and by proxy, select the methods of intervention. Three elements of intervention make up the project approach, inclusive of PO, AR and PAR. PO and PAR have been broken out of the fold of AR methods as they serve somewhat differing purposes, and as will be highlighted by the psychological contract section below, I as a researcher feel there are important differences between AR and PAR.

For the purposes of this project, with a linkage to abduction and the nature of the work being interventionist, I find solace in the work of Susman and Evered (1978) and the more Canonical form of AR, as well as the more spiral forms developed by Kemmis and McTaggart (1988). I find this form to be a more standardised version of the methodology, and more akin to a process of implementation, improvement and reflection, rather than purely emancipatory or self-practice focused. I also relate to the manner in which it was not born out of a field of study, such as education, and thus its merits are in its process and suitability to action, rather than its reactionary matching to work either in process or already done.

A brief expansion of the five principles detailed by Davison et al. (2004) is required here however as a driving influence to the manner in which the following approach is formed. Davison et al. propose that the Canonical form of AR, in expanding the work of Susman

and Evered, address five key principles, the researcher-client agreement / relationship, the use of a cyclical process, the adoption of an appropriate theoretical framework for application (as AR without theory is not research they argue), the initiation of change through action, and finally, the process of learning through reflection on action. All of these principles are considered throughout the following section.

With the building blocks having been defined, the next steps are to define what intervention in the social world means, how one structures it and what separates the creation of academic knowledge from our actions in the social world.

5.3.1 Intervening in the social world

This preliminary premise of this project (a new IDS in essence) did not delve into the minutiae of issues around change management and the potential of the relationship with UKWASC to facilitate change. This led to a multi-stage piece of research which moved between theory and action in varying degrees. This raised the issue of boundaries, both academic and social, and the manner in which these would be addressed. Importantly, it is not possible to define boundaries in the social world, and in many ways doing so can become poisonous to the AR relationship. As McNiff and Whitehead (2006, p.11) state:

Boundaries become permeable membranes, where meanings and commitments flow between lives, and people perceive themselves not as separate entities, though still unique individuals, but as sharing the same life space as others.

This raised the issue of how to structure social intervention, and how to separate that from the creation of what one may constitute as knowledge for the purposes of theory generation. To do this, one must be clear on the terms under which one can move between knowledge and action, how one can structure such a migration and what that means for the formation of a research methodology. I find Aristotle's three basic levels of man of value here, namely *theoria*, *praxis*, and *poiesis* (see Knight, 2007). *Theoria* has the goal of creating truths or 'knowns' as discussed above. I would argue that this is the premise upon which the PhD as generally understood is commonly premised, not

completely, but following from the doctrines of generalisation, or as argued, a form of relationship with generalisation and localisation. Poiesis refers to production, and the bringing to fruition of something distinct from the human producer. Praxis, to which Susman and Evered (1978) would find philosophical foundation in, is the realm of human action and dependant on the contingent social world.

The reason for this distinction is the manner in which the project will contribute back to knowledge (theoria), via a structured engagement process bridging theory and the social world to create a meaningful output (poiesis) with a view to engendering some form of meaningful and valuable change in the social world (praxis). The following sections will elaborate on how the project structure developed to respond to these key themes and consequently find validity via these different aspects of knowledge creation.

5.3.2 Structuring intervention in the social world

A common structure within social science focused research projects is to test an initial premise with either esteemed / learned colleagues, industry or focus groups with a view to testing whether a general idea even merits attention. This premise of initial test followed by wider engagement was the essential focus this project was initially built on. The indication was, albeit with a participatory focus, to test our initial assumptions within the focus ICO, to focus on the development of a new IDS and then to do a more traditional looking case study type arrangement with other organisations focusing on principles of generalisation (Figure 5D).

For example, the 'blue' line that represents the assessment of the social world, specifically through categorisation (in order to select cases) could also lead to requiring a broader questionnaire type approach in a bid to be even further detached, and theoretically objective from the social world. For clarity, the diagram prescribes the defined steps that can be formed to suit an academic endeavour and relate to theoria and poiesis, while the 'messy' social world is broken out to represent praxis.

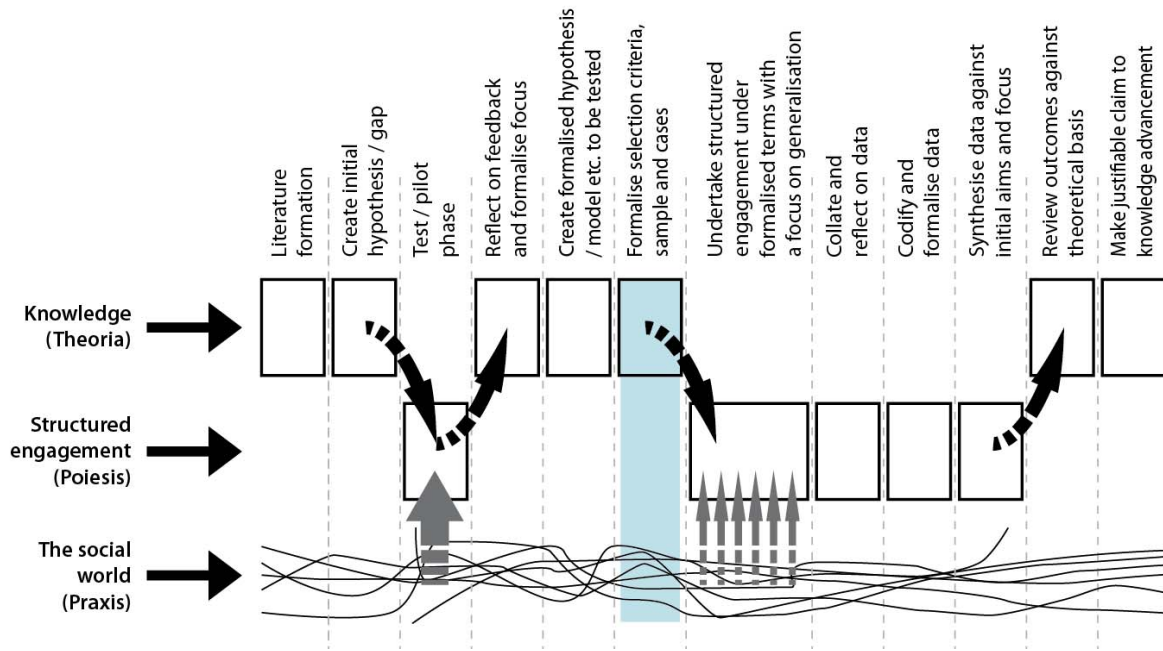


Figure 5D - Initial Case Study Model / Approach

(Source - Author)

This model of engagement has proved to be successful in bridging the gap between the social and natural sciences by introducing what many may present as scientific rigour in social research. This view of rigour suggests a natural only science formation of knowledge to which social research must relate or fit, and as argued in embryonic form earlier, is in fact more akin to being the other side of the same coin. This more tried and tested generalist method of knowledge creation focusing on multiple cases was initially considered the most apt for this project at the outset, and formed the initial research strategy (Figure 5E). The strategy presented an initial engagement with the focus ICO to understand and identify the problem gap, rather than simply test an initial premise. The project would then reflect and focus on the building of a new IDS within round 2, leading to reflection and development of the output with a view to testing in other scenarios as part of a generalising strategy.

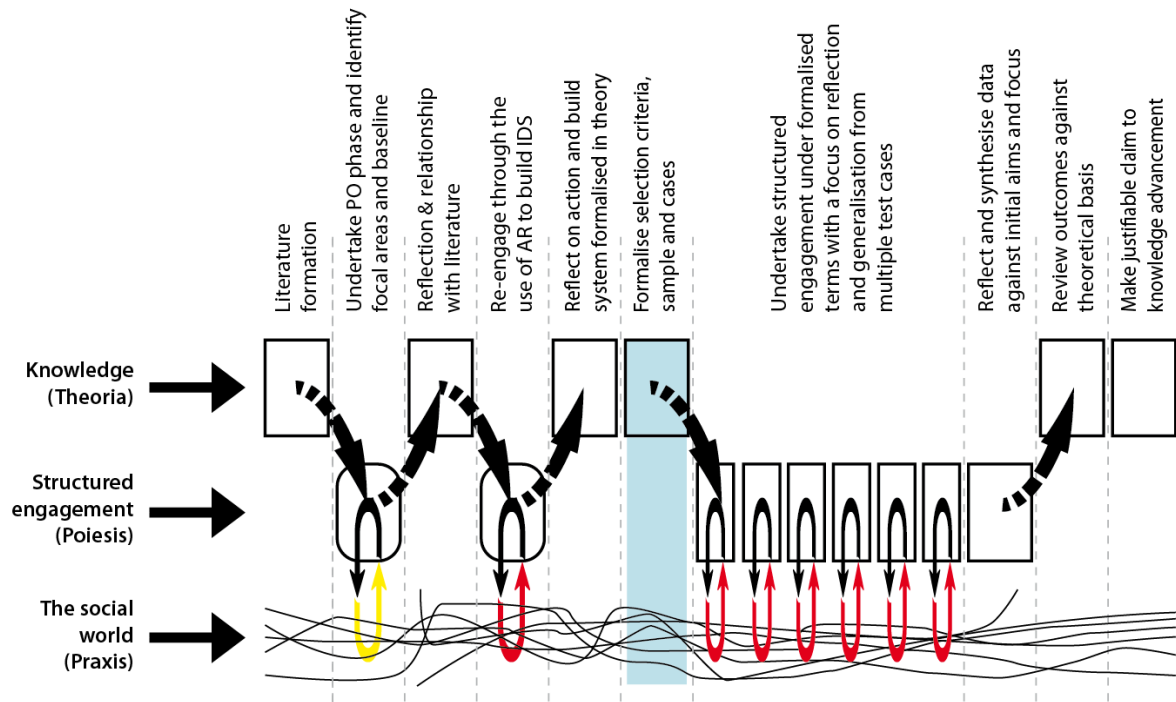


Figure 5E - Initial Research Strategy

(Source - Author)

This initial research strategy in principle suggested that the project would be in two broad action phases. A first phase spread across two parts of identifying the problem, followed by espousal and development of a solution, with a number of action oriented case studies within other ICOs forming phase two. What transpired was that a reflection process happened following the initial part of phase 1, and it was realised that there was an opportunity to do some real improvement work within the focus scenario, not simply focus on identification, but the doing as well. This raised the issue that rather than developing and defining a new IDS as an idealised formation as in the initial plan (Figure 5E), we would in fact be able to focus on enactment of change within the ICO. This led towards a strategy of change in real terms, opposed to the creation of a new system that would potentially lead to change if enacted by others. This is a fundamental element of this project, as the generation of knowledge in the social sciences is premised on the creation of social truths turned into natural facts in many ways, rather than the creation

of social facts. As we then began to focus on appropriateness, competence and change management, generalisation as a principle seemed inappropriate when seeking to create the 'optimised' specific. Development towards a change oriented project expanded the concern around how to define specificity and localisation. As will be discussed below, the element of system building remains in the form of modelling, but more as a statement of fact rather than knowledge creation. The new IDS in essence represents a 'stick in the ground' at a point in time to help frame the wider change work.

The modified research approach (Figure 5F) changed what the purpose of the PhD inherently aimed to do, albeit at the very early stage, but consequently changed how it would seek to validate itself within what we define as knowledge. To do this, the process became more akin to theory in action, opposed to the 'messy' social world being a source for theory building. The project is most certainly not an attempt at grounded theory in this regard, but instead is grounded in theory, with a view to using it and then returning to theory again to move in new directions. The result is a developmental piece of work that uses participatory methods for specific purposes at specific points.

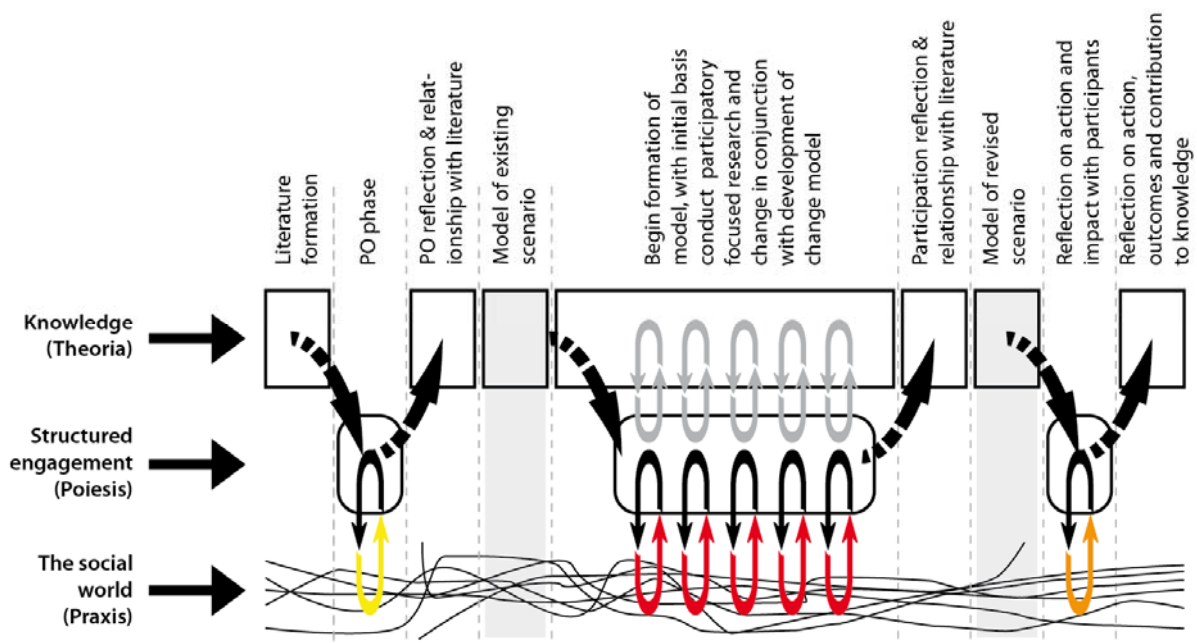


Figure 5F- The Modified Research Approach

(Source - Author)

To review what Figure 5F above represents, the project starts in the knowledge phase, understanding the broader problem and its nature with a view to defining an area of focus, in this case, the ineffective delivery of infrastructure by ICOs in the UK. The project then moves into an action based phase, but rather than testing a premise in accordance with a case study type project, the project is seeking to gain further understanding around the 'why' and the 'how'. It is actually during this phase that PO is employed as part of what is referred to as Phase 1, the aim being to highlight issues from inside the ICO. Presented with the opportunity to change a multi-billion pound ICO, and given relative free reign to suggest what we thought we should focus on at this point, a significant question was raised. If we were going to change something, given such an opportunity, how were we going to select what to change, and how were we going to do it? So this still required a step back into literature, in essence a reflection phase akin to the original plan.

The next step was to say, if something is going to change, and we are going to take advantage of this opportunity, then how do we contribute back to knowledge, and how do we measure any such change? This resulted in a reflection on the use of participatory methods and the ability to manage and measure change. The consequence being the use of participatory methods to enact change in relation to the five principles of SPMC, but that change within a singular setting would be sufficient. In tandem to this phase is the building of the change model premised in STS. In essence, a dual process of build and test. An important note at this point is the creation of interventions within UKWASC. In order to avoid blurring the lines between research, action and consultancy, a tool was 'built' that served as a bridge between the research and the action decision making levels. This tool is the Change Management Protocol (CMP), discussed below and highlighted in green in Figure 5G (also see Appendix B).

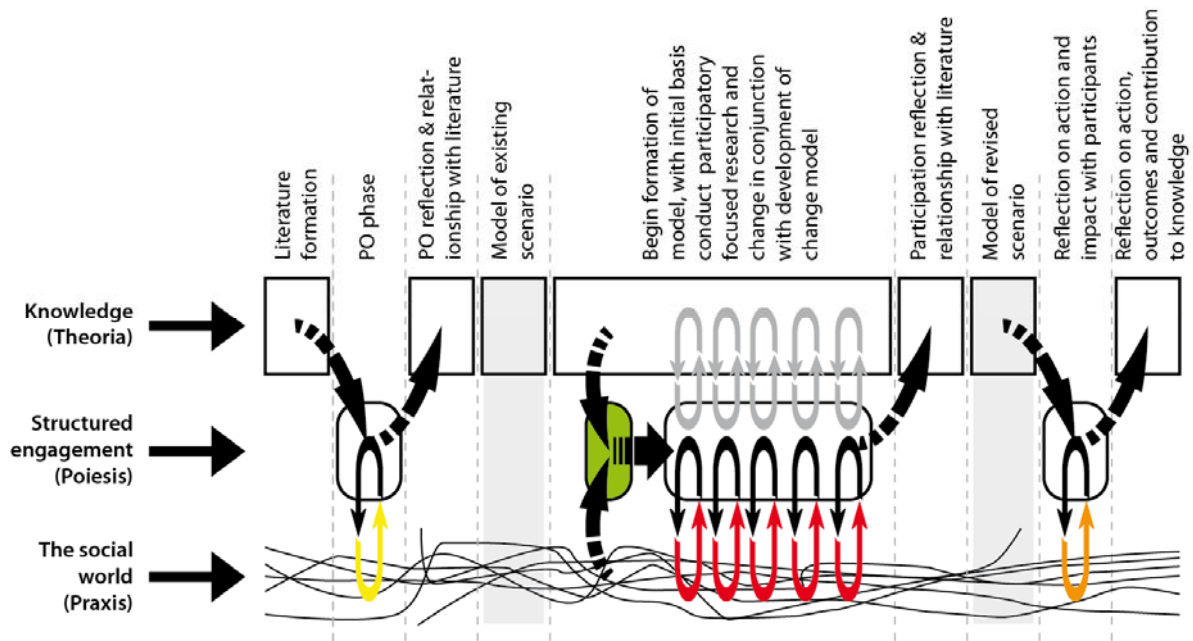


Figure 5G - Creation of the Change Management Protocol (in green)

(Source - Author)

Following the build and test phase, the project would reflect back into theory on the work undertaken and the validity and value of the change model. In accordance with the TPCA the project then closes with an element of reflection incorporating interviews and measurement to add further validity to the researcher focused reflections undertaken to this point, this was planned as Phase 3. It is following this 'proof' stage that one would then build more formal contributions to theory and knowledge.

An important element prior to the conducting of the interviews however is the element of modelling. The process in Figure 5G gives significant substance to the formation of an initial model prior to intervention and one afterwards. The reason for this is to allow for the researcher to make clear as part of the contribution back to knowledge to what components the project had an impact. These impacts have then by proxy been in the creation of a new IDS, the initial premise of the project. This is where the project has remained true to its intentions, but focused more towards the creation of the how,

rather than the what. It would be improper to suggest that all changes in the social world are in relation to this project, but the reflection element is able to clearly delineate between that which the researcher purports to be true via the intervention reports, and that which is deemed true by those in the social world.

5.3.3 Methodological alignment to the TPCA

The Three Phase Change Approach (TPCA) was premised on the alignment of the transition from PO in phase 1, to AR in phase 2 and into PAR in phase 3 (Potts et al., 2015a). In fact, at the outset of this project, phase 3 planned to consist of reflection, modelling and interviews only. It was the intention of phase 2 (transition) to conduct all 5 interventions, and then to reflect in phase 3 as to the efficacy of the change programme. Due to the fundamental nature of AR, we felt able to 'dictate' focus and then 'co-create' outputs within the ICO. We could not plan for a migration into PAR and thus this is why the plan in many ways restricts itself to such.

What in fact transpired was that rather than the 'we' of AR, there was a transition into the 'I' of PAR and thus the transitioning, as well as the re-freezing into practice became part of this project. What this means is that rather than simply reflecting in phase 3 around how well others may have put the work into practice, it was necessary for me to reflect on how well I had put the change programme into practice. Potts et al. (2015a) do not fully clarify the reflection, modelling and measurement element of phase 3, which in many ways, is built in as a pragmatic mechanism for this PhD project.

To elaborate on the methodological specifics of the TPCA requires us to be clear around what phase 1, 2 and 3 set out to achieve. We will then discuss how this process was built to allow for a contribution to knowledge to be made, and how else one might use it, followed by a clear outline of what these tools and techniques mean within the methodological context for this PhD project. Expanding on the principle of the 'action based research' (poesis) strand of Figure 5G as the basis for the TPCA, Figure 5H outlines what the TPCA in isolation represents.

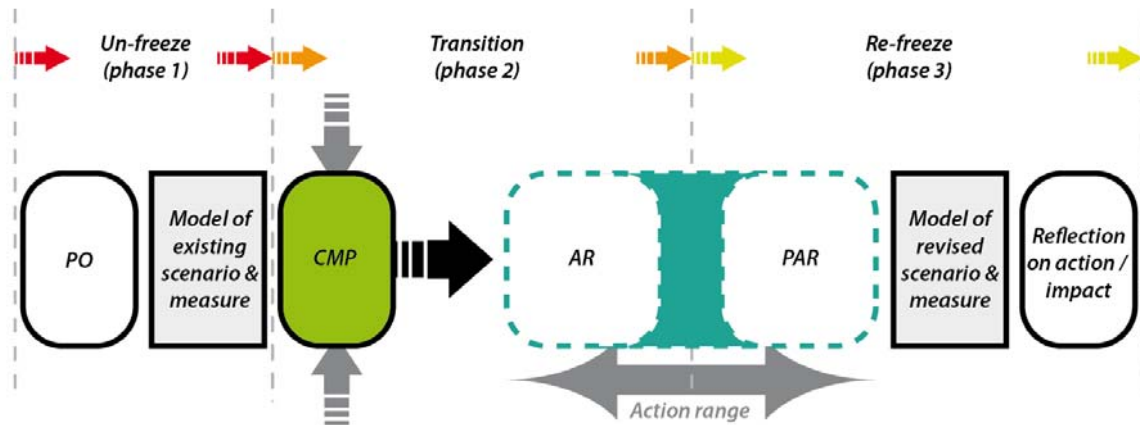


Figure 5H - The TPCA in isolation as an approach

(Source - Author)

This might best be described as the idealised version of the TPCA, with the solidly outlined elements of Figure 5H representing the ‘fixed’ elements of the approach. By this, there are scenarios in which the TPCA can be used differently, and these were thought through at the outset of the project. Before these are explored fully, it would be prudent to fully explore what the three phases of the model in an idealised fashion represent.

5.3.3.1 Phase 1– Un-freeze

This phase is concerned with understanding and identifying issues in the current situation. This is done via two components, (1) *PO* and the formation of themes of concern, and (2) the modelling of the existing IDS as entered and the associated ICO skill set.

PO

By putting you where the action is (Bernard, 2011), *PO* acts as one of several methods within the qualitative research framework, whereby the goal is to understand the nature of the phenomena opposed to quantification of it. Multiple sources are used from

informal interviews, pure observation, a review of policy and literature, document reviews and the building of social networks within the organisation. PO is used as an exploratory process to aid in the identification of issues to be addressed through intervention. It is offered that PO acts as an initial immersion tool to allow the researcher access into the ICO, but with a given purpose. The aim being (for the researcher) to ask oneself simple questions of how does this work and what are the problems? Care is given to associate with different sources of data in order to create accurate conclusions as to the areas of concern within the given situation. PO serves as a baseline from which to understand the 'implementer' (this case researcher) and organisational relationship, while outlining a long term commitment but with care given to define minimal specific action being pivotal to a successful working relationship in this situation. PO and a more unspecified abstract observation approach at the outset allows for commitment levels to be formed between researcher and practitioner.

Gorman and Clayton (1997) identify four main qualitative research approaches as observation, interviewing, historical research and group discussion, all of which are utilised in this approach. It is important that a social contract is created by which the practitioners understand the aims of the project and its foundations (Mackenzie et al., 2012), collaboratively defining the project expectations in the process (Denscombe, 2010). A moderate participation role is taken in order to differentiate between researcher and practitioner (Spradley, 1980), whereby PO in this manner allows appropriate involvement and a relevant amount of detachment to remain objective (DeWalt and DeWalt, 2010). The PO element should serve to build a picture of the scenario and its problems, with its outputs serving as a baseline from which the effectiveness of action can be judged (McNiff and Whitehead, 2006) and future engagement addressed (Mackenzie et al., 2012).

Modelling and baseline

The modelling element at this stage is about framing the nature of the scenario, its key relationships and interactions. This can be as complex or as simple as required, but needs to be clear as to what parameters it is built under. One might best describe such a

model as descriptive (Meredith et al., 1989; Fellows and Liu, 2009), with the focus being on the definition of the IDS 'as entered' prior to structured intervention. The use of this model building provides an element of gravitas in the explanation of change via intervention in phase 2, whilst also facilitating the re-modelling and resultant reflections in phase 3. Additionally, a competence baseline is identified for UKWASC for this particular project, the purpose being to focus intervention and facilitate additional reflections at the close of the project.

5.3.3.2 Phase 2 – Transition

Built of one part fixed component, one part action. For clarity, the fixed element is the CMP, with the transition / change element being via AR. The premise is on the setting of what to change via the CMP, and the instigation of change via AR, fed by the outputs from phase 1.

The CMP

The CMP serves to define the areas through which to intervene as part of the Strategic Change Model and begins to break down barriers to implementing sustainable and competitive practices. The CMP was formed to act as a bridge between the theoretical underpinnings of this project, and the practical needs and demands of UKWASC. This meant detailing the five principles of SPMC, finding applicable focus areas in relation to them, while allowing the nature of intervention to take a systems approach toward change. An important rationale for the CMP is to not blur the lines between research and consultancy, by forcing interventions to remain relevant to the research project, whilst also relevant to the business.

To do this, the researcher enters the CMP process within the ICO with 'two hands full' in effect. One with the theoretical basis of the project (SPMC in this case), the other with the outputs from phase 1. The engaged ICO parties then draw from their areas of concern. A fundamental component of consultancy is following the direction of the focal business, and in essence, responding to their whimsy and is not appropriate for research. Instead, one must have a framework for engagement, and that is what the

CMP serves to do, it acts as the physical bridge between theory and academic relevance, and action and practical relevance. The output is to decide what areas the project will impact in response to the theory, phase 1 outputs and organisational issues, and thus decide what will constitute / require intervention (see Appendix B for further details).

AR

Following the CMP phase, the intention is to do something, to take action within the social world, and this is through the medium of AR. AR is a self-reflective process aimed at improving practice, going beyond the extent of external review and strategic theory building, but keeping full integration at arm's length. Multiple methods are employed, from semi-structured interviews, surveys, workshops, discussion groups and further policy and literature reviews as action strategies are developed with co-researchers. Shani and Pasmore (1985, p.439) summarise that:

(AR) is simultaneously concerned with bringing about change in organisations, in developing self-help competencies in organisational members and adding to scientific knowledge.

The cyclical nature of AR, which is self-perpetuating in nature, suits the enacting of organisational change within a project or programme culture. AR centres on research in action opposed to research about action (Coghlan and Brannick, 2005), so takes a proactive role within an organisation. It takes on a human role as the researcher becomes an active member of the process, and research accompanies action, and the two parties act collaboratively. A key point is the responsibility on the researcher to 'enact' change and impart a component of direction towards others.

Through intervention, the researcher gathers knowledge and generates a set of skills comparable to that of their peers. As the researcher and peer group begin to focus on 'I/we' and 'our practice', the research process moves beyond the PO focus on 'they', and the directive 'we' of AR to become a collective 'I/we' of PAR, taking a different perspective on enactment. Rather than discovery to aid others, the concern is implementation and self-action. This is essentially Phase 3 action.

5.3.3.3 Phase 3 – Re-freeze

Continuing the action theme, to implement the re-freezing of change into commonality and practice is concerned with the development of personal actions within the workplace and thus, PAR.

PAR

Ottoson (2003) connects the holistic quantum paradigm of PAR with self-reflection and managerial / organisational change, utilising participation or involvement as a key differentiator of the method from Newtonian classical approaches. PAR is focused on the improving of group / organisational practice wherein the process itself forms an appropriate basis for effective change within the given scenario (Whyte, 1991). Here the focus is on enacting real world organisational learning to better understand the complexities of the organisational issues (Ottosson, 2003; Mackenzie et al. 2012). This leads to an ongoing reflective process where actions have become the ownership of the individual and the ICO, and 'spin-off' groups / actions and changed processes replace the directive focus of AR. It is important during this stage to take stock of the resultant knowledge change within the organisation and the formation of new behaviours (Burnes, 2004). Here, the data gathered during the AR/PAR cycles will be viewed in relation to the inputs provided by Phase 1. It will be instrumental in seeing the effectiveness of diffusion (Hall and Mairesse, 2006) within the ICO, and to provide feedback into the organisation about how to reflectively enact the process again. Here, artefacts such as action reports will become important reflective documents for the ICO. During Phase 3, it is important to act and reflect simultaneously, identifying one's own practice and reflecting on next steps.

Kindon et al. (2007) provide an outline of a 'typical' PAR process, which oscillates between action and reflection. A key component of such a process is the level of participation by both parties; Arnstein's (1969) ladder of participation being an early explanation of such variances ranging from manipulation to meaningful participation, inclusive of compliance, cooperation, co-learning and collective action. The use of PAR is

still through intervention, but the working parameters of such interventions differ from those utilising AR in Phase 2.

Modelling and closedown

To close-down the change works, one must move out of the action phase, whether it be AR only in phase 2, PAR only in phase 3, a combination of the two, or by measuring the works of others. One must conduct an appropriate reflection exercise. This is done through re-modelling of the revised scenario (the new IDS). One must also reflect on the impact of the interventions on this new situation, and doing this is best via interviews (in this case semi-structured). As the interventions are intrinsically participatory, interview reflections need select three types of interviewee, those that managed the definition phase via the CMP and their reflections on outputs, co-designers to the interventions, either with the researcher or independently, and participants to the interventions, in effect, the people the process impacted or were involved with it, but did not take part in its design.

At this phase re-measuring is important, in whatever fashion is designed for the project, but it must take into account the manner in which the researcher is able to make warrantable assertions regarding change, as well as understand exactly where the researcher's work differed from that of the organisation. It is likely advisable to split the re-measurement process and the interviews so not to confuse interviewees. This process again undertakes a further competence review as within Phase 1.

5.3.4 The psychological contract

Important to the above debate is the nature of transition from AR into PAR, a key component of the research approach. It would be far neater, and easier, to suggest that the research involved AR only, or PAR only. As the interventions continued however, in tandem with the development of theoretical understanding, I began to reflect that I was in fact changing my stance. As my supervisor would describe, becoming more native. This transition from they, too we, too I made me as a researcher reflect on what I was actually doing and readdress the research tools, specifically AR. This caused me to reflect

on what AR actually is, and what PAR in fact achieves. A medium I have found to be successful in explaining the difference is the psychological contract, helping to summate the differences between the tools in each phase of the TPCA, namely PO (they), AR (we) and PAR (I). The inclusion of the psychological contract may not seem particularly pertinent at first glance, as typically, this is in reference to employee to employer relationships. This contract however, characteristically determines the extent to which an employment relationship is defined in terms of mutual obligations or expectations (Rees and French, 2013). Rousseau (1995) offers a useful typology of this relationship, using timeframe and performance requirements as dimensions, representing a continuum between short term variants of transactional / transitional relationships, to longer term balanced / relational arrangements.

This differing vantage point serves as a baseline from which to understand the relationship between researcher and UKWASC. In the case of a large organisation such as an ICO where the creation of working psychological contracts could be perceived as the underlying norm, an understanding of the projects' relationship with the normative working environment is pivotal in positioning the manner in which the project is to be carried out. Long term unspecified 'contracts' lead to high levels of commitment and stability for example in the relational form. While short-term specified situations lead to low levels of commitment and high turnover (exit) rates in the transactional form, as well as 'little learning'; a form more akin to consultancy in this regard. It became clear then that alignment to a mutual commitment form would suit the formation and sustaining of change within the focus ICO. In effect, the more I focused on (and committed to) doing something, the more the organisation would respond.

5.4 The nature of the single study and the associated mechanisms for contributing to academic knowledge

5.4.1 Confirmation of UKWASC as a single study

In the selection of a single study source, it becomes important to understand the value in a single localised study, as well as the nature of single 'case' projects in general. This study in essence utilises a qualitative single case strategy within the focus ICO. Although there continues to be concerns about the validity of single case findings, Yin (2009) insists that the choice of whether to adopt a single or multiple case study strategy is dependent on the purpose and nature of the research. It is maintained that single case studies are especially advisable where the case is either unique, critical or an exploratory one. In this study, the case satisfies these three principles insofar as UKWASC is the only monopolistic water and sewerage provider in its geographic region, it has unique demographics to serve compared to other water and sewerage providers, and it has unique geographical changes to address.

Its criticality is in its provision of a health service to the wider populous and the wider network requiring significant investment, the 2015 contamination across Preston and Blackburn, the Cumbria floods and multiple Manchester sinkholes supporting the criticality of the service provided by UKWASC. It also serves an exploratory purpose in that the project is seeking to find a solution to a general concern, but also take 'specific' action in the social world. This requires exploring and understanding the situational specifics of the case under study and forming a localised view of reality accordingly.

5.4.1.1 Project initiation

As with most projects involving participatory focused research, the process of initiation always poses a challenge to the researcher (Potts et al., 2015a). Whether initiated by the client or researcher, the nature of entry differs, such as with guaranteed organisational entry with client initiated research, while this can be counterbalanced by a drive to focus on client derived issues (Schein, 1999). It is important then to define the social and

psychological contract that will govern the relationship, and thus make clear its foundation and focus. To this end, a project evaluation model is proposed in Table 5.3.

For this study, the initial originator of this project is the research body, in collaboration with UKWASC with a view to the development of a PhD programme. With this, the level of organisational entry is high, however, the focus is loosely prescribed and the skill level of the researcher is expected to develop in stages. The results are concerned with the parameters set in collaboration between researcher and organisation, utilising high client involvement. Schein (2008) observes that researcher initiation of a 'project' where the researcher and client involvement is high, usually results in AR. When linked in conjunction with the development of a PhD programme, the associated change in researcher skill level supports the division of the research process into phases, and as such aligns with the TPCA. This is not to say that the consideration of change readiness of the emergent approach is not considered, especially with regard to the changing internal and external pressures of a contingent approach (Todnem, 2005); but that its application is being used in a macro structural sense, and thus the overall structure of the change approach is in three phases, with contingent strategies to correspond to a changing research narrative.

| Originator | Entry | Focus | Skill level | Results expectations | Client involvement |
|----------------------|----------|-------------------|-------------|-------------------------|--------------------|
| Client | Specific | Predefined issues | Medium | Practical and directive | Medium |
| Research body | High | As unearthed | Low - high | Unexpected | Low - high |
| Consultant | Low | Within skill-set | High | Specific to topic | Low |

Table 5.3 - Project Initiation Model

(Source - Author)

5.4.1.2 Situational rationale

UKWASC is the second largest Water and Sewerage Company (WASC) in the UK. With over 5,000 employees, they deliver 2,000 million litres of drinking water through 42,000km of water mains, coupled with 72,000km of sewers, before cleaning it and returning it to the environment. With 184 reservoirs (biggest of which being Haweswater in the Lake District, which holds up to 84,000 million litres, providing a quarter of the water used), and a land ownership of over 57,000 hectares, UKWASC operate and maintain over 1,400km of aqueducts, 96 water treatment works and 575 waste water treatment works. As recently as 2011, UKWASC were the lowest performing water provider (of all 21), based on the industry tested Service Incentive Mechanism (SIM) score. By 2012, UKWASC had moved up to 16th, and 14th (6th out of 10 across WASCs) as of 2013.

A change in ethos within UKWASC formulated however within a context of innovation, change and forward looking strategising to help move the organisation even further forward, improve its relationship with its customers and to become a leading North West service provider and one of the UK's leading water and wastewater service companies (UKWASC, 2014). The result being a willingness to participate in such a project to which they are far from accustomed. Seemingly representative of the poor quality of delivery across UK based ICOs, UKWASC offered a suitable medium through which to focus a change based research project.

A number of organisations would have been suitable study environments, and likely have accompanied a more generalisable focused project. Study of the ailing rail service, the immense nuclear programmes or a whole host of public works would have added value to a project of this nature. A challenge can be made that entry into other such cases could in fact be done following the close of this project, and this could be considered a pilot study by some. Such assertions are not challenged here, and the researcher considers the use of other cases and change scenarios as an extension to this project, or at least 'another option' at the very least. I do disagree however with the potential view that the project outcomes would have been mirrored (or more valid) if a

more multi-case strategy was applied, and that the output of this project is somehow less valuable in the localised human context than it otherwise would have been. I feel the methodology and approach goes further than the surface level study of humans in a misanthropic way, or less aggressively, as mere units. Singular focus is therefore proffered here, but scope is accepted by this researcher for more multi-case scenarios, as long as the project framework is modified accordingly, incorporating this study, not diminishing its purpose.

5.4.2 Nature of study and its rationale

Dainty (2008) presents that in the construction management research community, research has broadly followed either an objective or subjective approach. He presents that the objective approach has concerned itself with the creation of 'facts', with the subjective approach focusing on the creation of different realities. Importantly however, is the necessity to generalise and focus on causality with objective approaches, while subjective approaches focus on localised subjective meaning. Saunders et al. (2012) suggest that research designs can thus be categorised as either quantitative, and aligned towards the objective approach, or qualitative and aligned to the subjective approach. This is not a perfect summation, and most authors would agree that the subjective / objective argument is a little more detached from that of qualitative and quantitative. Irrespective of this, there is a third approach highlighted by Saunders et al., that of mixed methods, which aligns more to the pragmatic paradigm and is concerned with both modes of enquiry. Selecting which mode of enquiry relates to the manner in which one collects and interprets data, with the mixed methods, pragmatic researcher as being concerned with both data types, a rationale for mixing qualitative and quantitative methods, presenting visual representations of procedures that follow sequential, concurrent and transformative inquiry strategies.

Drawing on the philosophical underpinnings of pragmatism, this study also finds congruence with the participatory focused knowledge claims of the qualitative approaches, placing oneself within contexts, collaborating with participants and above all, creating an agenda for change. The pragmatic mixed methods approach does

however create a framework to suit needs, and one could argue that the modelling component is more objective in its vantage point, with the interventionist approach being intrinsically emancipatory, with an element of unknown about it. So whilst qualitative in nature, the researcher must remain open to needing to use more quantitative methods if needed should the situation require. The use of qualitative methods also supports the human element of change, as well as highlighting the value of the researcher in the gathering of data. I am not external to the study situation, and in creating change will not see my scenario as external, thus the qualitative foundation is most aptly suited to this study.

5.4.3 Data collection techniques

In similar studies, it has been shown that the collection of data has involved a great degree of spontaneity (Hartley, 2004), and is usually of a qualitative nature. This does not detract however from the basic principles of data collection for this project, and some of the methods employed. With the study being split into different stages concerned with differing primary concerns, the premise of these stages is provided here, followed by a more in depth discussion of the main methods (techniques) employed discussed below.

PO - Explore and Understand

Using PO in conjunction with other methods is essential in improving the validity of knowledge claims (DeWalt and DeWalt, 2010). For this PO exercise, a range of methods contribute to what is described as PO here, including informal interviews, pure observation, a review of policy and literature, document reviews and the building of social networks within the organisation. Using this array of data sources contributes toward a single, more valid, version of the truth, albeit from one collection source. A key issue is the manner in which the single version of the truth is sought, as well as the data used to explain it. By this, it is highlighted that multiple collection 'routes' as well as media are presented, serving to assist in the clarification of the areas to focus on via intervention.

AR / PAR - Change, Develop and Understand

Mertler (2013) draws on the three (inherently qualitative) data collection categories, adding a fourth, more quantitatively focused category. These include (1) observations and personal reflections in the form of field notes, (2) interviews, (3) documents and records, and (4) checklists, ratings and scales. As Johnson & Christensen (2008) and Dick (1995) point out, among a plethora of other authors, AR affords a researcher the ability to employ a range of techniques, and taking advantage of this is important when seeking to triangulate particular views and build appropriate models through reports of the social world. While Kindon et al. (2007) offer that the more common data collection methods used in PAR include surveys, participant observation, secondary data analysis, learning by doing, political action, dialogue, interviewing, group work and discussions, mapping, storytelling, diagramming, ranking and scoring, and shared analysis, writing and presentations; they suggest further that dialogue, storytelling and collective action are the most common of these in contradicting the outsider researcher methodologies of conventional social science. Building on the categories of Mertler (2013) however, four distinct data collection approaches were employed across the project:

Field notes

Field notes represent the cornerstone of the participatory researcher's toolkit, documenting observations, feelings, attitudes, diagrams, dates and all other manner of sketches and ramblings. Importantly, Dick (1995) maintains that separating that which is collective and that which is individual reflection is important when recording AR focused fieldwork, so not to confuse between the thoughts of the researcher and the thoughts / actions / outputs of the collaborative group. It is from these field notes that the researcher will build reports that reflect the real world actions of the group, but also be able to make unique academic focused reflections outside of the intervention. This is akin to mental compartmentalisation and is not particularly easy, thus maintaining records during action, then solely focusing on reflection can be seen as more helpful way of dealing with fieldwork. This dichotomy leads from Dick's view that AR work and the

related thesis is cyclical, and thus one should be prepared to go back and change the academic report if one feels the social world action has warranted such a reassertion.

Interviews

Interviews can be conducted in a rigid structured fashion, be of a more interactive semi-structured nature, or completely open and unstructured. Saunders et al. (2012) present the value and use of the three forms in Table 5.4:

| Types | Exploratory | Descriptive | Explanatory |
|------------------------|-------------|-------------|-------------|
| Structured | | XX | X |
| Semi-structured | X | | XX |
| Unstructured | XX | | |

(XX= more frequent / X=less frequent)

Table 5.4 - The relationship between interview type and research aims

(Source - Adapted from Saunders et al., 2012)

Unstructured, often ad-hoc interviews were conducted during the PO phase to allow the researcher to gain a clearer understanding of the situation and to explore relevant themes. For the closedown phase, utilising the researchers judgement and experience was important in focusing on a number of key issues via semi-structured interviews. The aim of which being to unearth views on actions, but also focus on areas more relevant to respondents. Saunders et al. advise that the researcher may use judgement in omitting certain questions, or focus more on certain relevant specifics depending on conversation flow etc. Such interview approaches maintain an element of subjectivity and relationship with the real world, while a structured interview has a more objective formation and were not considered suitable for reflection. However, the collection of more quantitative data as part of baseline formation in phases 1 and 3 is done via structured

interviews, calling on a varied and purposive sample of parties involved across the UKWASC internal delivery chain.

Documents and records

These play a vital part in the building of mental models of situations, and play a large part in the integration of a researcher within a particular setting. It is argued here that a participatory researcher must become familiar with the material that defines and determines actions taken by actors in the social world. If a category management process is being employed for example, the researcher should have an awareness of what that is, not necessarily take as gospel the description of it as collected / recorded. This places secondary data sources, like company websites, internal intranets, printed resources and emails at the forefront of the participatory researcher's toolkit, and all efforts should be made to become au fait with the social world within which fellow researchers exist. If they use Microsoft Sharepoint to share data and documents, then the researcher is likely to need access and to publish relevant documents there also. So while documents and records are integral to the approach, integration of the manner in which they are digested is also important.

Ratings

The process of using measures to warrant ones actions is common within educational action research, where a teacher may measure literacy, do something and then measure again, thus relating data to action. The essence of this principle is applied here, and while the researcher cannot lay claim to any measured differences in isolation, such measures aid in the analysis of action as a whole. This more quantitative and objective data form accompanies the modelling phases of the project at its inception and close. Referred to as ratings here, the collection of a quantitative measure builds on qualitative perceptions of reality inclusive of opinions on competence and ability.

5.4.3.1 Data analysis

Mertler (2013) advises that analysis of data in an AR setting combines both the traditional quantitative method, where data is analysed at the end, and the traditional qualitative method where data is analysed throughout data collection and completed following data collection. Johnson (2008) suggests searching for data and themes, categories and emerging patterns during collection to influence further collection, with the researcher then undertaking an element of independent analysis once data is collected, or intervention complete (Perry and Zuber-Skerritt, 1992; Dick, 1995; McNiff, 2013). The focus here is on the localised collection of data, on the richness of the change, the validity placed on actions and the building of a change model which has by proxy influenced a real world IDS. The importance is not on the generation of inferential or descriptive statistical relationships, or the codification of categories of responses to generate a particular vantage point. The concern here is the generation of a model of reality (Kutsche, 1998), and the telling of a story (Phillips and Carr, 2014) with the aim of building a warrantable assertion (Dick, 1995).

In response to this, a process of building towards and enhancing what can be seen as warrantable has been created, utilising the dual form of analysis proffered by the prominent authors highlighted previously, outlined within Figure 5I. One clear difference is the espousal of the interventions which will be highlighted in the following chapters (in blue), specifically their relationship with their corresponding reports (covered in the next section) and reflection on their impact via interviews. In essence, the modelling stages in phase 1 and 3 act as more objective 'bookends' to the project. The interviews then focus on the effectiveness of the interventions at bringing about change.

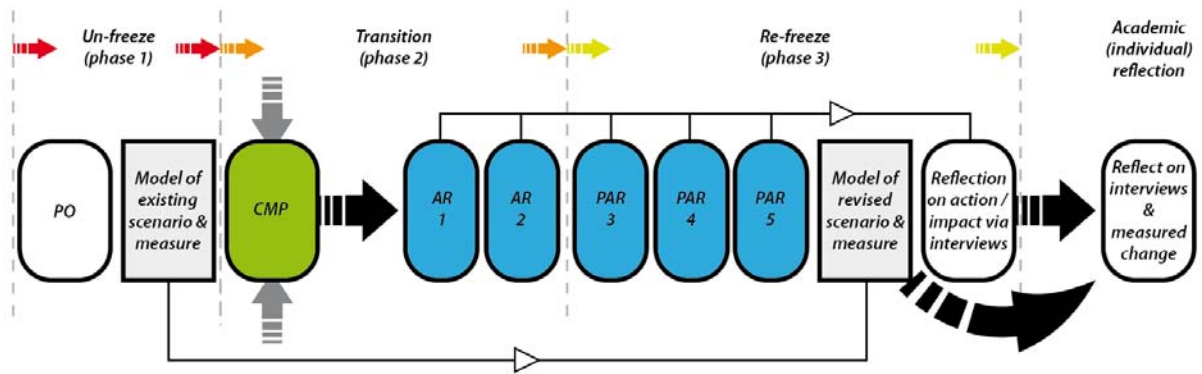


Figure 5I - The duality of data analysis for this project

(Source - Author)

5.4.3.2 Transformation of social intervention into legible reports

An important component of any participatory based piece of work is the manner in which it is converted into legible reports. Two words are used in the preceding sentence purposefully, convert and legible. Reporting any activity within the social world requires an element of conversion, either from field notes or interviews, or from choosing the right photo of what seemingly to others is the same thing. Legibility is about the manner in which one understands such conversions and decisions, and the story one is told. While early structural work will form a more conventional approach, such as a topic synthesis, a literature review and area of study, specialised literature will be accessed as the study progresses (Dick, 1995).

This is a critical point for the AR related thesis, it is true that convention needs to be adhered to in order to frame a topic and general research dialogue, but the formation of an actual report needs to reflect the manner in which research is conducted, which is predominantly cyclical in nature. In accordance with the separation argument presented by Dick (1995) and Perry and Zuber-Skerritt's (1992) argument concerning participatory reporting not being one's own work, a separation between researcher reflection and action is required. Thus the research reports relating to action for this project focus on

the action, not the researchers academic reflections. Reflections in this regard are left for the researcher in isolation on the research, not in the research. In accordance with the primary participatory methods employed for this project, the following highlights the manner in which one converts and makes legible the relevant action and corresponding data.

PO

DeMunck and Sobo (1998) suggest coding information to help remove the reporting of erroneous data and thus focus on the emphasis of a key message within a report. Kutsche (1998) adds that in the analysis of observation field notes and interview information, the researcher is in essence attempting to make sense of and build descriptive models of what is happening, not telling the 'truth', as there are multiple versions of the truth. The result is the ordering of information in accordance with a structure, and moving recorded data into that structure to form the particular interpretive picture being made. Researcher reflection on the populated structure will then begin to report on a particular culture in action. Lincoln and Guba (1994) see peer review and debrief as a way to ensure trust in one's research data and thus checking the reported structure back with those under study (or gleaning information from it) should be considered a valuable exercise.

Importantly, Wolcott (2002) advises that a fieldwork researcher should consider placing themselves within a discussion pertaining to the analysis. This more auto-ethnographical approach is worthy of note in that the value of highly personalised accounts that offer a vantage point of the intersection between societal and personal views can make a unique contribution to social science (Wall, 2008). To this end, whilst direct observation is the key here, elements of my own reflexivity and understanding of the environment I am a part are offered to provide a more in depth and valuable contribution to not only the social sciences, but to the formation of an intervention strategy as part of the CMP. Invariably utilising field notes, DeMunck and Sobo (1998) advise that using two notebooks can be helpful in separating observation from interpretation in PO. For this

research project, making clear the observed truth is vital in effectively engaging with the ICO and to identify the 'real' areas of concern.

AR

Commonly used in the development of teachers due to its participatory nature and focus on the discovery of actions required within a social setting, extensive AR guidance exists for teachers to aid them in their professional development. To this end, extent knowledge is available with regard to the use and validity of AR within this setting. Phillips and Carr (2014) present a clear outline of what constitutes a valid 'action research manuscript template'. While utilising some of the more 'traditional' initial structures suggested by authors such as Dick, McNiff and Whitehead, it presents value in the form of a research story, with a reporting structure addressing the abstract, introduction, literature reviews, project clarification, the plan of action, the detail of that action and an associated reflection.

As discussed by authors such as McNiff, Dick, Holwell and Reason, making clear the basis upon which a claim to knowledge has been made is vital in judging the quality of an AR project. With McNiff (2013) suggesting that reporting should somewhat follow the structure of the general action plan taken by the researcher, in essence, responding to questions asked of oneself and maintaining a golden thread in the report as presented. A key element here is the manner in which a researcher makes clear the framework within which validity is to be tested and then stays within that defined framework. The development of knowledge and resultant reflective claims therefore follow a clear path from inception, through realisation and onto reflection.

PAR

Kindon et al. (2007) identify that the use of non-traditional outsider methods in PAR is more of a challenge to conventional social science approaches where the (outside) researcher is in control of agendas, protocols, interviews or questionnaires and then analyses data in isolation, suiting their particular research goal/focus. Participatory methods thus contradict traditional orthodoxy through shared learning and definition.

The issue is that reporting of something shared is naturally difficult with the vast plethora of opinions relating to often minute moments in time when participatory projects can be moving at significant pace.

PAR has been defined as a research approach wherein persons from within the organisation actively participate with the professional researcher throughout the research process (Whyte, 1991). Similarly, whilst appraising the strength of PAR, Argyris and Schon (1974) observe that the approach offers a more practicable platform to enable researchers to achieve both rigour and relevance when carrying out a research project; a constraint which had appeared insurmountable in the past for social science researchers.

As a result, it is vital that stakeholders participate in the identification of the problem, data collection, and reflection in collaboration with the researcher. This active participation in the research process has since been identified as a salient advantage of the PAR approach (Rahman, 1993). It leads to the development of workable change model(s) based on group consensus, as well as the promotion of continual improvement and if need be, (re)invention of the developed model(s) long after the culmination of the research project. The formation of a formal report is therefore valuable to the PhD project, but not necessarily a direct reflection of reality or indeed action. Consequently, the structure of engagement proposed by Kindon et al. (2007) that oscillates between action and reflection would seem to be of value here as a reporting mechanism.

5.4.4 Research process

Important now is to frame the nature of the study as a whole and to populate the wider research process with a number of the components discussed above. Figure 5J and the following sections cover the project in its entirety, combing the methodological steps discussed in Figure 5G, the three phase action process in Figure 5H and the constituent 'knowledge components' of the previous chapters.

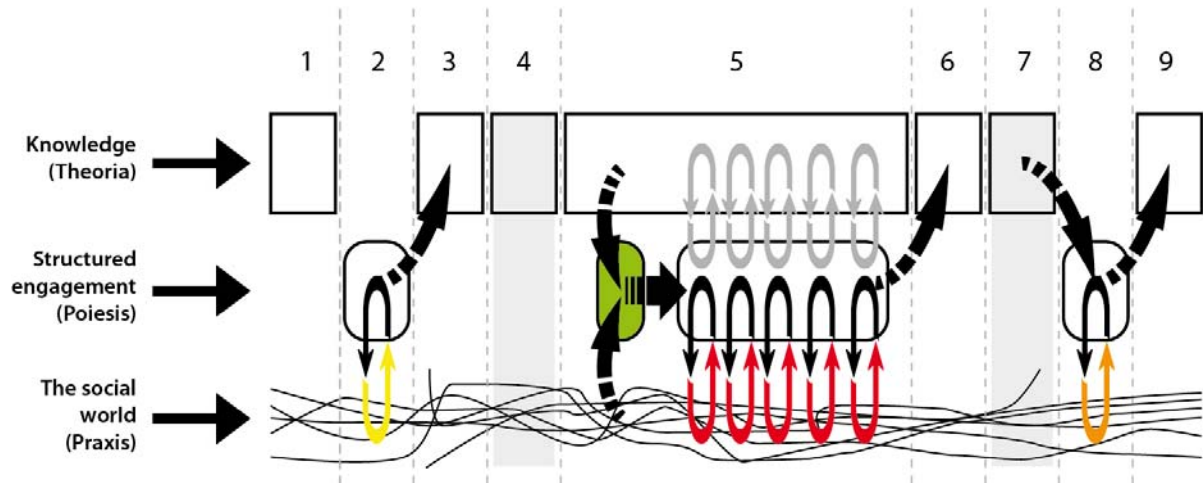


Figure 5J - The research process for this study

Source - Author)

1) Literature formation:

Here, one develops the theoretical framework for the study based on a preliminary literature review and the researchers personal knowledge, followed by creation of an outline research aim. Focus here is on infrastructure delivery, client competence, change management, participatory research and strategic procurement with a view to generating change in the real world while contributing to knowledge in the academic world.

2) PO Phase:

Here one investigates and unearths issues relating to ineffective delivery and the nature of procurement competence within UKWASC, we are asking at this juncture **what are the problems within the ICO relating to infrastructure delivery?** and thus we are **exploring, describing and understanding**. By investigating different aspects of the organisation (not just one group), one builds as complete a picture as possible of the given organisational scenario. Here one forms a frame of reference that best describes the scenario rather than quantification of it. It is important to use different data sources

and to constantly reflect on any assumptions made as a researcher, as well as the value and basis the researcher places in particular claims, statements and data so to focus on an objective scenario description.

3) PO output review:

Here the researcher reflects on the PO phase via a report. In accordance with DeMunch and Sobo's (1998) direction towards the coding of reporting data, and the building of a mental model (Kutsche, 1998) of the situation at hand, it is this model / review that is brought forward into the CMP stage. Such that the researcher enters the CMP with two hands full, one with literature and a theoretical framework, the other with a model of the organisational issues resulting from the PO phase.

4) Model of existing scenario (the IDS as entered and associated competency review):

The aim here is to work with UKWASC employees to understand the fundamental components of their delivery environment and corresponding relationships. The work of Fellows and Liu (2009) is of value here insofar as determining the purpose of the model, its components, a relationship with reality, confirming those models with others and then retesting them again for validation, leading to use of that model for analysis and making inferences (in later reflective stages). It is also important at this stage to form a baseline from which the efficacy of change can be analysed. It is advisable to be more objective at this point, and a range of respondents would provide a more viable and appropriate baseline at this stage. The manner in which this baseline is formed must be agreed with the focus organisation, but utilisation of the same methods in stage 7 is vital to maintain replicability and to facilitate analysis.

5) Combined build / research / action phase:

Here we start by asking ***how can I improve the delivery of infrastructure from within an ICO?*** We begin by forming the initial Strategic Change Model building on SPMC and STS, but as Dick (1995) eludes, specialist literature will only be accessed once the study is underway, and thus specifics relating to interventions which hold situational value are

uncovered in this phase. The concern here is the building and testing of the Strategic Change Model while working within, and relating to, the theoretical foundations for the project. This is a key aspect of any participatory work, and while the work is centred on five interventions and their own cycles of action and reflection, the process of literature review and model development is constant.

Change is dictated via agreement through the CMP, with interventions to marry up to and focus on the five principles of SPMC identified through the literature. At various points the researcher will test the formation of the Strategic Change Model with participants, as well as constantly improving one's own practice and ability in conducting participatory change. The amalgam between SPMC and STS will grow through-out this phase, with the number of cycles per intervention being dictated via collaboration between participants in achieving a desirable goal. One could view this entire phase as one spiral of cycles, but for the purposes of reporting, practicality, access and theory building, the breaking down of the interventions into constituent parts allows for clearer reflection.

6) Participation reflection and relationship with literature:

This is about building the reports from which claims about the validity of action can be made, as well as identifying the barriers to change, thus the focus here is to **evaluate**. This is building towards a contribution to knowledge, while an ideographic purist may claim this phase to be 'enough', subsequent validity steps are built into the process. The output reports at this stage it can be argued are of shared ownership with participants, thus stages 7, 8 and 9 represent my own reflection on action to form an appropriate separation.

7) Model of revised scenario (the IDS as exited and associated competency review):

The aim here is to provide a framework through which knowledge claims can be understood, and to find a medium through which to communicate the impact of the project. Again, the aim is to build this with UKWASC employees, but to challenge perceptions as to where the project impacted, and how the impacts helped move

towards more strategic approaches by the business. This is a relatively simple stage compared to the years in stage 5, but it is here that one is able to relate warrantable claims in stage 9. Again, a re-measurement process is required replicating the techniques employed in stage 4, allowing us to **assess impacts** of the work.

8) Reflection on action and impact with participants:

This is where the researcher selects participants via purposive sampling to reflect on their understanding of the Strategic Change Model built during stage 5, as well as their view on the impact of the change process instigated by the researcher (stage 5) and thus validate claims made in the associated reports (stage 6). This is done via a series of interviews. In essence we are **assessing impacts** here. Interviewees are guided by a series of questions relating to common aspects of the project rather than specifics of the interventions to allow for researcher reflection.

The use of different UKWASC role holders in relation to the project is to gain a more triangulated perspective on the project, the researcher and the impacts. This split was done by defining three types of interviewee, (1) the project overview, which in this case would be the industrial supervisor who understood the project and its components in its entirety; (2) co-designers, one for each intervention who represented a key person the researcher worked with; and (3) participants, individuals impacted by the research / intervention but not necessarily aware of its drivers and purpose whose reflections were vital in understanding the extent to which the project was able to change actual working life beyond the claims made by the researcher in reports. Interviewees are purposefully kept separate from the stage 6 reports and any stage 4 measures.

9) Reflection on action, outcomes and contribution to knowledge:

This stage is purely separate from action and is the ownership of the researcher alone for the purposes of the PhD project. Here the researcher reflects on stages 1 through 8, the relationship between action and theory, the use of theory, the contribution to theory and the nature of the project as whole. Did the project achieve its intended goals and what were the stumbling blocks? What might we learn from this project to apply it

either again or somewhere else? What might next steps for the research look like? These are questions the researcher will be asking of oneself in the formation of warrantable assertions that inform future action.

5.4.5 Research ethics

While McNiff (2013) discusses issues such as plagiarism, name-dropping and pedantry, with these being of considerable value to this researcher, ethics here is concerned with the principled delivery of the research methodology. With the considerations, values, personal and political issues raised through this research given complete anonymity as a primary concern (Kawulich, 2005). Furthermore, while organisational consent is given at the level of access and data gathering, where those techniques become more personable, such as with interviews, written and expressed consent is sought. It is the outright commitment, and belief of this researcher, that to do anything that would divulge, indicate or allude to the origin of particular findings without receiving consent would be wholly inappropriate, breaking the bonds of trust built over many months with my fellow research participants. Anonymity and respecting one's relationship with others must be at the forefront of all data collection and synthesis, and this is the case here. To this end, I find value in the deontological view presented by Saunders et al. (2012) that reflects that research aims can never justify something that is unethical, such as deception in the gathering of data.

DeWalt et al. (2010) identify that it is the responsibility of the researcher to engage with participants in the first instance to give them an understanding of the work being carried out. One should let others know that notes are being taken and records made, either through open dialogue or making clear you have a pad in your hand as minimum. Making those under study aware of what you are doing, then showing them clearly how you are doing it sets clear boundaries when collecting / recording data. A side effect of this is the constant reiteration of one's role as a researcher (Kawulich, 2005). DeWalt et al. (2010) identify further that the building of relationships is important when conducting participatory research, with some of these relationships forming friendships, the issue is around maintenance of the initial study purpose. Marshall and Batten (2004)

add that the building of relationships allows one to understand the culturally appropriate mechanisms for gaining approval and entry, albeit more from a cultural anthropology perspective. But the matter maintains that respectful understanding and integration within the human social construct under study is vital in gaining a meaningful and accurate understanding of the situation at hand, via immersion within it (Kawulich, 2005) or even by simply understanding when it is suitable to ask questions, and being able to ask suitable questions (Bernard, 2011).

At the outset of interventions, during workshops, interviews and all forms of participant interaction, a reiteration of the project aims was made, with a highlight being the ability for the researcher to 'step away' should there be any issue. It is vital that the researcher set the relevant exit strategy so not to concern any participant with being forced to take part. Making clear that there were always research alternatives was a key part of the engagement strategy from day 1. In support of this, participants were often directed towards the researchers' working documents held on a secure sharepoint area maintained by UKWASC, and informed that should they find issue with anything, that they could contact the researcher or industry supervisor accordingly. This, among other more verbal processes, such as reiteration of project objectives at the start of meetings, facilitated an ethical openness to what is a largely unstructured engagement process.

5.5 Contributing to knowledge through action

Research validity relates to the manner in which outcomes conform to the processes set out by the researcher (Saunders et al, 2012), with qualitative studies coming under increasing scrutiny with regards to their validity in comparison with the natural sciences (Shenton, 2004). Bradbury-Huang (2010) highlights that conventional social science pales in comparison to the actionability and reflexivity of AR, while AR pales in turn with regard to its generalisability. A core tenet of conventional social science, generalisability, can be said to add to knowledge through rigour via what can be described as 'global' knowledge (Dick and Swepson, 2013). An issue being that the global viewpoint of

knowledge creation has no relation to the local situation, and as AR creates local knowledge, seeking greater generalisability of AR jeopardizes practitioner partnerships (Bradbury-Huang, 2010). Dick and Swepson (2013) argue that to generalise in social science outside of a specific focus system (context), is to make true (thus generalising) of specifics between systems that are immersed within other interconnected systems, making their wider generalisability relevant only to the parameters applied.

Shenton (2004) however suggests that it is possible to appraise qualitative research methodologies in much the same manner as with quantitative methods. Proposing four quality criterion for qualitative research appraisal as credibility, transferability, dependability, and conformability (Lincoln, 1995; Shenton, 2004). Reason (2006), following developmental work with Lincoln in 1995 on the issue of qualitative and AR validity, asserts that quality in AR inquiry comes from awareness and transparency about the choices made at each of the four dimensions of AR, namely (1) worthwhile practical purposes, (2) democracy and participation, (3) many ways of knowing, and (4) emergent developmental form. Holwell and Checkland (2007) derive that social scientists, unable to match the replicability of the natural sciences, must attain a situation in which research is 'recoverable'. To do this, the researcher must make clear their epistemological foundations from which they make sense of their research, thus defining what counts (for them) as acquired knowledge.

5.5.1 The judgement of quality and validity in PO

PO is broken out here as it concerns an important first step in the change journey for this project. An issue with PO alone is the validity upon which one can place the claims made by a researcher within that particular setting. Iacono et al. (2009) argue that bias arises from two main sources, the researcher's own belief structures (what they might choose to record as relevant), and their influence over the given setting (making people act differently because they're being watched). DeMunck and Sobo (1998) add that PO relies not only on the researcher's interpretation of the situation, but also that the use of 'key informants' can create different representations of events. Bernard (2011) suggests that resolution of this problem can be found in selecting 'culturally competent'

participants, whilst Johnson and Sackett (1998) attest that the systematic and structured use of PO is the only way to eradicate the creation of spurious descriptions.

Its use is therefore appropriate when used in conjunction with a valid (and varied) framework of approach where consideration is given to mixed media and data sampling rather than of open engagement and blind communication. The result is the use of PO in conjunction with a number of data collection methods. So while PO is used as the overarching title for a phase of research activity, it entails a number of other data collection methods that enhance the validity of the outputs upon which action is taken. This structured approach towards building a reflective picture of the situation is done via the systemic selection of informant groups and appropriate professionals from within UKWASC. This entails focusing on (1) the working group the research is centred on, (2) the individuals themselves separate from the group, (3) individuals and groups outside of the focus team but within the wider delivery chain, and (4) through external interaction to, in essence, 'close the loop' on the delivery chain and to be able to see both sides of the issue.

5.5.2 The judgement of quality and validity in AR / PAR

While the value and differentiation of participatory methods has been discussed at length in the literature, Bergold and Thomas (2012) raise the prominent issue of (assessment) quality criteria for participatory research methods. They highlight the use of adapted quantitatively oriented quality criteria such as by Lincoln and Guba in response to the classical objectivity, reliability and validity arguments. They instead choose to focus on the underlying relevance issue for participatory methods, and tackling the problem of quality criterion for assessing participatory methods, present that firstly one must identify the various institutions and groups of participants to whom the participatory research project is accountable. Importantly, understanding the institutions and organisations to which a justificatory argument will be made is dependent on these institutions, such that research will be accountable to research bodies and thus need to communicate to them or risk not being accepted. So a vital component of this argument is the manner in which a project is undertaken, but care is

given first and foremost to the environment within which it exists, as participants' reflections on institutions may differ from one-another. For the purposes of this project, commonality is found with the manner in which Dick (1995, p.5) sets out this argument, adding that:

Action research is unable to use the methods of experimental research to develop a warrant for its assertions.

Therefore, methodologically, it is important to consider four aspects of how AR differs from more natural science (and even most social science) forms of research through the use of (1) cycles, (2) triangulation or dialectic, (3) documentation and (4) your own reflection (Dick, 1995). In accordance with Reason's (2003) view of the importance of aligning AR principles with those of pragmatism, the following table sets out how Dick's four aspects relate to a number of prominent works in the AR field concerning quality, recoverability and validity.

| Prominent supporting authors | Dick (1995) aspects of action research | | | |
|--|---|--|--------------------------------|------------------------------|
| | Cycles | Triangulation / dialectic | Documentation | Your own reflection |
| Waterman's four characteristics (2001) | Clearly defined phases | Participants described and justified | Consideration given to context | Relationships considered |
| Davison et al.'s Five principles (2004) | The cyclical process model; change through action | Use of theory | Researcher-client agreement | Learning through reflection; |
| Reason's quality in AR inquiry (2006) | Worthwhile practical purposes | Democracy and participation; Emergent form | Many ways of knowing | |
| Winter's six quality criteria | Collaborative resource; Show | Dialectical critique; Accept | Demonstrate a plural | Reflective critique |

| | | | | |
|---|--|--|---|---|
| (1989) | transformation between theory and practice | risk | structure | |
| Breur and Reichertz's goodness criteria for social science research (2001) | Goodness of logic; methodological appropriateness; practical relevance | Goodness of discovery; human ethics; politics of representation; external science evaluation | Goodness of the results of human ethics; | Goodness of honesty; self reflection and perspective taking |
| McNiff's contextualised claims (2013) | Methodological (rigour) | Social (criteria / judgement) | Textual (product) | |
| Greenwood and Levin's credibility criteria (1998) | Workability (relevant actions) | Making sense internally | | Trans-contextual credibility |
| Herr and Anderson's quality criteria (2005) | Outcome validity (workability); Catalytic validity (transformative nature of research) | Democratic validity (reliance on input from those affected) | Process validity (honesty / transparency of approach) | Dialogic (self-criticality) |
| Kindon et al.'s seven themes of reflection (2007) | Building theory; Action | Collaboration; Power; Ethics; Emotions and well-being | Knowledge | |

Table 5.5 - Comparison of prominent quality and validity criterion set out in AR literature

(Source - Author)

To then utilise these four aspects, it becomes important to explore their prominent features.

(1) Cycles:

While the nature of cycles has been discussed previously, for clarity, the expanded Susman and Evered (1978) model by Kemmis and McTaggart (1988) involving spirals, or at least multiple cycles is presented here for use in AR spanning stages of diagnosis, planning, intervention, evaluation and reflection. The oscillating model between action and reflection presented by Kindon et al. (2007) is utilised in PAR. Somewhat confusingly, cycles can exist within cycles, so an interview can be considered a cycle as part of data collection, but multiple interviews constitute a cycle within themselves as may a congruently running survey or series of workshops. For this project, PO could be seen as a cycle, followed by intervention cycles and then a close down cycle (interviews etc.). To differentiate, this is referred to as research approach and in essence, is the TPCA. These phases of activity are represented via reports for PO, the CMP, the Skills assessment and the AR/PAR interventions. This content is then reviewed in subsequent chapters and provided via appendices to the project, with the interview data incorporated into subsequent chapters.

(2) Triangulation or dialectic:

Dick sees that triangulation is coming to represent mixed methods in research vernacular, and while using multiple sources, data collection methods and varied informants is important, he moves towards using the term 'dialectic' instead. The intention being to use multiple data sources within each cycle, enabling the researcher to focus on agreements and disagreements while working towards positive consensus in the social world (Dick, 1995). Unique information can thus be discarded, with the researcher only needing to carry forward their interpretations. Interestingly, by only carrying forward interpretations, AR provides an economy over other qualitative methods and their larger bodies of data that the AR practitioner 'cannot be expected to find the time to deal with'. Development and formation of warrantable assertions is

then formed from searching for exceptions (if sources agree), and explanations (if sources disagree).

(3) Documentation:

Dick advises that for thesis production, one should consider keeping a running record of emerging interpretations, any methodological changes and refinements, the literature you access and any quotes from raw information that best capture interpretations being formed. It is important that documentation helps build the picture being presented, such that when one considers, has change occurred? One can present how things were different. This places dialectic and documentation in a relationship, each reliant on the other, such that in this context, the addition of interviews as a validity mechanism for action reflects on the documents that warrant the researcher's assertions made in the reports. This holistic view is where quality and validity most relate.

(4) Your own reflection:

Representing a further cycle for the purposes of thesis writing, Perry and Zuber-Skerritt (1992) suggest that a challenge can be made that the use of a participative approach leads to the thesis not being one's own work. To navigate this issue, it is suggested that the researcher should treat research cycles as the act element of an individuals' reflection. The researcher is then critiquing the planning, action and reflection of those cycles. In other words, through the use of a diary or some form of ongoing reflective process, the researcher documents their learning about the client system, about people and systems in general, about change, or even about yourself and your approach to change (Dick, 1995). Dick adds further that reporting one's own learning and activity in a qualitative research thesis is becoming increasingly prominent, and thus the research process builds in a defined reflective stage (stage 9) to support the creation of warrantable assertions.

5.5.3 Making warrantable assertions

In discussing the formation of an AR focused thesis, specifically concerned with robustness of processes, Dick (1995, p.1) in building on Dewey's view that all research can do is make a 'warrantable assertion', adds that:

Truth is elusive; but research, well-conducted, can provide a warrant, an adequate assurance, for the assertion which we eventually offer.

Thus research, and importantly its reporting, specifically with regard to the communication of evidence resulting from a methodology 'is as much as anyone can reasonably demand' (Dick, 1995, p.1). Dick adds further that, taken together, two components define a good PhD as one that is:

- Able to claim its methodology as appropriate to the situation, and
- Able to support a claim of some warrantable addition to knowledge.

Extensive effort is made to present the manner in which the research process for this project was considered, modified and rationalised within the social and academic world above. The researcher has sought to draw on the extensive body of knowledge surrounding AR and its different purposes, and make an informed selection of the appropriate tools, as well as to pragmatically build that which was needed to either separate action from research, research from consultancy or need from want. The support for a claim to knowledge comes via the duality of analysis discussed in Figure 5I. I have made extant efforts to disprove any assertions made manifest by this work, and to find fault with the methods used and the tools built. I have attempted to allow for all manner of opportunities for my fellow participants to peel away the layers of the project and raise any issue with the methods, views, approaches or artefacts that have come from this work.

Furthermore, Dick (1995) asserts that contributions to knowledge (findings) in the realm of action based research relate to any (or all) of the following:

- The **specific client system**, and (to the extent that you can generalise) about similar client systems. You probably cannot generalise directly from a single system. But the literature may enable you to make claims about the extent which your findings apply to other systems.
- **People, systems, and change.**
- The **methodology** you used. Of importance here may be the **variations** you introduced to deal with the unexpected. Some of these variations may be novel, and useful additions to the methods available.
- **Yourself.**

The central point to this being concerned with a view to the creation of the 'new sentence' with evidence that it is indeed worth knowing. While via a generalising case study type structure one might reasonably expect for project conclusions and propositional statements to be 'placed back' into theory, with the rationale premised on the methodological formation of truths in the form of propositions that are thus confirmable or refutable. Here, in the localised setting utilising warrantable assertions, we are in fact making judgements which are either warrantably assertible or not (Boyles, 2006). Dewey's views of knowing intrinsically makes linkage to inquiry and the value and potential of espousing something that is indeed worth knowing. It is the worth and value of that espousal which makes something warrantable, such that we should have a desire to know, and that knowing will and can lead to future potentialities. The manner in which we unearthed that knowing is then the structure through which what we espouse that which is warrantable.

While I do not present to find distinct comfort in fallibilism, or indeed wish to stray into solipsism, the assertions formed by this study aim only to represent the culmination of a single study of inquiry that was indeed worthwhile. It is not for me to place assertions alongside the generalisable work of others, such that X, Y and Z expands on Eriksson and Westerberg's (2011) views on the positive impact of softer parameters in bid evaluation. Or A, B and C contrasts the barefoot empiricist arguments made by Cox and Townsend (1998), exemplified in IUK's (2014a) presentation of Alliancing Best Practice in

Infrastructure Delivery. That in fact ICO's do not assess procurement vehicles in such a manner, as the decision making process is too disparate from the front end of the ICO internal delivery chain and are thus merely seen as rationalisations of procurement activity. Such analysis, reflections and expansions suit a generalist presentation of knowledge creation, and this is intentionally not provided. Project assertions are made in respect of Dick's (1995) expansion on the fundamental principles of John Dewey, and standalone in respect of this project.

5.5.4 Contribution to knowledge through a PhD

Due to the demanding nature of participatory methods opposed to conventional research methods, Moore (2004) concludes that we must wait for academic evaluation criteria to be changed before moving PAR into the mainstream. Thus, Klocker (2011) discusses the perceived danger that examiners may assess the rigour of participatory focused PhDs using conventional criteria (Bernard, 2011; Moore, 2004). Herr and Anderson (2005) claimed the need to legitimize the use of the PAR approach for doctoral students in their assessors' eyes in order to satisfy traditional requirements. Bridging this perceived barrier is seen by this researcher as an issue of enlightenment opposed to a conflict.

Levin and Greenwood (2008) in discussing the difficulties that await in writing an AR PhD thesis, suggests that the author may wish to focus on communicating the gradual learning process. Through the reporting of key events and incidents that led to the development of the researcher, this more narrative style will help transform the thesis into a more cyclical document opposed to a typical linear reporting document. The reasoning for this is the move away from force-fitting a cyclical type method such as AR into a linear report and then miss some key data, decision making steps and generally fail to 'take' the reader on the learning journey. Whilst I have taken heed of some of these warnings, extensive effort has been made to communicate a non-orthodox methodology within a digestible and more traditional format. This has potentially led to some longer and repetitive ramblings than would otherwise have been preferred, a problem warned by Dick (1995), but the aim was to make the methodology and thesis as

a whole appeal to a range of readers. To formulate such a communication, the researcher undertook a review of a number of differing, but successfully completed participatory focused PhDs. These included:

- Glavey (2008) - PhD - University of Glamorgan - *Helping Eagles Fly - A Living Theory Approach to Student and Young Adult Leadership Development*
- Roberts (1997) - PhD - University of Western Sydney - *Action researching my practice as a facilitator of experiential learning with pastoralist farmers in central West Queensland*
- Gibbons (2009) - PhD - University of St. Andrews- *Enacting social accounting within a community: actualising hermeneutic conversation*
- Butcher (2007) - PhD - Southern Cross University -*Participatory development: methods, skills and processes; a design framed action research thesis*
- Heinze (2008) - PhD - University of Salford -*Blended Learning: An Interpretive Action Research Study*

To summarize a more extensive review, these works in essence start from an issue they have seen and use AR to change that situation and reflect on what they are doing and have done. They may use AR to explore an issue raised in the literature. They may use AR to reflect on their own practice. They may enact and use AR for the purpose of relating back to AR and they may use AR just as a process of engagement for production. However it is used, my conclusion is that this project again modifies the use of the participatory methodologies to suit a particular scenario, but does not aim to object to positivist forms of knowledge creation in order to make an argument for validity, but instead suggests serving a complimentary (and appropriate) approach to the social world.

I have used the participatory methodologies to solve my questions, building a programme of work which the pragmatic paradigm would support as reasonable. I have focused on the formation of warrantable assertions as I feel these best support the nature of the paradigm within which the participatory approaches sit. I have made efforts to best support the formation of these assertions, respond to the needs of my

relevant institutions, and feel I responded to some of the extensive work highlighted in the selection of PhDs highlighted above in my formation of this document.

5.6 Constraints and limitations

There is little doubt that combining the participatory methods with the attainment of a doctoral award is difficult. The nature of immersion in a setting outside of the comfort zone of an individual places strain on the person and challenges their ability to satisfy the demands of their 'source' organisation. Participatory work does not follow the traditional doctrines of the established academic institutions and thus requires both the unskilled researcher and their peer group to go on a learning curve, a curve sometimes opposed to the procedures of an institution. This is not so much a criticism as it is an input as to why this chapter is made more unique from the other chapters in this thesis document, the risk of non conformity to the orthodoxy after such personal exertion is just too high. Efforts have been made to maintain the flow of the work and keep an element of reflexivity to it, but the fact remains that this still constitutes a report, rather than a story as some more participatory method purists may prefer.

Organisational demands also play a part, and in this case there were three, the focus organisation (UKWASC), the University of Salford (UoS) and the Engineering and Physical Sciences Research Council (EPSRC). The EPSRC placed additional reporting requirements on the work which actually served to be quite helpful as planned stage-gates, but staying within the parameters set by the initial proposal created issue throughout the project. The demand of the University to follow more orthodox protocols, and the draw of the organisation to get as much from the project as they could (once value was experienced), created a management challenge, and the satisfaction of tri-institutional demands has most definitely challenged the production process of this project.

Being linked to one organisation however represents a blessing and a curse. The relationship has allowed the researcher access I couldn't have imagined, but consequently, placed a burden on me to make sure they were satisfied. It could be

argued that satisfaction comes from a good output and that I should strive for that, but satisfaction in terms of commitment places the researcher in a dichotomy between to whom the researcher focused their efforts when all want something on the same day. This has always been a hard balancing act, and whilst integral to the manner in which change was enacted, I am not sure how such a relationship would have transpired if across a number of other cases.

This leads to the consideration of this entire study as a potential first step, the initiation of a long research journey across many organisations focusing on the improvement of delivery even beyond the borders of the UK and the creation of a more globalised theory. That is acceptable in principal, but I want to make clear that such a global view of knowledge creation would neither have suited the project's aims, or facilitated the extent to which the change model was built, and change enacted accordingly.

Furthermore is the issue of time. One person has only so many hours in the day, and to balance tri-organisational demands with becoming a father since the start of this project represents an achievement in my eyes. It could be viewed as disappointing that so much scope is left for publication from this work, and that the number of publications merely scratches the surface, but to marry such publications with the wealth of action that has taken place, almost three years of participatory activity coupled with the formation of this document, I am not unhappy, but more excited about the work that could come from this. Time was always going to be a constraint, but we managed to achieve the plan, and in all honesty, a lot more than that.

A certain shortfall from my perspective is the lack of a number of vantage points on the study. The organisational boundary placed around the work omits views of external contractors, regulators and a whole host of bodies involved with the delivery of the works. Addressed in the PO phase and in the review of literature and theory formation / identification, this would certainly be a part of any future works. I consider the work to be intro-analytical in this manner, and whilst the methodology is fully appreciative of this, expansion of the assessment of the study to include those other parameters would no doubt add an interesting dimension to the work. Especially when one considers time.

One last element is that of measurement. I focused on the improvement of competence, but competence is inherently about delivering an improved service which either gives an increased service to customers for the same cost, or the same service for reduced cost in terms of profit or bills. Irrespective of this, I would like to have found a way to build this into the study, but due to time limitations again, matching such fiscal data to the change made by this project, as well as accounting for all the possible variables, was considered outside of the potential remit of this study.

5.7 Chapter summary and linkages

What this chapter has aimed to show is the reflective manner in which participatory methods have been applied in order to facilitate change within UKWASC. This method has focused on the oscillation between theory and action, and the drive to create in one hand, and test with the other. The aim to essentially make an organisation deliver more strategically has required a complete overhaul of what even I thought participatory methods were for. I can openly admit, I believed in a more positivistic view of the world prior to the commencement of this PhD. I think this is reflected in my efforts to define the relationships between some of the participatory methods, especially the transition from AR to PAR, and that is something I toiled with personally for quite some time. However, I have found the participatory framework, with the use of appropriate tools to match contingent situations a method most suited to the situation, and also my view of those around me. I feel a contribution to the participatory methodologies has also been made, and that this is in the form of the research process and the PO / AR / PAR relationships as part of the TPCA. I have made many attempts to prove myself wrong throughout this process but present the TPCA as valid within the context it was defined. I look forward to the potential for others to either refute its application, and in some fashion prove the idea of localisation, or add to its rigour in other settings and start the journey of globalising its value. The following chapters now turn to address the outputs from this process and highlight some of the valuable work this structure was able to facilitate.

CHAPTER 6 RESEARCH DATA GATHERED THROUGH THE THREE PHASE CHANGE APPROACH

6.1 Chapter Introduction

The following chapter summarises the data collected as part of this research study. It is meant as an honest presentation of the actions and key outputs created within the study, and consequently follows somewhat of a chronological order. An important note for readers here is that reports have been created in accordance with the nature of the study. However, due to the nature of the project, these reports contain commercially and ethically sensitive content. While this section provides an overview to communicate the research story, the full reports themselves are referenced (Appendices D-J) whilst being intentionally omitted.

The full reports will be held via a secure process that can be accessed upon request and associated approval from both the University and UKWASC. For note, examiners of this work will have access to the full reports for the purposes of review.

Additionally, the remainder of the PhD report adopts a review strategy to coincide with the argument made by Perry and Zuber-Skerritt (1992), expanded upon by Dick (1995) that one make a separation between work with others and reflections on that work as part of a thesis. Subsequently, this section is concerned with communicating the data and actions from the project, some of which constitutes as 'shared' knowledge with the colleagues and fellow participants that took part in the respective activities. The sections that lead from this will then draw out the reflections of the researcher in making warrantable assertions of note back to theory and practice as discussed within the research methodology.

Figure 6A outlines the structure of the remaining sections of this thesis, inclusive of the associated data that feeds into the analysis sections and the related formation of warrantable assertions.

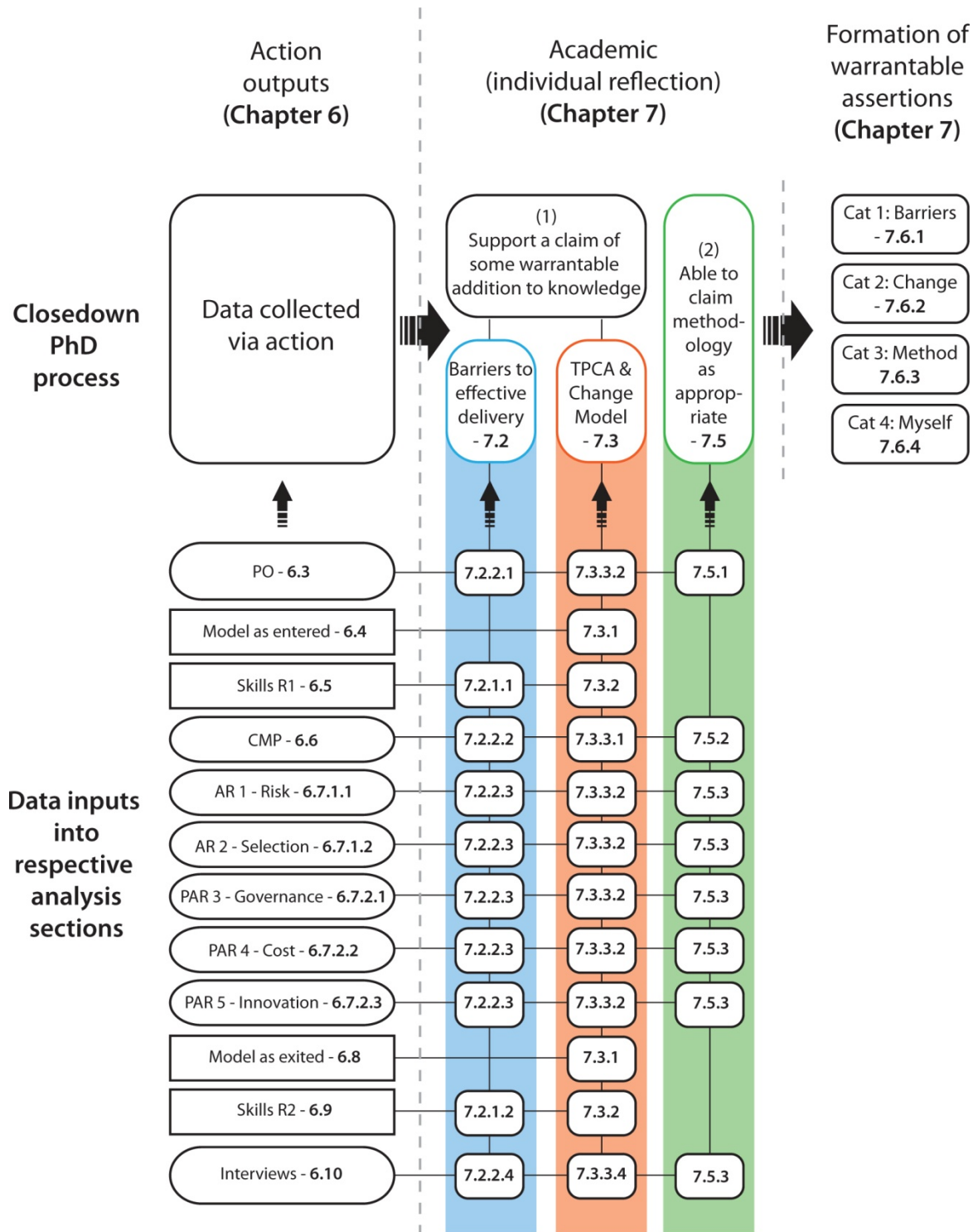


Figure 6A - The structure of analysis and closedown of this thesis (with some key sectional references added to aid navigation)

(Source – Author)

6.2 Situational focus - where the project was based

The following data is set against the backdrop of a number of key components. It is important to make these components clear in order to understand the relevance of this data to not only this PhD research project, but to the situation in which change 'originated'. In no rank order these include:

- Situation: originally set within the confines of the AMP6 Procurement Team (APT) within UKWASC, the project migrated to be based within the AMP6 Mobilisation Team (AMT) following selection of the AMP6 partners, and then into the wider Supply Chain and Commercial business function. Data generally refers to the researcher's 'attachment' to these teams within the wider UKWASC business, with interventions often stepping outside of this environment;
- AMP6: refers to the 'Asset Management Plan' for the water sector, period 6 being 2015-2020. Put simply, water organisations re-negotiate with the regulator around their service levels, delivery requirements and capital and maintenance activities etc. resulting in revised programmes of work to be delivered during the period. Changing requirements, customer needs and business performance levels all contribute (among other issues) to the possible need to change delivery approaches. The original APT was tasked with the re-procurement of new relationships for the forthcoming 'AMP', and this process began in late 2012;
- The APT: headed by the Industrial Supervisor for this project, the APT started life with only one man conducting an initial assessment exercise of the current delivery arrangements and the possibility of their extension. This expanded into an optioneering exercise with the view to possibly re-procuring differing relationships. The team began to expand during a period of assessment to the point where a transition towards being a re-procurement team (opposed to an assessment team) took place following formal senior leadership sign-off. This led through assessment, evaluation and award and onto an eventual process of mobilisation before full enactment. Mobilisation in this regard is concerned with bringing new entities 'onboard' the organisation through an embedding process prior to full operation;

- Data collection period: this coincided with the initial APT assessment and strategy phases in November 2012. Subsequent phases of this project stretch through procurement and assessment and into mobilisation and operation, culminating in the delivery of closedown interviews in October 2015; and
- APT make-up: situated outside of any particular department but calling on a number of resources from within Supply Chain Management (SCM) where one might find the core of the organisation's procurement skillset, the team incorporated a large number of persons at different phases from throughout the organisation.

6.3 Participant Observation

For further details refer to Appendix C.

What did we want to address and how did we do it?

Participant Observation (PO) acts as the initial step towards change within the focus organisation (UKWASC). PO as a process serves to not only identify areas for potential change but also as an integrative phase for me as a participating member within the focus situation. It serves a further purpose of acting as a buffer between the researcher and the organisation in the initial phases of the project. PO in this regard then serves the situation in allowing I, the researcher, to understand the dynamics of the situation at hand with a view to changing something via a different engagement method. PO sets the agenda for action and is a vital precursor to engagement via the CMP. The CMP serves to answer questions such as:

- What are we going to change?
- What can we change?
- When is best to change it?
- Who gives us authority to change it?
- Who will help us change it?

PO on the other hand, focuses on exploratory questions such as:

- What are the prevalent issues?
- Who are the interested parties?
- What are the power issues throughout this situation?
- Are there different patterns of behaviour?
- Do people act differently given their situation, surroundings or in response to power structures and culture?

The analysis of this phase was across four areas that respond to Kutsche's (1998) view of model building within a particular setting; in this instance, the issues affecting effective infrastructure delivery within an ICO. So while PO was undertaken as a single exercise over a period of time (November 2012 to Jan 2013), the reporting is broken down into typologies to help me as the researcher, outline the differences observed as part of the process leading to the identification of the main themes from the analysis. The four areas of PO analysis included the working group (the APT), the individuals themselves, wider business areas and via external interactions. These four typologies then fed into the summation of issues by the researcher in isolation to the collection. Readers are directed towards Appendix C for further details regarding the collated data for this activity.

6.4 Model as entered

Members of the APT helped detail the existing arrangements for AMP5 during the PO phase, this was then formed into the model below (Figure 6B) and retested with them. It was also tested within the iCase quarterly review sessions, providing an additional element of academic testing. It outlines the key relationships and what was seen as defining the AMP5 IDS. The discussion was facilitated by the researcher, so far as I proposed elements such as regulation, finance and organisational boundary around certain elements to promote discussion. Certain elements were discounted by the team and thus the following was used as a communication tool for this phase as the 'system

as entered'. In essence, the AMP5 IDS into which interventions would be formed. This model served as a frame of reference for the definition of interventions within the CMP, as well as a reference point from which to communicate the differences between AMP5 and AMP6 when analysing the effectiveness of intervention.

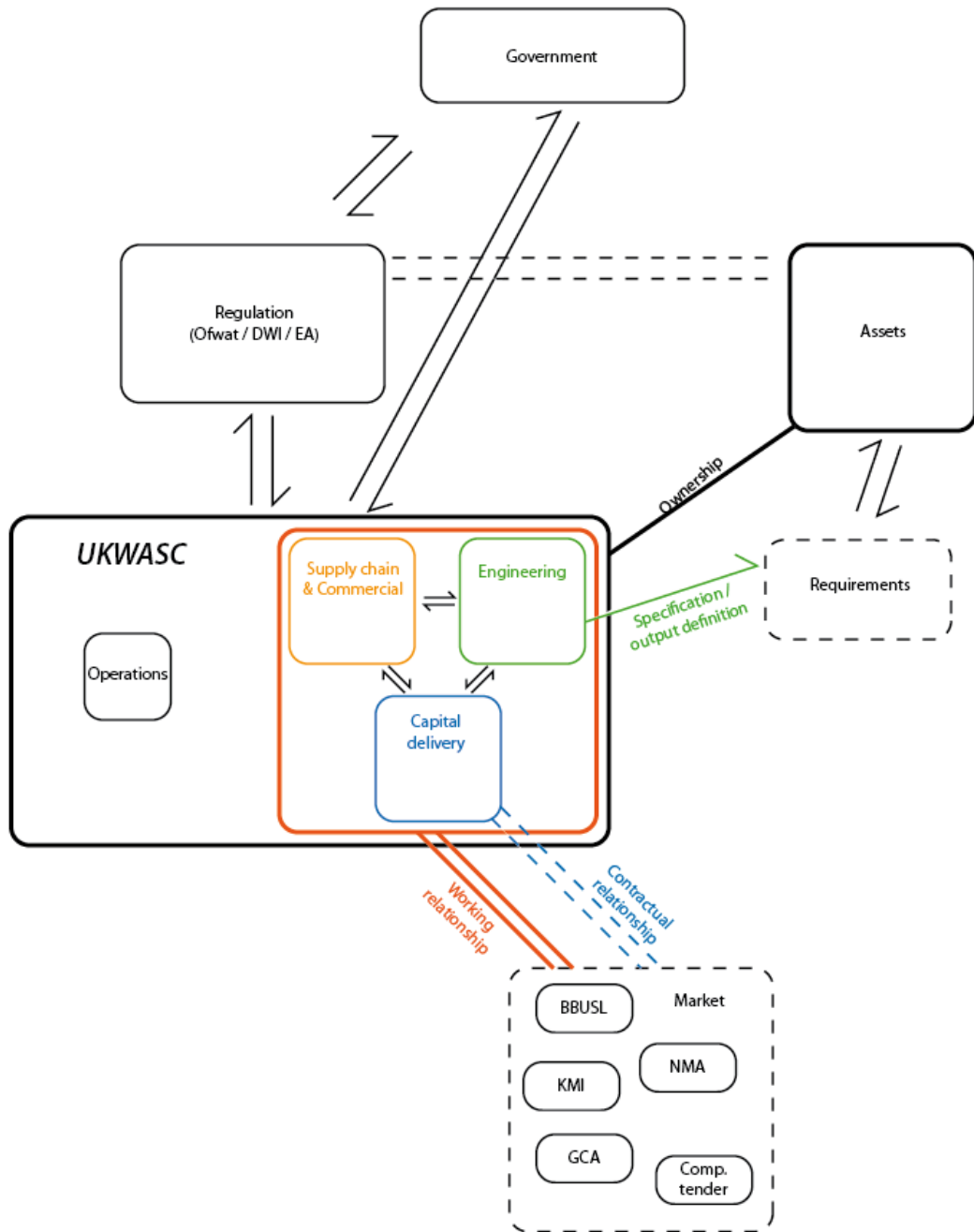


Figure 6B - UKWASC AMP5 IDS

(Source – Author)

6.5 Skills / maturity benchmarking exercise - Round 1

For Further Details refer to Appendix D.

What is it, what was it for and how was it done?

As part of the initial modelling exercise, there was a necessity to create a skills benchmark to support the PO phase and subsequent action. In essence, an assessment that would provide a further facet of analysis come the closedown of the interventions, and to give the researcher a more in depth view of the focus organisation from a pragmatic perspective. The assessment utilised the IUK IPR released officially in January 2013. The tool fit within the framework of the research approach and had a loose connection with Socio-Technical Systems and thus the foundations of this project.

The guidance is aimed at helping sponsors / clients understand their own capabilities more clearly. It is an overview tool in essence, built on a series of assessments to help clients understand competence in delivery and begin to assess gaps. Pilot studies on programmes such as Crossrail and the Thames Estuary required full assessment processes taking up to 8 weeks. It was seen however, that such an activity, involving potentially over 100 people was too be too intensive, especially considering the number of workshops involved, and especially considering the business appetite of UKWASC who continued to see themselves as a private entity and exempt.

While true to a point, it perpetuated a sense of closed off ideas and values. I knew I wanted to create a benchmarking exercise that separated me, the researcher, from describing the situation, in essence, confirming my views via PO or unearthing additional elements. I had initially considered that this could be done via either a focus group, workshop or via interviews with some supplementary materials required to facilitate discussions around capabilities. The IPR, somewhat opportunistically, represented a ready built tool to serve as a benchmark and to stimulate engagement with employees. The issue was the level of involvement required. The consequence was to build an abridged version of the IPR and turn it into a more simplistic skills / maturity exercise that drew on the principles of the IPR, while being able to be conducted via one-to-one

structured sessions, allowing explanation and any questions, as well as for me to understand the implications of any notes.

Importantly, interviewees were asked to fill in an 'as is', and their perception of what AMP6 'needed'. This was to allow me as a researcher to conduct the review again at the closedown of the project and to assess the extent to which business change married onto personal perceptions of change, inclusive of actual skills required. 15 people in senior business roles across multiple delivery functions were approached, each mapping onto key roles identified by the IPR as summated by Table 6.1:

| No. | Role | IUK - Matrix role - Adjusted |
|-----|--|------------------------------|
| 1 | Head of Supply Chain, Capital Programmes | Client |
| 2 | Engineering Delivery Manager | Client |
| 3 | Senior Construction Solicitor | ALL |
| 4 | PR14 Commercial Manager | Asset Management |
| 5 | General Manager - PDS | Sponsor |
| 6 | AMP6 Category Manager | Supply Chain |
| 7 | AMP6 Commercial Manager | Supply Chain |
| 8 | Director of Supply Chain and Commercial | Sponsor |
| 9 | Engineering Delivery Manager | Client |
| 10 | HR Manager | ALL |
| 11 | AMP6 Programme Manager | ALL |
| 12 | Programme Delivery Manager | ALL |
| 13 | Salford University Professor | ALL |
| 14 | Head of Construction Services - PDS | Client |
| 15 | Area Business Manager | Asset Management |

Table 6.1 - Respondents, their role and their mapping onto the IUK IPR roles for Round 1

(Source - Author)

6.6 The Change Management Protocol

For further details, refer to Appendix B.

What is it and what does it do?

Data collection for this project exists across two distinct phases, the identification and the enactment. These are essentially separated by the Change Management Protocol (CMP). Put simply, the CMP is a bridge between literature and practice. The action phase within UKWASC is an engagement based on enhancing SPMC within UKWASC, building on the TPCA and utilising STS as the basis for change and optimisation within delivery. In order to set the parameters of interventions, this tool was built to allow the researcher and the focus ICO to reach agreement on the five intervention areas of SPMC and the proposed plan of works.

Who engaged with the process?

This was initially conducted between the researcher and the industry supervisor and then tested with other members of the AMP6 Procurement Team (APT). An assessment process was devised to allow for as impartial an assessment as possible during this phase.

What was our initial plan?

Following the engagement exercise, the initial plan for intervention was as follows:

- 1. Risk** - *Project Handover (process) and Delivery Route Allocation*
- 2. Selection** - *Behavioural assessment programme*
- 3. Governance** - *KPIs and Collaboration (potential for incentives)*
- 4. Innovation** - *Design for Manufacture and Assembly (DfMA) and Market relationships*
- 5. Cost:** *Project Handover (contract)*

The need to revisit the CMP process

The CMP did not serve as a fixed process for this study, it served as a gateway, a terms of reference from which to act. The CMP was consequently revisited following a number of changes made in light of a range of pressures, ranging from time and access, but predominantly around improved options. What is meant here is that intervention scenarios arose that presented the opportunity to impact UKWASC to a greater degree than compared to the initial options. The same CMP process was followed to determine suitability however to maintain conformity as the process as designed demanded. The final list of interventions as entered consists of the following (changes in bold):

- Risk (1): *Delivery Route Allocation and Project Handover*
 - January to April 2013
- Selection (2): *Behavioural assessment programme*
 - March 2013 to August 2014
- Governance (3): *Governance / KPIs & Collaborative working / **Incentives***
 - February 2013 - Jan 2015
- Cost (4): **Commercial Organisational Re-Design**
 - February to June 2015
- Innovation (5): **Programme Optimisation**
 - June 2014 to October 2015

6.7 The nature of intervention

Intervention into UKWASC was across the five areas of SPMC as defined previously, with these focal areas acting as fulcrums of activity. Furthermore, there was a transition of the researcher from outsider to insider during the process, and thus the adoption of PAR in the latter interventions differentiates these from the earlier interventions utilising AR in the canonical form. The following outlines the interventions within the context of activity and shared knowledge with participants. The analysis section will then extrapolate this data in the support of warrantable assertions and thus form a

separation between researcher reflection and shared creation via action for the purposes of this PhD.

6.7.1 The Action Research focused interventions

6.7.1.1 Intervention 1 - Risk

For further details, refer to Appendix E.

Intervention title: Delivery Route Allocation and Project Handover

Action date: January to April 2013

Participants: 15+

This intervention focused on the formation of appropriate delivery arrangements to accompany the creation of new delivery systems for AMP6. As such, the focus was on the working relationships between the client and the supply chain, especially around project handover and the extent to which the client was responsible for certain aspects of work. This by proxy became concerned with the formation of an initial Delivery Route Allocation Model that stipulated the associated organisational structures and risk profiles of particular works and the appropriate use of AMP6 delivery systems. Key importance was the nature of social structures and communication of a holistic delivery picture with a view to the joint optimisation of both environments to aid in effective delivery. The intervention went through three cycles, each with the following focus:

- Cycle 1 - Creation of new engineering working models
- Cycle 2 - Hierarchy modelling and multi-disciplinary team design
- Cycle 3 - Creation of delivery route allocation model

What did the intervention teach us about UKWASC's approach to Risk?

- Procurement was largely seen as an 'end of the line' process, as something that should be considered at the level of market engagement once a package of information is ready rather than in terms of delivery processes. In essence,

- UKWASC delivered traditionally, whether they had relational delivery arrangements in place or not;
- Only where design and programme activity was handed over to the market via lower risk works, often with more regular works, such as maintenance, did they release risk, but still not 'share' or mitigate;
 - The supply chain was consequently not seen as an aide to more complex endeavours, and in this regard, UKWASC did not understand the premise of a strategic approach to market, holding onto risk for more complex works in a traditional manner;
 - UKWASC did not seek to deal with risk collaboratively, instead seeking to 'design it out'. Furthermore, they failed to address appropriate risk transfer or mitigation strategies, failing to understand the knock on effects of risk at a programme level;
 - A key issue was the prevalence of single project traditional working within an 'alliance' approach. The practicality was this only removed the procurement process by having a pre-selected partner, the essence of the alliance approach was lost due to their single project, traditional procurement system approach. The result was an avoidance of risk under the proviso of future work, not utilising the delivery system to leverage value, streamline working practices or actively seek to reduce programme risks and general market exposures; and
 - Understanding of the entire delivery picture was considered the responsibility of budget holders, not supply professionals, even though they were a disparate group of internal clients. Supply approaches did not therefore mitigate business risk, but only 'sub' client risk.

What did the intervention teach us about changing UKWASC's approach to Risk?

- It became apparent that breaking the view of differing delivery approaches to market as merely simplifying the procurement process was of the utmost importance. There was a significant barrier between supply trained staff who focus on totality of spend, the categorisation of 'products' and associated supply risks, and commercial / construction trained staff, who focus on the single

- project as their 'product', with the two forming an informal matrix to which no-one was fully aware;
- Additionally, this dichotomy of approaches led to a cross over in supply thinking to treat all projects as single endeavours, and then only rationalise products that were standard across them, such as pumps for example. This led to a situation where all suppliers were to be 'selected to suit the product', either at item or whole project view (depending on vantage point). The result was a lack of advancement of the holistic picture, any commitment of spend and any clear view of all the delivery arrangements in place; and
 - The impact was to get delivery professionals to consider the end to end delivery cycle of projects within a framework of the entire delivery chain, inclusive of the external market and customers. Too often discussions focused on technical specifics, such as 'the responsibility of survey data', rather than the social process that would support the technical structures. The tendency to jump to the specific hampered holding attention at the 'helicopter level', seeking to identify a direction for zones of delivery with associated attitudes and processes that would work harmoniously. Changing this attitude was central to the intervention.

6.7.1.2 Intervention 2 - Selection

For further details, refer to Appendix F.

Intervention title: Behavioural Assessment Programme

Action date: March 2013 to August 2014

Participants: 8+ in design and delivery (not including workshops)

This intervention focused on the creation and delivery of a behavioural assessment process to accompany the selection of new AMP6 contractor (and engineering / design) partners for the new delivery arrangements (systems). It focused on challenging the notion of simply pulling resources from the market place to suit a business need, and instead consider the nature of the supply chain being procured. By proxy addressing client side barriers hampering more relational forms of delivery. This intervention

focused on the alignment of social attitudes, both internal and external, towards the nature of the new delivery system, with the aim of utilising the assessment process as a driver for wider business change. The intervention went through three cycles, each with the following focus:

- Cycle 1 - Creation and design of behavioural assessment process
- Cycle 2 - Conduct and participate in workshops
- Cycle 3 - Creation of behavioural improvement report / assessment

What did the intervention teach us about UKWASC's approach to Selection?

- UKWASC considered the supply market as being unskilled and undevelopable, in essence, something fixed in terms of offering and associated skill-sets;
- UKWASC considered suppliers to be there to be called upon, not worked alongside;
- UKWASC considered that relational practices only reduced competition and that they generally cost more to operate;
- UKWASC considered there to be no need to change their practices to suit delivery arrangements;
- UKWASC considered selection practices to be more about risk mitigation in the process, than alignment to supply chains;
- There was no cohesive relationship plan in place prior to selection activities, instead seeking to 'create later';
- UKWASC maintained a primary focus on cost for selecting new delivery partners; and
- UKWASC made little effort to take assessment learnings forward and address in start-up / delivery.

What did the intervention teach us about changing UKWASC's approach to Selection?

- Any intervention approach needs to align to business processes in order to be taken onboard. Business leaders need to consider a process to align to what they are doing to be taken seriously, to be provided with resources and to maintain

- commitment. The change process could seemingly not run in tandem, or maintain commitment following the closure of the specific business activity;
- Change needs to be considered in light of objectives, either personal amongst leaders, or via external consultants with other agendas;
 - Change was considered in the remit of 'someone else', with a reluctance to consider the broader impact of selection practices in delivery;
 - People are open to the concept of change while it relates directly to what they understand as their job or as satisfying a superior. In hierarchically driven organisations, aligning to superiors in this manner seemed the norm and affected the change process accordingly; and
 - People need to be taken 'on the journey' of change, and reflection needs to be collaborative if it is to be understood. Simplicity is paramount to this, as well as finding the appropriate communication medium through which to allow others to take part in the process.

6.7.2 The Participatory Action Research focused interventions

6.7.2.1 Intervention 3 - Governance

For further details, refer to Appendix G.

Intervention title: Governance / KPIs & Collaborative working / Incentives

Action date: February 2013 to January 2015

Participants: 12+ in design and delivery (not including workshops)

This intervention focused on multiple elements of the wider governance strategy for the main capital intensive focused delivery arrangements (systems) for AMP6. Comprising what can be viewed as three interrelated streams of activity in the form of an incentive strategy, the performance management strategy (predominantly KPIs) and governance structure, with collaborative working a bridge across the three. This intervention focused on bringing these somewhat disparately focused elements of delivery under one approach, and to align the harder measurement processes of the delivery environment

with the social working structures. This intervention created a number of constructs that otherwise would not have been created or considered, as well as seeking to force change within the design and utilisation of certain processes and attitudes. While the previous interventions were concerned with 'things', models and assessments etc., this intervention also concentrated on things, but the manner in which they were created, used and how they contributed towards an optimised delivery environment.

What did the intervention teach us about UKWASC's approach to Governance?

- UKWASC gave no consideration for sharing governance processes with supply partners, they wanted to maintain a 'healthy gap' between themselves and the 'self-interests' of the supply chain;
- UKWASC had an immature approach towards the management of programmes, and by consequence, showed a reluctance to take a programme approach towards incentivisation and to deal with the delivery system in its entirety. Instead choosing to continue with a single project approach from the outset (in terms of delivery system design);
- UKWASC only gave consideration of project level governance practices linked to replication of process, rather than aggregated views of demand and supplier relationships. They had little regard for other works the relevant suppliers may be delivering, their pressures and their needs around ensured demand requirements in order to provide the service UKWASC were looking for;
- Many of the interfaces between internal professionals and external consultants were towards lean type models of operation, often based in, both experientially and theoretically within the manufacturing and aerospace sectors and by proxy, not suited to project level thinking and the complex over the complicated; and
- UKWASC did not take a systems approach to issues or implementation, choosing to deal with issues such as incentivisation, performance measurement and associated governance structures (all underpinned by a collaborative approach) in isolation, rather than dealing with their interconnectivity.

What did the intervention teach us about changing UKWASC's approach to Governance?

- UKWASC were open to the premise of measuring behaviours, but not from an actionable perspective, instead choosing only to highlight issues and avoid any real world connection between behaviours and relational actions across the delivery system;
- There was a general resistance towards engaging with other theoretical positions, specifically the categorisation of lean as being 'the' answer, rather than being among other tools. With other options presenting a challenge, rather than either a framework for application and improvement, or in addition to their own skill-set;
- There was a general refusal to adopt or engage with more behavioural, social and cultural issues and their impact on delivery. A general pretence of going along with the process and then getting back to normal was maintained;
- Especially during mobilisation (post delivery system contract award), there proved to be a direct need to be an 'owner' of change processes, irrespective of change agent focus to force adherence to issues of change and the definable actions of a business workstream. In essence, a number of employees were forced to look at something they were not comfortable with and otherwise would have comfortably ignored;
- A change reaction to the business practice of using others simply as informants to one's own process, forced the use of knowledgeable others as change agents, getting them to come on board to processes and enact change elsewhere, rather than the idea of attending workshops, imparting content and then waiting for change to happen to them, somehow. The change team I was connected to in this regard struggled with this issue;
- An important aspect of this intervention centred of the overcoming of interpersonal barriers, of redefining relationships in order to focus on change, instead of seeing the person as a barrier and focusing on context. The difference in tact of joint optimisation of social and technical aspects by the researcher, and process optimisation followed by social orientation of the participants led to

- approach separation, as well as associated political issues with regard to rationale. It became clear that failing to agree on the principal created a barrier between objectives and satisfaction with the process of how to achieve them;
- The consequence of this was understanding the need to align change to another's agenda and then changing their agenda, rather than bringing them on board to my change agenda from the outset and potentially challenging their social and psychosocial foundational premises.; and
 - A further key focus of this intervention, in accordance with the drive to align change to another's business need and requirement, and to align drive to change and link to work practices, there was a need to align shift in activity within a framework of engagement. In essence, making participants stick to certain goals and task outputs in order to remove shoehorning and force fitting at the end of a process to remove the impact of the good work done before it.

6.7.2.2 Intervention 4 - Cost

For further details, refer to Appendix H.

Intervention title: Commercial Organisational Re-design

Action date: February to June 2015

Participants: 16

This intervention was somewhat opportunistic in its formation, taking advantage of organisational pressures to focus on the alignment of social and technical working practices to aid in the delivery of effective working relationships. In essence, the focus was on the re-formation of a 100+ strong Commercial function within UKWASC to not only take the opportunity to integrate it more effectively within the delivery chain, but also to act as a fulcrum for strategic procurement activity that can then aid and work with other colleagues. Considered a service function until this time, business change conditions meant there was an opportunity to re-design not only the structure of the function, but also the working attitudes of a function essentially in ownership of contract delivery for the AMP6 arrangements (systems).

What did the intervention teach us about UKWASC's approach to Cost?

- Commercial and supply chain functions were seen as a service to project and programme management functions, not a part of decision making and consequently became reluctant to propose alternate approaches to cost management they were even aware of, irrespective of potentially new processes;
- Commercial functions consequently consider themselves as advisors, with project managers and capital delivery functions as the owners of cost;
- The single project focus leads to an emphasis on price rather than cost and associated skill-sets within the commercial environment, with little surprise being found in a price focused relationship between the business and the market;
- A disconnect between project level cost management and the understanding of the entire delivery picture led to sub-level decision making not in the wider strategic interest of the entire programme of works. An example of this is putting no strategy in place to mitigate risk with a contractor who had vastly under-priced a fixed price package of works. UKWASC were happy with the value they had created, rather than thinking of the long term viability of that supplier relationship.
- UKWASC considered the finance function and the management of cost as two different elements, rather than different ways of looking at the same thing. Consequently, there is only a focus on allocated budget at project level, not affordability issues for the business, leading to the undertaking of projects or plans not in the business interest due to disconnected attitudes;
- UKWASC sees the supply chain (and its management) as being there to mitigate on site risks and tendering price variations only, with the associated delivery environment concerned with increasing their return, leading to an attitude that they should not be involved openly towards the front end of projects.

What did the intervention teach us about changing UKWASC's approach to Cost?

- UKWASC personnel are reluctant to take on board the responsibilities that are associated with being a front end decision making participant;

- Furthermore, the wider delivery business does not understand the difference between project based and functional based organising;
- Change is considered a staple of the delivery environment, but not from a perspective of adaptation, more from one of waiting until change is over and reverting back to norms;
- Communication of relevant data and its linkage to one version of the truth is avoided in order to mitigate unearthing the facts, relevant workarounds or diminish the personal specific value added by particular employees. Making a linkage between data and helping, rather than hindering became central to the focus of change;
- Successful change is linked to removing barriers external to the team's control, as well as redefining the definition of their own roles as they have come to understand them. This means breaking down opinions of oneself as much as other's opinions and views. This makes change being linked to potential rather than adaptation; and
- Professionals are typically single project trained in the construction sector, such as engineers and surveyors etc., with supply professionals concerned with categorisation of products. The interface between the two has not been addressed, either in practice or via strategy, leading to supply professionals becoming subservient as spend is used as a definition of importance (compared to large project budgets).

6.7.2.3 Intervention 5 - Innovation

For further details, refer to Appendix I.

Intervention title: Programme Optimisation

Action date: June 2014 to October 2015

Participants: 12

This intervention centred on the creation of an optimised programme of works with an associated pipeline for the wider AMP6 capital construction programme. Until this point,

UKWASC had little in the way of programme overview, especially with regard to supply chain engagement. This intervention focused on giving clarity around the nature and scope of upcoming works, as well as working with those involved in determining the appropriate procurement systems and associated contract strategies that would serve the wider AMP6 delivery systems. This meant focusing on the underlying social structures, especially with regard to bounded rationality issues and knowledge base. As well as the 'actual' processes utilised to engage with the supply base via more aggregated and committed programmes of work to leverage value.

What did the intervention teach us about UKWASC's approach to Innovation?

- Innovative delivery practices, rationalisation of commercial relationships and general delivery strategies were considered the remit of others, not within the function responsible for supply chain engagement;
- Stepping outside of contract management and into the wider impact of delivery decision making was considered as 'the sponsors responsibility', and thus finding innovative solutions to delivery should originate from the sponsor team, rather than seeking to identify with any new ways of working within current practices. The associated culture is of delivering the role, not questioning rationales;
- UKWASC employees are able to point out blockers to innovative practices, but seemingly have little connection with the decision making process hierarchically to be able to do anything about it;
- UKWASC employees tend to consider the world as is, rather than how it could be, seeking to find new approaches to problems already defined if they are prompted, rather than whether that solution was ever required or indeed is appropriate to begin with; and
- UKWASC sees market innovation as being in the interest of supplier returns only, and thus focus on internally sourced innovative practices, considering market innovation only once it has become 'the norm'.

What did the intervention teach us about changing UKWASC's approach to Innovation?

- There was little in the way of resistance to doing things differently, in general, the participants could see the benefit. They struggled however with their view of the business delivery process and whether the activity would come to fruition and thus, whether there was even any point in investigating it;
- Change around innovation was not so much the ideas, or even challenging preconceptions, it centred more on seeing the world differently, assessing why one does something, rather than how something new affects how one already does something; and
- This intervention showed how collaboration at the embryonic stages of change, without pressure to achieve an end goal, but instead focus on the nature of one's own work was central to instigating change that has repercussions beyond the impact of a change agent. Understanding the need to 'share the journey', but also while understanding a general plan provided a loose working relationship with clear end goals, but a shared idea of how to get there.

6.8 Model as exited

Following the completion of the interventions, a second modelling exercise was undertaken, again to coincide with the second skills / maturity benchmarking exercise. This was undertaken with members of the original APT, and as with the model as entered, it was tested within the iCase quarterly review sessions. The revised model (Figure 6C) essentially details AMP6 at the time of project closure. It allows for a comparison to be made in the analysis of the location and extent of intervention impact in changing the delivery arrangement for UKWASC. It also facilitates forming a representation of the AMP6 IDS in action at project closure.

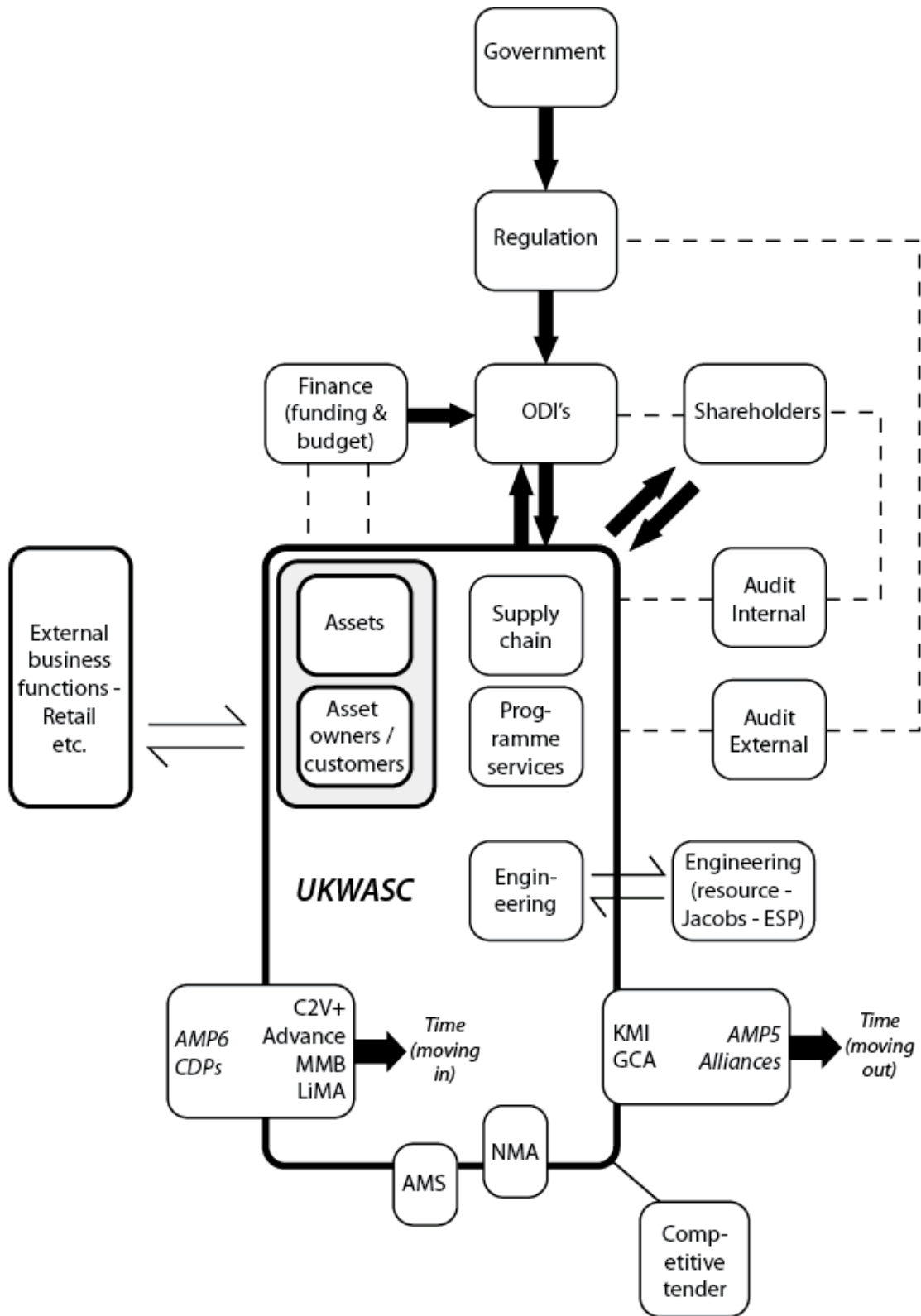


Figure 6C – UKWASC AMP6 IDS: The new IDS

(Source – Author)

6.9 Skills / maturity benchmarking exercise - Round 2

For Further Details refer to Appendix D.

What is it, what was it for and how was it done?

This represents the second round of analysis of UKWASC using the abridged version of the IUK IPR utilised for Round 1. Readers will note from Appendix D that the Round 2 activity utilises the same assessment process and material as identified within Round 1, rather than engagement with the revised guidance issued in 2014 under the guise of the Project Initiation Routemap by IUK. The rationale being to facilitate comparison between the two in assessing the nature of the business outside of the remit of the reflections provided by the researcher through reports. While the interviews reflect on the work of the researcher via intervention, this exercise provides a view of UKWASC to which those interventions relate. Again, 15 respondents were selected to represent significant roles within the AMP6 delivery chain. They were mapped onto the IUK IPR roles as follows:

| No. | Role | IUK - Matrix role - Adjusted |
|-----|--------------------------------|------------------------------|
| 1 | Area Commercial Manager | Client |
| 2 | Strategic Business Partner | Sponsor |
| 3 | Operational Excellence Manager | Supply Chain |
| 4 | Commercial Manager | Client |
| 5 | Head of Operational Excellence | Supply Chain |
| 6 | Programme Services Manager | Client |
| 7 | Area Contracts Manager | Client |
| 8 | Commercial Manager | Client |
| 9 | Area Engineering Manager | Asset Management |
| 10 | Head of Commercial | Client |
| 11 | Procurement Manager | Supply Chain |
| 12 | Commercial Manager | Client |
| 13 | Area Business Manager | Sponsor |
| 14 | Area Engineering Manager | Asset Management |
| 15 | HR Business Partner | ALL |

Table 6.2 - Respondents, their role and their mapping onto the IUK IPR roles for Round 2

(Source - Author)

6.10 Reflection interviews

Part of the closedown of the project and associated interventions, was to step back from action and to reflect on the impacts of the project in bringing about real world change to address the barriers to effective delivery. This was done via interviews that aimed to address three key aspects of the project, namely:

- General intervention information and validity of the Strategic Change Model
- The nature of the researcher's impact via the Intervention from the interviewee's perspective as either a:
 - Co-Designer (part of the delivery and design of the intervention); or a
 - Participant (effected by the intervention either directly or indirectly); or in terms of
 - Oversight (provided by the project industry supervisor)
- The wider impact of the intervention on the business and further issues relating to delivery

Interviewees were selected based on their relevance to the interventions as either co-designers or participants (see table 6.3 below). Where possible, different co-designers and participants were selected to give as broad a reflection on the process as possible whilst remaining knowledgeable enough to add value and allow for more in depth analysis to take place. A co-designer and a participant were selected for each of the interventions, with the project industry supervisor providing an overview of the study, and consequently concerned with impact across all the interventions and general relationship with the CMP.

Due to issues of availability, one participant was interviewed to reflect across two interventions (interviewee2). Similarly, one co-designer (interviewee8) was selected for two interventions, with this being based more on the level of involvement being way and above that of any other co-designer involved in either intervention, so this was by design rather than responding to issues of availability, willingness to be interviewed and time constraints. One interviewee was best placed as a participant in one instance, and co-designer in another (interviewee 6). As the co-designer for the Cost intervention, no-

one else could have filled this role, for the Risk intervention however, there were availability and knowledge issues of others regarding the intervention in a participant capacity, hence the cross-over in this regard.

| intervention | Overview | Co-designer | Participant |
|--------------|----------------|-------------|-------------|
| Risk | Industry | 8 | 6 |
| Selection | Supervisor (7) | 8 | 1 |
| Governance | | 4 | 3 |
| Cost | | 6 | 2 |
| Innovation | | 5 | 2 |

Table 6.3 – Closedown UKWASC interviewees

(Source – Author)

The relevant roles of the interviewees and their corresponding responsibilities within UKWASC is as follows:

1. Area Commercial Manager – responsible for the commercial arrangements for a particular delivery stream;
2. Strategic Business Partner – responsible for the formation and transformation of client requirements into market strategies;
3. Operational Excellence Manager – responsible for delivering management strategies with regard to supplier relationship management and process improvement;
4. Head of Operational Excellence – responsible for forming and delivering strategy for performance management across the supply chain;

5. Area Contract Manager – responsible for the contract formation strategy, and the management of the team responsible for contract formation and tender activity;
6. Commercial Manager – responsible for strategic items for delivery such as the sourcing strategy, strategies for the allocation of works within delivery routes and the definition of revised delivery vehicles;
7. Head of Commercial – responsible for the entirety of the commercial management function across all delivery vehicles; and
8. Procurement Manager – previously in the role of Commercial Manager within UKWASC (at the time of intervention), now responsible for the commercial management, ‘contractor’ side, of a £120+m UKWASC job currently in contract.

6.10.1 Interview content

The basic premise of this project was to investigate two primary elements, namely:

- 1) Through the use of a participatory approach, namely through Participant Observation (PO), Action Research (AR) and Participatory Action Research (PAR)- *What are the problems within an ICO relating to effective infrastructure delivery?*
- 2) Through the use of a participatory approach, namely through Action Research (AR) and Participatory Action Research (PAR) - *How can I improve the delivery of infrastructure from within an ICO?*

The consequence of this work was the creation of the Strategic Change Model, and the influencing of the AMP6 Delivery System within UKWASC via five interventions focused on Strategic Procurement Management Competence.

As above, the interviews were centred on three primary aspects of analysis to reflect on the study. The interventions were premised on improving identified issues within a framework of optimisation, with the interviews focusing on the efficacy of those interventions at bringing about change. Appendix J outlines the Semi-Structured Interview Guideline used by the researcher in conducting the interviews, as well as

Appendices L and M that cover the Research Participation Overview and Consent Forms filled in by interviewees accordingly.

6.11 Chapter summary and linkages

What the previous chapter has summated is the nature of the data collected with UKWASC participants over nearly a three year engagement period. This data, in accordance with the TPCA represents the 'action inputs' of Figure 6A and facilitates my separate reflection in chapters 7 and 8. This chapter can therefore be considered as shared knowledge, and in accordance with the creation of a thesis, a precursor to my individual analysis of data and the presentation of warrantable assertions into theory.

While it is not possible to present the main body of the intervention reports as part of this thesis (outside of review), it is considered that an appropriate reflection of what they set out to achieve has been highlighted. Chapter 7 will now move into the rational formation of warrantable assertions by me as a researcher, utilising key learning aspects from those interventions, and supporting activity. Such assertions however give appropriate credence to the commercial and ethical sensitivities of research of this nature.

CHAPTER 7 THE ANALYSIS OF DATA IN THE SUPPORT OF FORMING WARRANTABLE ASSERTIONS, AND THE NATURE OF MY OWN REFLECTION.

7.1 Chapter introduction

Dick (1995) advises us that there are two key aspects upon which to build the 'good' thesis, (1) being able to support warrantable assertions about the project, and (2) being able to claim the methodology used as appropriate. The following responds to these key aspects analytically in respect of the preceding data section, as well as presenting the warrantable assertions pertaining to this project. Importantly, this chapter represents the separation of researcher from action. Whilst the collected data presented within this thesis has been compiled by the researcher, arguments presented by Johnson (2008) in suggesting a researcher searches for themes, categories and emerging patterns during collection to influence further collection, and that of Dick (1995), Perry and Zuber-Skerritt (1992) and McNiff (2013) that the researcher should undertake an element of analysis once all data has been collected, centres on the separation of the action researcher from the activity.

This allows for reflection intended for the purposes of research, and to separate one's own work from that of research colleagues. Put simply, the data collected is shared with my research colleagues (subjects) to some extent, while this section is purely my own, and the warrantable assertions are my own that I choose to share with the academic community. This forming of layers is what separates the academic focused action researcher's work with that of the action oriented facilitator of change.

The warrantable assertions for this project are split into two key focal areas in accordance with the two primary project aims. The collected data is segmented and analysed here in support of these main aims in order to form the associated assertions. This relationship is characterised by Figure 6A at the beginning of chapter 6.

7.2 The analysis of problems within an ICO relating to effective infrastructure delivery

The following analysis is split into two sections, (1) the data drawn from both skills / maturity benchmarking exercises within a single ICO, and (2) the data drawn from the interventionist approach adopted for this project, incorporating PO, the CMP, the AR and PAR interventions and issues drawn from the closedown interviews.

7.2.1 Barriers identified by the Skills / Maturity assessments - Round 1 and Round 2: providing benchmarks of delivery capability

From the two assessment undertaken at the outset and close of this study, key themes were formulated to summarise the associated data. While the nature of change between AMP5 and AMP6 is analysed in support of the change focused warrantable assertions, here the focus is on understanding the problems affecting the effective delivery of infrastructure.

7.2.1.1 What the Round 1 assessment told us

- Hamstrung organisation - a large number of respondents identified gaps in current processes akin to the early / low competency levels. A number of issues were identified as not being given appropriate attention early in the delivery process such as *"unnecessary bespoke solutions / highly risk-averse in behaviour, regardless of supply chain capability / does not incentivise investment within the supply chain"* which are all 'Level 1' areas, suggesting very low capability as an 'Initial System'. Yet, UKWASC also carry out elements in Level 2, 3, 4 and 5 for the same area. So the issue is not how able the organisation is, but how their skills have been accumulated. The results suggest the lack of a 'Knowledge Acquisition Strategy'; as in to say, UKWASC have acquired skills to suit the task at hand, without systemically defining how they as an organisation need to up-skill. BIM is a prime example; UKWASC IT services are yet to be consulted (at the time of survey) over the effects of BIM on the organisation. BIM is a heavily IT delivered piece of strategy, it requires a high level of competency (user), technological

'power' (IT), widespread knowledge of risk and ownership (legal/user) and engagement with other suppliers / owners / designers. It has a large effect on an organisation and its practices, yet UKWASC are still a very risk averse and inwardly operating organisation, so the effect on 'people' will be massive, and this barely seems to be getting looked at with appropriate rigour.

- Up-skill - In order to deliver the future strategy, UKWASC will need to address the skill gaps it currently has. A general consensus is that UKWASC are delivering 'soft' alliancing, being led by the alliance partner and not getting best value from the arrangement. A revision of the strategy towards partnering (in some form) would address this issue but would still need a broad skills enhancement accordingly. The situation may best be described as one step back, two steps forward towards AMP7. UKWASC's partnering strategy aims to engage the market competitively, but with a more appropriate level of ability. This will plunge them into a more aggressive market and they thus need to address foundation level gaps so to move forward efficiently.
- Silos - UKWASC need to address internal communication, and the issue of engineering as an 'entity' within the organisation, opposed to being part of the organisation. In all practicality, in house engineering capability is a 'make or buy' decision; UKWASC has decided to 'make' a portion of the design required (knowledge) and to go to market (buy) the rest. Engineering should instead address their value to the organisation, warrant their position, and then barriers can be removed in terms of debate over internal silos and moving forward. Soft landings for example, this is an issue about Asset Management and their engagement with design. A common theme of discussion is "*they get what their given*" (APT member), they being the asset management community. Such that they have become insular and believe they get the wrong end of the stick. Soft landings will be about asset management's relationship with designers, decision makers and delivery partners in the future, and this can only be done via collaboration and shared goals across the organisation.

These three key themes heavily align to those unearthed by the PO exercise, and add more substance to the discussion around silo's and especially the skillset of the organisation. Across every assessment area, inclusive of client, supply chain, engineering and project sponsor, respondent / interviewee's agreed that current perceptions of capability were low, and that improvements were required. When one considers that UKWASC were delivering a series of Alliances at this time, a vehicle considered the extreme of the relational approaches (Lahdenpera, 2012), one would expect to see more advanced skills levels and an apportionment of 'shared destiny'. The relationship however was more akin to low level project partnering, with one party still taking advantage of the other (Walker et al., 2016). It is little surprise therefore that this delivery model, without the appropriate skills, organisational practices and holistic delivery approach to market was unable to drive price reduction across its programme, and thus began the search for new delivery approaches.

7.2.1.2 What the Round 2 assessment told us

- Market understanding - a common theme was that of the fixed market place, an environment from which the organisation will get people to do 'stuff'. There was no suggestion during Round 1, or little understanding or communication of something in flux, something adaptable or something that one was able to manipulate. Some comments however during Round 2 referred to getting the supply chain to 'work better' and by proxy 'do it cheaper', but agreement was virtually wholesale (knowledge allowing) that the issue lay within the client organisation, even if things seemed 'more supply chain focused than they did in AMP5' (according to respondents 7 & 8).
- Development programmes - there was a consensus that 'things were in development', rather than simply being poor as seemingly expressed during the Round 1 review. This suggests that the business is at least moving, if not there, but at least moving. Scores however suggest something different. Whilst there was a general idea that 'things were changing', there seemed little connection with this message and the skills identified within the assessment.

- Addressing fundamentals - irrespective of any communications to the contrary, a general view was that of needing to do the basics properly, and almost all respondents selected a skill or behaviour they recognised from the matrices in level 1. This means that change aside, that UKWASC still has some basic issues that will hold it back if not addressed.
- Maintaining a drive for change - the feeling that the 'hump' from AMP5 into AMP6 had been passed for respondents suggested a lack of concern around doing things differently, so far as 'the arrangements were underway'. While true, they were also in their infancy, and this lack of concern towards building relationships suggests a rationale behind why previous relational vehicles (AMP5 alliancing and AMP4 partnering), irrespective of contractual terms and formations, failed to ever deliver the benefits they initially proposed.
- Understanding requirements - a general theme was that of understanding the needs of others in the team oriented environment, and in fact not really understanding the customer needs. Respondents found it hard to understand why such a review held sway now that the procurement relationships were let, or why gaining further insight into their relevant delivery counterparts would 'make things better'. There was an odd attitude that once procurement 'had happened' that it was somehow over, or at least they had little power to change it. They would live with what they ended up with and focus on the terms of the contract when things didn't go to well. The idea of embedding with one another seemed beyond the remit of their day to day working life, as well as defining new working terms with internal clients and customers. Whilst this was far from as severe as experienced in the first review, an impression remained that making further change somehow lay with someone else.
- Gaining a whole picture of delivery – a theme maintained from Round 1 was of not having a whole view of the delivery environment. Whilst scores in the main had improved, with significant improvements to the front end, with asset management and sponsor capability, there was some significant step change within the client functions. No scores reflected opinions of where functions

needed to be for AMP6, but there seemed a general agreement that change had focused on parts, rather than the whole delivery cycle.

There is little doubt that the skillset of the delivery organisation had improved from Round 1, but still short of the capacity required (by IUK at least) for strategic partnering. The measurement exercise showed an increase in sponsor and client ability, the core focus areas of this study, while maintaining a strategic mismatch. The revised delivery arrangements, akin to transitional arrangements toward AMP7, remain hampered by UKWASC's immaturity for more advanced forms of delivery. They continue to see procurement as a process to be passed, not a continual companion to a strategic approach to the market place.

While an argument can be made that the nature of the AMP6 programme of works is more suited to critical or leveraged delivery modes, and the organisation has taken some steps forward in the client and sponsor areas to suit, there is little doubt that that the view of the supply chain by the organisation continues to be maintained. There was an almost vociferous rejection of the market as something to be worked with during the Round 1 review, while there are at least pockets of responses to suggest this attitude is changing. The issue however is the organisations' understanding of the need to commit to change, and the selection of new relational partners requires works and is not 'easy'.

The suggestion that the procurement activity is complete would be a concern. Whilst there is a suggestion that change is in progress from the reviews, the idea that this was in the remit of others continued. While one can identify with significant skills gaps, there is at least a conscious effort to date to improve skill-sets for AMP6. The question would now be as to whether they are able to continue to up-skill to maximise their AMP6 arrangements and prepare for more advanced and appropriate delivery options for AMP7.

7.2.2 Problems identified through intervention

The following analysis is broadly split into four elements:

- Analysis of the Participant Observation exercise and the formation of key themes;
- Analysis of the areas of concern raised during the Change Management Protocol exercise in relation to Strategic Procurement Management Competence;
- Cross-analysis of the themes identified within each of the five interventions into Strategic Procurement Management Competence building; and
- Analysis of key themes raised during the closedown interviews relating to the practices employed by the focus ICO.

These themes together form the basis of forming warrantable assertions regarding the problems within ICOs that impact on the effective delivery of infrastructure.

7.2.2.1 Through Participant Observation

For further details and expansion on the below, please refer to Appendix C.

Four themes were identified from the PO phase, these were synthesised from the data collection process as best describing the story of the observed scenario. This is in accordance with arguments laid out by DeMunch and Sobo (1998) regarding the codification of PO data, as well as that by Kutsche (1998) in attempting to present a model of the scenario. These themes, elaborated upon in more detail within Appendix C address (1) UKWASCs inability to marry up actual practice to its declared processes, and thus its inability to deliver against its promises; (2) the phenomena of knowledge transfer and misuse via adjudicative resolution (the observed system of practice) and collaborative feedback (the desired system of operation); (3) the problems created and encountered due to silo cultures, self preservation in working practices and the predilection to maintain and perpetuate archaic practices dogmatically; and (4) the blurred practices relating to market engagement, understanding the supply chain and maximising it. These four themes represent significant barriers to the adoption of more

strategic approaches to delivery, and the realisation that UKWASC plays a major role in dictating the way their market operates.

7.2.2.2 Through the Change Management Protocol exercise

For further details and expansion on the below, please refer to Appendix B.

While the CMP served as a tool for identifying areas of focus for interventions in relation to the principles of SPMC. It also served as a forum through which to raise areas of concern that the organisation was already aware of as being an issue. The relevance of re-engaging with the CMP here is that while areas were chosen for intervention that would allow and facilitate the researcher to focus on the joint optimisation of the delivery environment, through incentives for example, the interventions also had to focus on processes deemed worthwhile to the ICO under study.

This meant that during the exercise, members of the ICO raised what was of concern to them and we worked to allocate the issues to competence principles. While we worked through the CMP for the purposes of intervention, a host of areas of concern were identified during this process that relate to barriers / problems within the ICO and are thus worth highlighting here. During the sessions and follow up discussion with UKWASC employees, we discussed prevalent issues of concern, their relevance to the AMP6 delivery environment and the problems faced by the organisation. These key themes with an associated reflective commentary by the researcher are provided in Appendix B for the purpose of analysis, readers will note how a number of these initial CMP themes became interventions. Themes prevalent to the first CMP exercise include understanding around project release points in relation to different delivery models, understanding behavioural alignment in delivery, the proclivity to avoid looking at market skills rather than simply requesting, and understanding the value of performance measurement beyond fiscal only contract terms. Leading from the second CMP exercise, issues included market engagement via pipelines and programmes of work, organisational alignment to the delivery environment created by procurement and the disconnect between client / customer needs and delivery arrangements, an arrangement akin to professional Chinese whispers.

7.2.2.3 Through the interventions

What the data section highlighted with regard to the interventions is what can best be described as shared knowledge with my fellow co-designers and participants. Covered extensively previously, it is important to separate my views from those of my intervention colleagues and provide my own reflection in support of making warrantable assertions. What the following does therefore is to analyse the key issues identified through intervention and to cross-analyse them in forming an independent view of the scenario. In essence, I am thematically addressing the aims of this project from a set framework of collection. Readers are again directed towards Figure 6A for clarity on how this segmented analysis is formed.

The following outlines what the interventions (plural) told us about the barriers affecting effective infrastructure delivery. To do this, I have responded from the key learning's of the interventions to form cross analysed representations of intervention (singular) findings. I have then formulated representative statements that characterise the barriers to effective infrastructure delivery across the five aspects of SPMC.

I begin by organising the individual intervention summaries into data themes. This is then applied across all five interventions and placed into tabular form. From those statements, summaries are formed in relation to each intervention area where there is significant input, leading to edited statements that have grounding in the interventions in their singular form. These statements are then cross analysed thematically to create the theme definitions. While singular incidents are considered in the avoidance of creating spurious themes, an overlay of experiential importance is applied such that replicability and value both play a part in theme formation. The summarised themes are as follows:

1. Procurement was largely seen by the ICO as an 'end of the line' process, not requiring business change to suit. Following a more traditional segregated and disparate team approach across all works, irrespective of market approach and client requirements, with more strategic approaches representing rationalisation of the procurement process rather than a modification of delivery practice;

2. The ICO considers that relational practices only reduce competition and that they generally cost more to operate, they consequently engage the market via risk transfer, engaging collaboratively for smaller scale works, and maintaining a distance from the supply chain for larger more complex works;
3. The ICO perpetuates a single project reductionist approach to delivery and thus fails to maintain a holistic view of programme risks and opportunities, instead choosing to focus on traditional cost focused procurement approaches at the level of the project;
4. The ICO has a disparate group of internal clients with differing goals and requirements that utilise the market place in a reactive fashion via a maintenance of master-servant relationships internally across an already disconnected delivery team;
5. The ICO does not consider existing processes and ways of working as a solution to a particular problem, but as a series of hurdles to be addressed, or existing ways of working to be tweaked or worked around, rather than either finding or adopting new or more appropriate solutions; and
6. The reductionist approach taken by the ICO towards assessment and improvement of the delivery chain creates a disconnect between participants and a sub-optimal view of the delivery process as a whole.

7.2.2.4 Via extraction from interviews

An additional level of analysis for the problems relating to infrastructure delivery is in the form of reflections from the closedown interviewees. Whilst the questions detailed within Appendix J focus primarily on analysing change, they serve a supplementary process of instigating discussions around UKWASCs proclivity towards such change, as well as the organisations' attitudes and processes towards delivery. A number of key quotes are provided with an associated reflection by the researcher.

1. "We think after the event. We appear to manage on a project by project basis, and bundling appears to be more of an afterthought"

This centres on UKWASC's tendency towards the single project view, and their failure to use aggregation techniques toward market engagement to facilitate more advanced delivery approaches within their wider delivery strategy.

2. "As a business we are predominantly transactional, certainly reactionary"

Here the traditional delivery practices of UKWASC, especially their reactionary nature are highlighted, emphasising their reluctance to adopt revised delivery practices, even though they are aware of what is happening.

3. "My view is we certainly have an objective to pass risk into the supply chain, but we are psychosocially weak and finding it hard to pass risks though, or clearly define what they are"

Again, whilst an understanding of a more strategic approach exists within the UKWASC delivery chain, there continues to be a reflection that their own practices, even of those to which key people manage, continue to be unable, or have the skillset at 'lower levels' to enact such approaches.

4. "Our driver is to the regulator such that we should change or come up with a revised delivery strategy. Following their process as an afterthought we question how we prove it and by consequence match up to what we promised"

This puts a different twist on the nature of delivery strategy insofar as it represents a preconceived view of what it should be, something set far in advance without proper forethought. The result is strategy that does not connect with need, but an initial representation to business governance processes (in this case regulation) that they indeed knew what they were talking about when they made their submission and thus back that up via procurement. An entire exercise in this manner could boil down to a ten minute decision made in isolation of the delivery reality that the organisation would actually be facing.

5. "(the partner organisations) Don't want to help us achieve our business goals just their turnover requirements"

Following from a view by the interviewee that the selection of organisations by UKWASC is primarily on the basis of cost, this comment follows that the contract manager was completely unsurprised by the behaviours experienced in delivery. The partner organisation showed followership and a lack of challenge in the behavioural workshops for example, and it was raised at the time that they may in fact not represent an advanced business to business type partner able to help UKWASC in its change journey. They were ultimately successful however, and have focused on recouping their procurement investment and maximizing value for them as a supplier. Also, without the creation, enactment or sustaining of relational practices between the supplier and UKWASC, the two parties have very quickly ended up in an adversarial relationship that is deemed inefficient and expensive, under the title 'partner'.

6. "Systems issues, we don't have the tools for success. Controlling demand, (UKWASC) has a disproportionate opinion of our control ability"

This view reflects a concern raised some time ago around the ability of UKWASC to review its own capabilities in relation to 'actual' skills, rather than perceived. UKWASC considered themselves to be an advanced organisation in many regards, yet continued to reflect on their dissatisfaction with delivery processes. Rather than change, they sought to change procurement activity and in essence, find someone better from the marketplace. In a sector where market leaders have had forms of alliance with the same partners in place for over 10 years, seeking to extend those same relationships for at least another 10, UKWASC is on its 3rd set of strategic 'AMP' relationships and already planning to do something different for AMP7. A simple conclusion might be to look at themselves instead.

What the interview process highlighted above all else, is that problems relating to effective infrastructure delivery within ICOs cannot be directly linked to a lack of knowledge about strategic vehicles and approaches. In fact, there was a general consensus around their value in opposition to the traditional practices employed. Every

interviewee expressed frustration in the delivery practices of UKWASC, yet also placed blame at the feet of an 'aggressive supply chain', as well as embossing the view that such practices represented the norm. The issue seems that there is little in the way of empowerment amongst employee's to do anything about it.

Whilst one can argue that knowledge may be centred within the commercial and supply chain oriented teams who do not 'own' the projects and therefore have no power over steering them in different directions. These teams continue to be responsible for the procurement, selection, project allocation strategies, contract / cost management and benefit capture practices that dictate the relationship between UKWASC and the marketplace. They may blame their colleagues, and one could argue their colleagues do not use them effectively, but the issue remaining is that of the chicken and the egg, with neither prepared to identify with the other first.

7.3 The analysis of the effectiveness of the TPCA and the creation of the associated Strategic Change Model

The following is split into three primary sections and is centred on supporting the formation of warrantable assertions relating to the change undertaken within UKWASC. This relates to both the use of the TPCA in conducting activity, and the formation of the Strategic Change Model as a vehicle through which to intervene within ICOs to improve SPMC. The first element highlights the model as entered versus the model as exited. This relates to the researcher's relationship with the creation of the new AMP6 IDS, the very initial aim of this project. The second part focuses on the comparison between the first and second skills / maturity assessments and the focal areas of this project. The third aspect reflects on the nature of intervention within UKWASC, my own reflections on change as well as those by my intervention colleagues. These strands of analysis are provided here to form as rich a picture as possible of the change activity undertaken, as well as representing the rigour through which I attempted to challenge my own view of change, and the empowerment of others in their work.

7.3.1 The entry and exit models, and the creation of the new AMP6 Infrastructure Delivery System

What Figure 6B highlights is the prevalence to see supply relationships as external to the business, and to consider the operations function (asset management) as a small scale, additional function to be considered. In this model, Engineering own the definition of requirements relating to the assets owned by the business, those solutions are formed and approved in accordance with regulatory requirements. The focus here is on projects and is heavily capital intensive, so far as building new facilities was virtually the 'aim' with the business making additional returns on its borrowing at low rates amongst other avenues. There is little surprise then that the business oriented itself towards a maximisation of its delivery functions, as well as pushing the Engineering function to the fore, with asset management essentially 'getting what they were given'. A passing comment during the building of Figure 6B was of UKWASC being 'an engineering business'. This view was perpetuated in the delivery arrangements, inclusive of a lack of actual supply chain engagement, risk transfer or bundling strategies in delivery.

An important consideration at this juncture however is the principle change that was underway within the business, in response to both regulatory and business pressures. Figure 7A highlights the researcher's reflection on the change in delivery 'tact' that was underway within UKWASC as they moved away from AMP5 ways of working and output regulation (focusing on projects) to outcomes in AMP6 and the maximisation of existing assets. To summate, delivery and the 'project', and by proxy Engineering, were no longer to be kings; the asset life cycle and the contribution to wider business outcomes was.

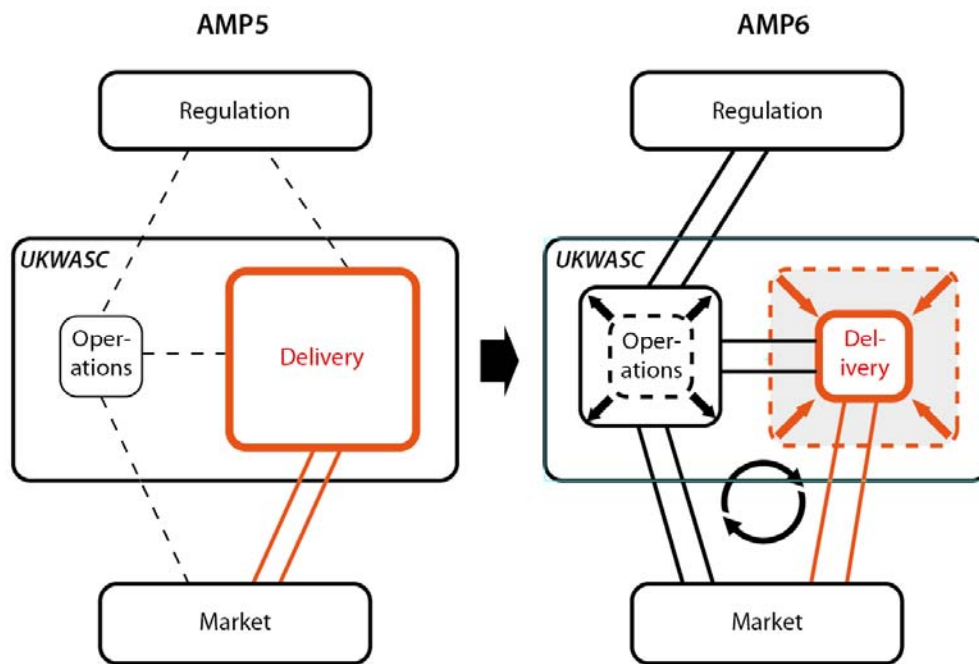


Figure 7A - The transition from AMP5 to AMP6

(Source – Author)

Readers will note that Figure 6C represents a view of UKWASC as being less static, with an element of transition taking place between the ongoing AMP5 and the initiating AMP6 relationships where the researcher primarily intervened. There is also a differing relationship toward internal customers and regulation, delivery and the separation between UKWASC and the marketplace. A focal point is that of the assets and the asset management community, essentially as integral customers, something one can directly link to the view of holism across delivery opposed to separation.

The revised regulatory environment, focusing on outcomes (such as improved river quality in an area) and not outputs (such as a new treatment plant) means that the drive to do projects is less paramount. The focus is on building less to maintain revenue streams, and as such, the delivery community serves the internal customer needs who are aiming to comply with Outcome Delivery Incentives (ODIs). Figure 6C also begins to

communicate the function of the UKWASC business as a whole, and the nature of some of its more key relationships that impact the formation of delivery arrangements.

The intervention work of the researcher and the approach in general centred on the formation of a holistic approach to delivery that created a direct link between business drivers and needs as a whole with associated delivery arrangements. A key component of the approach was centred on optimising delivery relationships to maximise value. One such element is the integration of strategic delivery vehicles within business operation. Figure 6C clearly shows how delivery professionals were beginning to consider the whole picture of delivery and those vehicles as 'part' of the business, and not merely a series of market options as with Figure 6B.

A key facet of Figure 6C is the manner in which UKWASC delivery professionals recognised the varying degree's to which the relationships were either 'in' or 'out' of the organisational boundary, as well as the transitional element between the AMP5 relationships on their 'way out', and the AMP6 relationships on their 'way in'. Furthermore, the inclusion of components such as finance as being more prevalent, although just as involved in AMP5, were now being considered of note in AMP6 more than they were previously. The same can be said for shareholders and their need to test and understand the activities happening within UKWASC.

The model continues to fall short in describing the full functionality of the business however, such as customer interactions, investment arms and functions such as IT, all generally considered 'non-delivery' through the process of modelling AMP6. So whilst the AMP6 model represents a clear and significant shift in the operation of UKWASC from AMP5 to AMP6 in terms of holistic thinking, asset management relationships and the integration of strategic vehicles within the business boundary. The view perpetuates that delivery is somewhat construction only oriented, and separate from wider supply chain spend. The model does not show the mandatory AMP6 Kit Frameworks for example (for things like pumps), to which the general consensus was of such items not being part of the 'project delivery map'. It is possible to conclude that this model does

represent an advancement on AMP5, but that it is potentially a model of transition in preparation for AMP7 operation.

7.3.2 Skills Round 1 and Round 2 compared, understanding change within the ICO

The purpose of this comparison, rather than reflecting on UKWASCs ability to optimise their delivery vehicles effectively, is to review the manner in which the business had addressed issues of alignment and change. Specifically, gap analysis and up skilling to match to their more marketplace aligned approaches. The aim being to find linkage, if possible, with the focus areas of the interventions from this project. It is virtually impossible to take ownership of any associated change, but by primarily undertaking the assessment with employees involved with interventions, the aim is to see if they can reflect on an enhancement of their delivery skill sets. One can then look at such comparisons, at least from a more global perspective, and understand the manner in which the actions of this project fit within the wider operation of the business.

Something the Round 1 assessment outlined was the lack of market engagement and skills within UKWASC to marry to either the scale of its programme of works, or the type of delivery model they were using. Part of the review into UKWASC as part of Round 1, I presented the issue via Figure 7B below, a figure readers will also find within the communication poster detailed within Appendix D. The premise being that UKWASC was skilled in areas, but considered the marketplace as separate to delivery, thus engagement was lower than their respective skill-set. They would thus need to re-address their delivery arrangements, namely something akin to critical delivery, and begin to focus on the required up-skilling exercise if they wanted to leverage appropriate value.

The issue however was that with the size of their respective programme, they would need to develop some high level strategic skills moving forward to maximise their delivery practices. The result was the communication into the business of AMP6 as a transition period, with a revised set of strategic vehicles being appropriate (and required) for AMP7. In summary, they were not skilled enough to maximise the vehicles they were using, but would not be able to do something about it for quite some time.

The result was the need to select an interim strategy that accepts the process of business change and the maintenance of business as usual operations, while planning for delivery up to 6 years in the future.

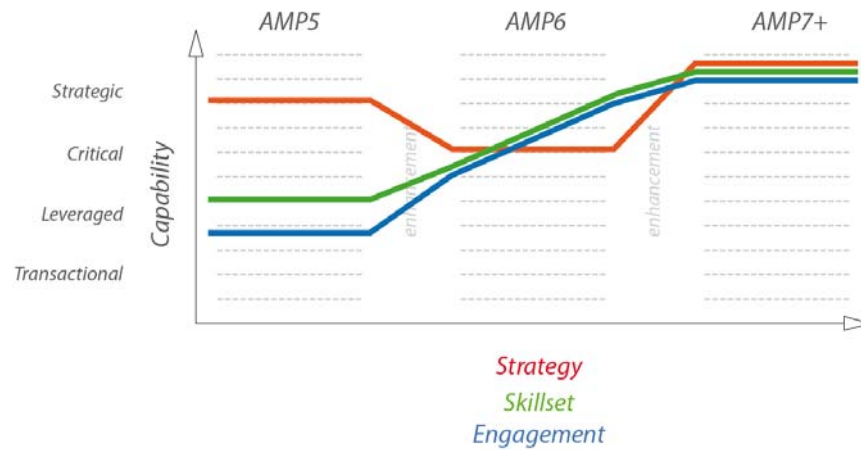


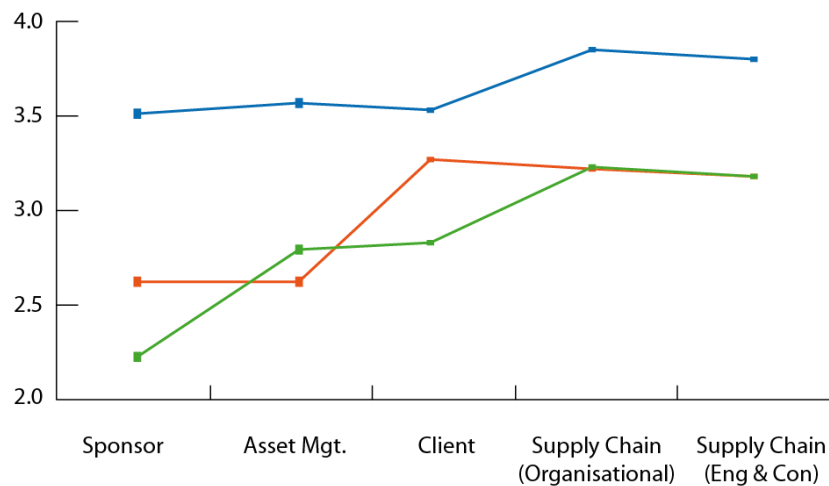
Figure 7B - Focusing on a new market approach for AMP6 to facilitate AMP7

(Source - Author)

The key element of analysis between Rounds 1 and 2 is the manner in which the primary delivery function has either changed or optimised. This study is focused on the internal delivery function, namely, the client. Whilst many ICOs may be structured differently, such as one off delivery organisations or those with more segmented arrangements, within UKWASC, the sponsor, the management of assets and the delivery client is all internal, with assistance in certain areas provided by the marketplace. This study concentrated on the operation, decision making, structures and social environment of the client function, encompassing engineering, capital delivery and commercial with the associated supply chain. Figure 7C compares the Rounds 1 and 2 assessment results. Key observations include:

- The replication in Round 2 of the supply chains' capability, both technically and organisationally, with respondents maintaining a view of the supply chain as something static, but still with greater ability than themselves;

- In no assessment areas had UKWASC been able to marry up to the views of Round 1 respondents in terms of where they thought UKWASC needed to be for AMP6;
- The sponsor and asset management were very much seen akin to one another in the Round 2 exercise, something reflected in the AMP6 modelling activity and in contrast to the scores and modelling exercise for AMP5;
- There was a general consensus that the client function had experienced a somewhat drastic up-skill, whilst not to the extent the Round 1 respondents perceived it needed to, there was a stark difference in the general view.



View of ability required for AMP6
 View of ability in AMP6 (Round 2)
 View of ability in AMP5 (Round 1)

Figure 7C - The comparison of the Round 1 and Round 2 results

(Source - Author)

Whilst no attempt is made here to take ownership of the changes within the client function (in terms of this projects' interventions), there is little doubt that this review has reflected a step change within the main delivery function of UKWASC. While a gap is still perpetuated, the client and sponsor functions are more advanced with the view of the marketplace (the two supply chain elements that look externally) showing the view

of the marketplace as the same as the round 1 review. An argument can be made however that the impending change of AMP6 could have had a negative impact on the views of respondents in Round 1 on internal aspects, especially in relation to the client function, making the Round 2 responses unfairly deflated. Whilst comments during the process itself suggest the contrary, Figure 7D reflects in more detail the stagnation of change between the Round 1 and Round 2 reviews.

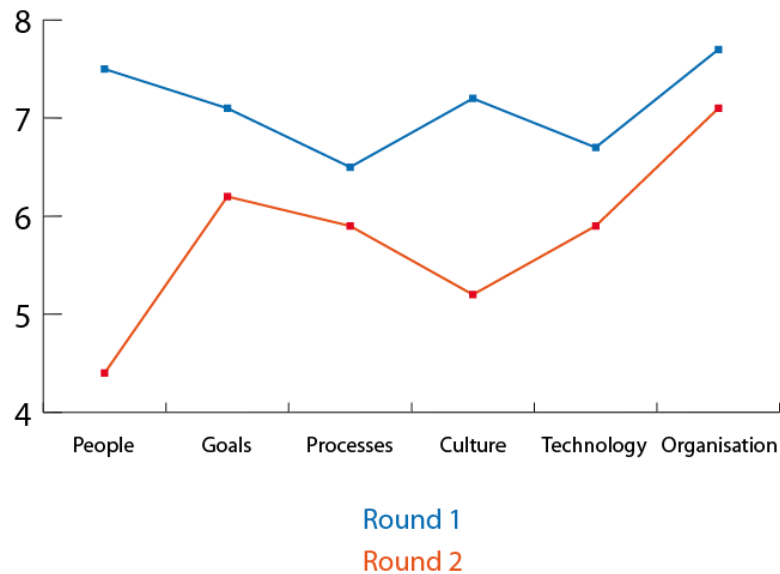


Figure 7D - The Socio Technical Exercise for Round 1 and Round 2

(Source - Author)

In essence, the feeling of a change driver had somewhat diminished between the reviews, and in an organisation where change is perceived quite negatively, this could account for the significant difference in client scores for Round 1 and Round 2 in Figure 7D, and staff comfort / positivity / happiness accordingly. A challenge to this however is the more incremental differences for the asset management and sponsor functions. Assuming for an element of change deviance in the results between Round 1 and Round 2, it would be prudent to presume that the large change in the client function is not solely down to sour reflections in Round 1 compared to Round 2, and in fact a significant

increase in ability has occurred. I would be of the opinion that the review need be done more extensively to draw any singular conclusions from the assessment, but as an aide to the analysis process of the this study, one can say quite conclusively that an improvement has taken place within the delivery practices of UKWASC from a strategic delivery perspective.

7.3.3 Understanding the impacts of change through intervention

Representing the third stream of analysis in understanding the effectiveness of the TPCA and the creation of the associated Strategic Change Model, the following is split into four sections:

- Understanding change and its alignment via the CMP (7.3.3.1);
- Understanding change within the context of the interventions (7.3.3.2);
- My reflection on impact via the interventions (7.3.3.3); and
- My colleagues reflections on the change enacted through intervention (7.3.3.4).

7.3.3.1 Aligning focal business areas with the principles of Strategic Procurement Management Competence via the Change Management Protocol exercise

To analyse the CMP through a lens of change rather than in terms of either content or creation, is to present here another thread to the weave in support of the creation of warrantable assertions. Whilst the CMP can be seen as a simple exercise compared to the scale of the interventions, its purpose is of pivotal importance in the analysis of change brought about by this project.

- The first CMP exercise – the tool was essentially built prior to the exercise, with some refinements made during it. These refinements came in the form of additional questions and the insertion of the need to step back before confirmation (see Appendix B for further details). With the relationship in its infancy, and with no specified intervention action yet undertaken, the definition of interventions responded to a distance in place between UKWASC and myself as both were wary of varying project aspects, and about to step into the action abyss. Whilst one can argue that we had stepped beyond the precipice following

PO, the modelling exercise and the initial skills / maturity baseline, the business was yet to entrust me with anything on their critical path. The result is holistic definition of initial interventions from which the researcher's impact could be mitigated and managed, feeding into the delivery process rather than owning elements of it.

- The second CMP exercise – following the early interventions, the CMP was revisited when more expansive opportunities arose. Re-entering the CMP at this point was vital as the psychological contract had developed between myself and UKWASC, with the business prepared to allocate activity to the researcher that would be seen as critical path items. The revised intervention options were also of far more significance in terms of impact within UKWASC. One could argue that the researcher had proved something to the business and a relationship transition had taken place.

What the CMP demonstrated is the importance of a bridge between study and activity, but also the connection of it with the researcher's level of engagement, organisational knowledge and the extent to which one is embedded. It is important to engage early so ICO participants are aware the process is on the horizon, but remain open enough to return. If I was to undertake the process again, I would potentially advise a 6 step process with the CMP, with phase one being the allocation of a range of options to suit the five areas, followed by a CMP 're-work' prior to each intervention, rather than 'to suit the project needs and demands'. This element of structure would aid in others work to re-use the TPCA I would advise, catering for various levels of relationship and psychological contract to exist.

Regardless of who uses the tool, a novice researcher, one who develops in tandem with the focus organisation (as I did) or someone embedded (to name only a few options), the tool is dedicated to the theoretical foundations of the project and allows structured engagement to be conducted that facilitates the researcher's activity. Without the CMP as part of the TPCA, one can risk blurring the line between theory and activity, and being able to pull apart the project actions and their relevance to academic knowledge. Furthermore, without the CMP, one can easily fall into organisational followership and

fail to conduct activity in accordance with the foundations of this project, or indeed be able to see the outcome as in any way a direction of proven theory, rather than responsive to organisational power and managerial directives.

The CMP has proven to be a valuable addition to this project and the sanity of the researcher. When walking a fine line between theory and the demands of an organisation, with their day to day drivers and pressures always providing the next 'big issue' for 'some good people' to help with, having the agreed principles of the CMP in one's hand can be a project saver, as much as a life saver for the researcher.

7.3.3.2 Understanding change via the interventions

Via the same process employed for the identification of problems causing ineffective infrastructure delivery within an ICO identified through the interventions, this section addresses the same but for issues of changing one such ICO. Again, the reflection of those interventions can be considered shared knowledge to an extent, and thus it becomes vital to separate out the assertions of this project and this researcher from those of my intervention colleagues. An argument could be made that the intervention reflections represent the 'first cut' of my own reflection, leading to the cross – analysed reflections presented here. Part of the researcher's drive towards holism and the creation of an appropriate dialectic of the focus situation, the following draws from those reflections to present as concise a view as possible of the nature of change within an ICO. With the following representing the result of this analysis, in no specific order:

1. Barriers to change within ICOs include their failure to address the difference between functional and project based organising, their lack of redress to the social, cultural and behavioural aspects of delivery and the chasm between supply chain focused and construction focused delivery professionals. Their prevalence towards the maintenance of the single project view, coupled with a disconnect with their delivery colleagues has led to a reliance on traditional delivery approaches and an expansion of project level thinking.
2. Changing ICOs must focus on the entire delivery chain, involving all of those affected in the delivery process, it must be collaborative and be

communicated through a simplistic medium to allow entry into the process by a range of different ICO members from across the delivery chain. Those involved should be treated as individual change agents who essentially act like a positive contagion within the delivery practices of others, changing the process in operation.

3. Change within an ICO must find common ground with the working activities of those who it affects in order to gain traction and remain relevant, whether it be theoretical or practical. In light of resistance to programme level thinking, one must maintain a drive to address and break down internal cultures that may seek to circumnavigate its impact. This can be done by building a collaborative focus between participants without a defined goal or output. Participants must create the change together with equal equity in the actions of the change, helping one another to share the same view, change each other's views and to focus more on working in the same direction, rather on the creation of something that affects or that one defines to another.
4. Change within ICOs must address the proclivity of delivery professionals to distance themselves from the requirement to change their own delivery practices, instead preferring to either wait until the change process is over and they can continue as they once did, or to fail to put works into an actionable reality during the change exercise and thus hamper its impact.

7.3.3.3 Personal reflection on change

Whilst the previous section draws directly from the interventions, prior to drawing on reflections from colleagues on my impact via the TPCA, and the creation of the associated Strategic Change Model, it remains prudent to provide an element of personal reflection on the impact of change. To avoid replication, but as more an aide memoire prior to my colleague's opinions on my activity, this reflection is on the activity of this project as I saw it as an individual. Beginning in fact at my interview for the associated PhD studentship, I have split this reflection into the three sections, focusing on myself, how I have affected others and how I have affected understanding.

7.3.3.3.1 How I have changed

As somewhat of a novice in matters of procurement, this project represented an expansion of my own understanding of the world as well as myself as pre-proposed to a definition of oneself as an architect. I no longer see myself as such for example, but as having the skills to also 'act' as an architect. I feel my development in this project has allowed me to act in the role of strategist, change agent, theorist, academic, educator, facilitator, communicator, challenger, procurer, designer, accomplice, co-conspirator, supporter, champion, belligerent and augments, to name a few. The fundamentals of this project have profoundly changed me as a person, from seeking to remove the barriers to people's working life to realise their potential and value to the world of work they inhabit, to challenging on the design and structure of strategic procurement arrangements with potentially criminal outcomes should they not be treated with appropriate care.

When I started this project, professionally at least, I might only have been an architect, a practice manager, a bidder, socialiser etc. Now at least, I wouldn't presume to believe anyone can be defined in such finite terms.

7.3.3.3.2 How I have changed those around me

A significant part of this project has been changing what people do, either through what they use or how they use it. The data section accompanies a more structured outline of this point. Here however, I want to bring attention to the manner in which I engaged with the social world, and how I used my own change journey to impact on others. At the outset of this project I anticipated a more objective outcome, something harder and more natural sciences in formation. I soon began to realise that a project of this nature did not suit such an approach and that I had to look at myself and my own educational and professional past differently. This led to a realisation that I was on a journey, taking years (and broadly encompassing most of my waking thought) that could not be condensed into 'getting others to do it differently too'.

I had to reign in the extent to which I expected other, single project, silo trained professionals to all of a sudden look at things differently. I have battled with many concepts raised in this project myself, so how could I reasonably expect others, notwithstanding political, professional and personal barriers to take to my point of view? I did come across a number of people who refreshingly found it easy to engage with the subject matter, but I found they were generally of an ilk of change already, by which I mean they were already seeking new ways of doing things, and what I presented often 'made sense', or they were at least prepared to try and understand it. Others however, not already on that drive towards the new, found it hard to understand why they would ever look at a problem differently, and why someone like me was worth listening too.

I remain proud of the extent to which I have been able to conduct change, and address a variation of barriers to delivery. I feel a number of outcomes are potentially down to the researcher rather than the process, whilst a range of others were solely down to the process taking me 'along for the ride'. For this reason, I find the project a success, I feel I made an impact, but also feel that another would find success within the same research framework. They may end up somewhere different, and might I should I start all over again. But what can be gleaned, is that the project aims where addressed, situational specificities negated where possible and I did as much as I possibly could have done, and I can't reasonably ask anymore of myself.

7.3.3.3 How I have changed our understanding of change

Another aspect is what the project will tell us about how to change an ICO, and the appropriate tools to be used in such an endeavour. The TPCA and associated Strategic Change Model have served to supplement the formation of a new Infrastructure Delivery System within the UK water sector. This project by no means takes credit, but something is indeed different, and one would like to argue that things have improved. A cynic could argue that the project may have served as a hindrance to the wider UKWASC change activity, and one would hope the interviews serve to dismay such a view, whilst no-one would argue that wholesale change is linked to this project either. What I reflect on is the amount of change one person has been able to bring about, and more valuable

than the outputs which so often became the focus of the interventions, is the project's ability to empower people.

In many ways, I see the project and the approach in general akin to the detergent, milk and food die experiment. As one adds food die to a pool of milk, little happens other than the die dissipates a little. When detergent is added, breaking down fats in the milk and reducing the surface tension, the greater surface tension around that point rapidly pulls the milk and associated die with it. For want of a better description, a catalyst. The reason for this metaphor is the manner in which you can tell someone about something to your heart's content, it is when you create the scenario for it to be used, reducing associated barriers to implementation and 'tensions' that one sees results. It is via this premise that I see how the TPCA and Strategic Change Model represent value to the study of change and improvement within the sphere of infrastructure delivery and SPMC.

7.3.3.4 Reflecting on change via colleagues

A concluding point of reflection is that of the closedown interviews and an analysis of how my intervention colleagues consider the value and impact of this study. In accordance with Appendix J, the following presents the interviewees views across four question areas. The analysis here however is split according to the nature of analysis, insofar as:

- All interviewees except for the industry supervisor responded to section 1, with his omission due to general build oversight overtime;
- The industry supervisor answered both co-designer and participant questions;
- The industry supervisor answered questions in light of all the interventions;
- Those designated as Co-designers answered all questions except those for participants; and
- Those designated as Participants answered all questions except those for co-designers.

Consequently, the following is split into four sections:

- The general overview;
- Co-designer focused questions;
- Participant focused questions; and
- The wider impact of the intervention, answered by all interviewees.

A reflection by the industry supervisor is provided at the end of each co-designer and participant section as an overview of the interventions' approach in general. Those responses are denoted by an (IS) for Industry Supervisor.

Where possible, contrasting views are presented to give as complete a picture of the effectiveness of the approach, the interventions and the associated change model. A running analysis is provided with an associated summary to close this section. Interviewee quotes used here align to Table 6.3 presented in the data section and are highlighted by a (3) for example.

7.3.3.4.1 Set 1: General intervention information and validity of the Strategic Change Model

1. Does the strategic change model make sense in terms of being a transformative process based on inputs and resulting in a change in outputs?

(2) Issues with lack of feedback into inputs from org system. Generally have no issue just want to get a view on inputs, context of wider markets and how to change inputs before we ever impact outputs. Leverage change market in advance.

(3) Yes it makes sense, think it's incomplete but makes sense. Vast ranges in sub systems, goals and values are very different across each group. Consider pulling out components into a separate system.

(8) The loop is important for management relationship on changing inputs. The managerial element, as a concept seems subject to change from inputs hence requirement of feedback. Does it consider non reg. could one say it is fixed for as

long as you or I perceive it to be. Nature of internal clients and definition of demand? Impact of external rate payer?

The general consensus was that the model made sense and that a golden thread was maintained through the model, the issue of feedback however was of note, with interviewees focusing on change within inputs prior to delivery to then change delivery as a representation. The concept of the ICO was largely accepted, with agreement that plenty of crossover between the sub-systems existed as well of depth in understanding and variance. No counter arguments were presented to its structure.

2. Can you understand the boundary of the Infrastructure Client Organisation (ICO) as being a formation of four primary subsystems?

(3) Yeah I do, never thought about psychosocial system in isolation as a trade-off. Potentially a blurred boundary with the market place.

Again, general consensus around the combination of the systems that form the ICO, with interviewees understanding their organisational boundary as permeable, irrespective of whether this is represented in reality. The psychosocial subsystem raised the most issue, with focus being given to why it did not span the entire model, or as to why it was even of relevance. The unearthing of this premise as important to delivery was not challenged however, with interviewees preferring to want to 'get into' the four sub-systems, not change or add to them.

3. Can you relate to how the management of portfolios, multi-projects, programmes and projects differs within an ICO when engaging with the marketplace?

(1) We think after the event. We appear to manage on a project by project basis, and bundling appears to be more of an afterthought.

(3) It does highlight engaging the market earlier and the importance of sub systems in influencing delivery.

(4) Definitely different, not sure what we are doing though in terms of direction.

Very little challenge was given in understanding the premise of this question, but even when prompted around understanding why in some instances, the premise was maintained. There could be a rationale that all interviewees understood the difference, or failed to wish to point out they didn't. The only feedback centred on the proclivity of the business to focus on the single project view in delivery. Supporting a premise raised by this study that delivery professionals' understanding of these differences may in fact be flawed, or as a minimum, without basis. There was little challenge with the origination of the decision making process being at the forefront of delivery however, but agreement was presented that this did not marry to UKWASC's actual practices.

4. Focusing on strategic procurement principles, can you relate to where the current delivery arrangements would be sat within the model?

(1) As a business we are predominantly transactional, certainly reactionary.

(4) I think we are in strategic where we set out to be, bordering on leverage in some respects, not treating the supply chain strategically.

(5) Edging towards a more advanced approach, past attitudes specifically deeper than the issue of through demand, we tend to make procurement fit the demands of the time.

There was little issue in understanding the premise of delivery route allocation and the difference between model types. There was a struggle with communication however and the nature of delivery model types, suggesting one might wish to expand on what they are, but as most were delivery professionals themselves this does raise a concern around competence matching to the skills review. While the steps of the model were

easily understood, the connectivity through to client needs for example continued to be misunderstood as to why it was of importance. There was a general presentation of change and a drive to want to do things differently, as well as the understanding that they indeed were not acting strategically at this point.

5. Based on your experiences within the ICO, do you feel the organisation changes its delivery approaches to suit procurement arrangements, or uses them as a secondary item to supplement internal delivery processes, such that, do you think the recent arrangements for AMP6 are making the most of the supply chain and maximizing value for the business?

(3) We make attempts to change to suit the market place and align to it. Made a pig's ear of it. Change needs restructuring in engineering to maximise supply chain expertise.

(4) We should do, feedback is we have not got it right yet.

*(6) The business has a reluctant attitude such that you might be a market leader but **** off you're gonna do it that way. Procurement influences how we deliver our projects, it just isn't the walk in the park it should be. People don't appreciate that procurement is my skillset, my expertise and they are dabbling and messing with my valves. I don't go down to their treatment works and start turning valves. I have been doing procurements for 10 years and I am very proud of my projects I have been involved in.*

(8) Try to implement the delivery model, but attempt a little bit reactionary, didn't really know why it was breaking up just responding to it. No smart analysis. Never done managed benchmarking.

The premise that delivery is disconnected from business directives is raised here. The rationale for aligning delivery to the business needs and market drivers is missing within UKWASC. They continue to operate a silo model, and at this time, that mental model of

delivery places the formation of procurement arrangements 'further down the line' of importance. Their reactionary approach reflects the issues raised by this study, as well as the premise that the business is indeed in a state of transition.

7.3.3.4.2 Set 2: The nature of the researcher's impact via the Intervention(s) from the interviewee's perspective as a Co-designer (involved in the design and / or delivery of the intervention)

6. Do you think that the participation of a third party researcher aided in the formation of the particular solution?

(5) Definitely assisted. At times you're blinkered, you don't know what you don't know and you were helpful in showing me something I wasn't aware of. I saw a benefit in you having experience in the field (as an architect), I don't think (UKWASC) had the internal skills and as a business we don't always value innovation and thoughts from our own people. We often value external thoughts more.

(6) I couldn't say yes any louder.

(8) 100% better than any external. Externals don't have the will or desire or skill to take something and turn into a meaningful piece of work. Resistance to just follow process and to give fair reflection and being prepared to understand our lack of capability.

(15) Valuable that it was third party, if we were to go back you got involved in interventions we would have done in some fashion, but some things you did were unique and valuable, independent destiny.

A very positive response around the nature of the researcher and the project. The premise of building a change approach around an 'interested' third party with an agenda greater than fiscal return but on improvement does seem to have been reflected in the

views of UKWASC delivery chain personnel. There is a challenge that the personal quality is important here, and one might add that professional relevance has a large part to play in being able to work alongside employees. The project has been able to step into the business without being seen as an external advisor which was a key part to the entry construct of the project and my aims as a researcher, focusing on embedding within the working environment and essentially changing it from within.

7. How did you see the researcher, as a co-worker for example or more like a consultant....discuss?

(4) I'd like to think you're a guy I would go have a beer with, more as a co-worker.

(5) Definitely saw you as a co worker.

(6) Both, when it was appropriate, consultancy type view, had to be one of the boys when it was needed, maybe 60-70% consultant.

(8) Consultants are brought in, in my opinion, to provide or back up a pre-defined answer, you had no predefined end result, and resisted the challenge to cut your processes short i.e. behaviours especially. Helpful to be a knowledgeable person, I felt you were embedded rather than here for a thing but then again are you embedded or were you just part of a team?

(15) I don't draw a line between the two, collaboration isn't either, so has been in between for me.

Consensus was found with the view of the researcher as a co-worker, but some challenge was presented around what a co-worker is, and indeed whether its relevant. To some it was presented as more valuable and in their best interest, to others, it wasn't seen as relevant and instead about the person and the associated work. To some, being part of the team and on their side is of more importance, then tackling the problems

together. To others its more about getting the right people to help tackle problems, and sometimes the business doesn't have the right people.

8. Do you think that aspects of the intervention would have been different if the researcher had not been involved....discuss?

(5) Might have had something, don't think it would have been as good or had the same impact.

(6) We would have ended up with what we did last time, more of the same, you provided us with a wider view, removed blinkers 100%.

(1S) Yes, likely a repeat.

Wholesale agreement was presented that the project indeed changed something, and that change was linked to something forward looking, positive and addressing barriers from AMP5. The extent to which the project impacted no doubt varied, and as much is presented within the intervention reports for example, but a connection is made between the more positive aspects of the AMP6 working environment and this project and that is of key value.

9. Do you think that the researcher focused on the strategic aspects of the intervention, specifically the alignment of delivery and organisational processes....discuss?

(4) Yes it was always being considered and I think it became integral.

(1S) Yes. Benchmarking validity, challenging around delivery model, governance rationale and pipeline which we wouldn't have otherwise looked at, doubly valuable due to challenge of strategic mind set, made you (us) more aware of issues.

Embedding the concepts of the change approach has seemed to be a success, and with interviewees reflecting that positive changes are linked to this project then by proxy, those changes are linked to a focus on optimisation. Joint optimisation was central to my actions and the project in general.

10. Do you think the researcher brought a differing perspective to the solution, specifically in terms of being external to the situation, but without a specific agenda....discuss?

(A) Different perspective, got your own agenda in terms of PhD output, but don't think that was counterproductive.

(IS) You did come with an agenda of research and action, rather than a personal advancement agenda.

I believe one's agenda to be an important aspect of the change journey, especially with regard to those whom the change affects. By changing the dynamic, it is argued that change was not done onto people, but with people to the extent that I eventually changed myself also. The positive aspects of the interventions and their changes to the normal delivery practices of UKWASC are linked to this premise of the basis upon which change was enacted, with people, for people and via a process designed to accept the variability and uncertainty that surrounds the activities of people.

7.3.3.4.3 Set 3: The nature of the researcher's impact via the Intervention(s) from the interviewee's perspective as a Participant (affected by the intervention either directly or indirectly)

11. What were your opinions of the intervention....discuss?

(2) Hard to be specific, but given the strategic approach and given the choice in procurement routes the issue is appetite. Consequently, there's no actual or

perceived value in the intervention, as we haven't counted the benefits and people don't understand I don't think. The intervention is the right thing to do but I don't think it landed, working with our people I don't see how you could've possibly succeeded.

(3) Interventions with partners from behavioural workshops were excellent and were definitely different. Helps bring it into reality.

(15) The clever bits were focusing on specific bits, could have been bigger, or at least more expansive, but then not as deep.

There represents a disconnect between the activity of the interventions and the groups of focus, compared to the impact within the wider business. The issue of measurable outputs was raised a number of times, especially around what the intervention meant to achieve. Given the amount of time it takes for something to be different, and the inherent difficulty in the activities of one researcher then laying claim to positive programme out-turn results, I find it hard to make the associated connection. What this issue can best be boiled down to is of working validity and the problem of social versus technical issues, rather than a combination of the two as being related. By not having a measurable outcome, some see the interventions as pointless and potentially not worth adhering too in their daily lives, and by proxy, facilitating the negating of the interventions' impact and potential value. One could suggest that the interventions may have been better served by an associated communication plan, linking their activity to the wider change programme, and providing the more numerically focused personnel the framework through which to understand the importance of collaborative working for example. This however remains a reflection on the interventions in general, with their impact being felt, but then the challenge to the wider delivery populous around what to do with it next.

12. Do you think that the work helped focus on the strategic alignment of the organisation to its delivery arrangements....discuss?

(1) (the new partners) *Don't want to help us achieve our business goals, just their turnover requirements. The work (intervention) however at least gave us a better understanding of where (UKWASC) want to be and to help sort the problem. The consequence of not following through is that nothing has changed. I'll give you a quote, we don't have a partner, we just have another consultant, which is a big disappointment. They give us what they've got, not what we need.*

(2) *Systems issues, we don't have the tools for success. Controlling demand, (UKWASC) has a disproportionate opinion of our control ability. Intelligence has helped to communicate the supply process and structure without which the AMP6 ways of working wouldn't be possible.*

(3) *I think it helped senior managers, and exec, heads of and discipline leads. Didn't help at the coal phase though, didn't do enough in terms of change management internally once the assessment was done. Maybe there was an expectation that engineering would change overnight. To the extent that the partners came to AMP6 ready for the challenge, in many ways doing such a good job they have left (UKWASC) behind. The way we engaged the partners was excellent, design and delivery of the KPIs in terms of input especially. Shame however too much to do, although we filled our remit pretty well.*

(6) *Found it hard to relate to it, but a catalyst for change and processes leading to alignment of skillsets for the creation of the 11 modules of the AMP 6 ways of working. Still some gaps with people using AMP 5 ways of working but you influenced the move towards something better.*

(1S) *Not many people looking at wider perspective. Yes, you were the only person looking into it and were committed unlike everybody else to doing the 'do'. Lots of value in you as an individual, but also the action research approach. A co worker wouldn't say "I've looked at the dynamic of the team and think....". Failing to follow that (skills / maturity benchmarking exercise and intervention content) is potentially a reason why things have not landed, used to test but not benchmark or change delivery.*

There is little doubt that the interventions are seen positively, but a general perspective of poor implementation remains. Whilst outside the remit of this study, and one can argue we have achieved our aims, I would have hoped that the change message would have resulted in more positive connotations within the delivery community. As a project however, we have succeeded in our goals, if not surpassing what I thought we had done at the time.

13. Do you think that having someone integrated within the organisation, but not an employee helped focus the output towards appropriateness for the situation rather than being manager or business led....discuss?

(1) I do yes, but the result is a partner who is focusing just on their elements not on our requirements. So whilst I appreciate the effort I think you are alone in your plan.

(2) In this case yes, but it shouldn't have to be. If the foundations have been in place already it shouldn't have been needed.

(3) I think you were good at being independent and bringing things into context. Got to put the right person in who is politically astute and able to conceptualise the theory and models.

(6) Yes definitely.

(1S) I think that actions such as co presenting at North West Construction Summit, reviews with the university and wider business to business engagement would not have happened without the project. If an employee had done something like that, we wouldn't have got the output. I think the value was in the independence, your assurance and the project's appropriateness. Without you we wouldn't have the EMG (Executive Management Group), and that's the big ticket item for me.

Again, general consensus suggests the project was a success in its aims, but the wider business still maintains an air of slow implementation and frustration around a lack of uptake in change. Whilst a direct change impact had occurred at intervention level, and the skills assessment supports the view that the delivery function has changed, there persists the impression that the business is slow and unwilling to change, and that change is still about the person doing it, not some wider change process. This presents change as the responsibility of people together, in action, not communicating a vision of change and presenting it to people and expecting them to blindly adopt it.

14. Do you feel that that the researcher and his approach had a pro-active impact on the intervention, specifically focusing on non-political issues and instead on the improvement of the organisation's delivery arrangement / practices....discuss?

(3) You did, but you also put a bit of realism to it. You had the idealistic models but were able to put into reality.

(6) Really important that you were the person doing this. You worked in these environments for a long time, with such a clear goal, I couldn't articulate the way this has been done and no one could do it the way you do it Mike.

(15) Wouldn't have happened to the degree it has without your input, or been as successful. Behavioural workshops, independence as well as design principles challenged the status quo.

Responses again focus on the personal rather than the process or structure, but the nature of the question may have had an impact on this. There is again however a confirmation of the impact of the project, the efforts of the researcher and the positive changes that have taken place. To a certain degree, the manner in which the researcher conducts activity is of little consequence, the manner in which that approach has a positive impact however is. The connectivity between positive outcome, nature of the researcher and the combination of approaches has led to a more jointly optimised delivery environment.

15. Did you see the researcher as being in the best interest of the business....discuss?

(1) Mixed feelings, you've got an ulterior motive and I have a suspicion of all the other consultants, good to change the status quo however, fresh pair of eyes, different perspective. As an employee you would have been able to follow this though, which is really the only problem as far as I see it.

(3) Yeah. Not doing just for the sake of your own research.

(6) Yes, absolutely, would never let me do anything wrong.

(15) Natural tendency is to say yes, but not being in it for the business but for research, so priorities potentially not aligned. Testing boundaries rather than enhancing value and process from a client perspective.

Whilst there was agreement that the activities of the researcher were of benefit to the business, there was not complete agreement with the nature of the project necessarily finding the most appropriate solution to issues in the eyes of the business. This explains a number of issues in communication found across the early interventions, as well as presenting a rationale for more success being found across the PAR focused interventions that one can suggest originate from 'within' the organisation. This presents that the approach and change in general, when focusing on adapting and improving, rather than replacement with something new, needs to be seen as business led rather by those involved, whether the content is of value or not.

7.3.3.4.4 Set 4: The wider impact of the intervention on the business

16. Do you think the intervention has had a positive impact on the delivery practices of the organisation....discuss?

(1) No, we haven't followed it through. The practicality is that things like this get done, gather dust and it doesn't get implemented.

(3) Yeah, I think it helped to bring different bits of the department together, bit of a glue for different disciplines not used to working alongside each other.

(4) Yes, but it's taken longer. Not landed fully yet.

(5) Yes, but underlining data needs improving. The model and process we built is there however.

(8) Absolutely for AMP 5, can't really comment on AMP 6.

(15) Got what we wanted from the partners, no doubt about that! Things could have been different but you did your part, stepping outside of your responsibility for implementation. Someone else in a similar capacity could have got frustrated, instead you focused on what was needed, and continued to challenge regardless.

Whilst the action of the interventions was generally perceived as valuable, there is little doubt that consensus across the interviews suggests that the business environment has not been conducive to enacting the intervention outcomes any further. The essence is more towards the squeezing of any preordained activity, such as a procurement exercise (as understood) and then to move onto the next 'thing'. The insertion of the new results in low buy-in, enhancing previous reflections on the necessity to align to people's own working activity in order to maximize change impact, rather than inserting something new.

17. Do you see the researcher as more of an employee now than you may have done earlier in the process....discuss?

(1) Yes, I do. Maybe because of the amount of time.

(3) Yeah, think of you as UU staff now, know you on a personal level.

(8) AMP 6 as an employee but with the academic overview when in isolation. Two sides of the same coin?

(IS) Naturally happens because you become a known entity. Presenting academia to us as the action of a professional not just as information. Time also brings intelligence and interaction.

As reflected previously, there is little doubt that the researcher was seen more as a fellow employee, and this is reflected in the PAR activity. The impact of activity suggests this has had a significant impact on the extent to which the intervention content has been able to change UKWASC also.

18. Do you associate any positive or negative business changes with the researcher and the outputs of the intervention....discuss?

(1) Positives - unbiased, separate from politics. Negatives - the theory, the textbook, can be perceived as negative around what is to be done, don't generally get it, suggest more digestible, so we can engage and understand.

(2) Yes as the business moves through its next natural change cycle, attitude and principles of the intervention are likely to be supported and adopted in new ways of working.

(5) Very positive, as above. It's being used even though you're not doing it, I wonder if they are aware of the blind spots though?

(IS) Business unhappy with procurement vehicles, we had a direct impact on changing this and responding to business drivers. Got to ask ourselves why our suppliers are telling our bosses why we are doing a bad job!! Not wanting it as an improvement, brings negative connotations to the people on the shop floor, doesn't make it a bad idea. If I was to focus on you, and the image of the project I think the innovative thinking from assessment criteria, behavioural workshops that changed leadership attitudes, resulting in an environment where everybody is challenging, the "global reach with local delivery" tag line was directly related to early interventions, associated assessment processes, tender processes etc,

problem is we only have pockets, because we didn't land gap analysis on a broader scale.

Whilst issue was found with the researcher's academic foundations and the communication into reality of theoretical concepts, something noted as an issue in early interventions especially, and something I had to learn from, the wider engagement of the project is seen positively. There has been some significant impact from the interventions, but as noted, there is an extent to which only one person can achieve.

19. Do you think the business has been proactive in engaging with the outputs and subject matter of any part of the intervention, specifically with regard to improving issues / processes from before the intervention started....discuss?

(1) Think it was an aspiration, issues with what I have discussed before, but maybe that's because of the amount of change within the business. Change is going on in a negative environment, good money after bad. Stability affected by ongoing change, too many things going on all at once.

(3) Some of it has become business as usual so I would say so, yes.

(4) Yes, we've implemented it.

(6) Definitely been an influence, still an influence today if only as a catalyst for doing things new, which I think sells it short.

(15) In parts yes, in other parts no. Lots of benefits seen across the delivery chain, specifically delivery route allocation, governance and the pipeline. Maybe more so the pipeline.

Again, the intervention activity has changed practices within UKWASC, the issue continues to be around the extent to which that change is widely adopted. When engaging with a multi-billion pound delivery programme, has the project been able to

completely modify practices, no, has it made as significant a dent as one could reasonably expect, I think yes.

20. Do you think the business is focusing on a holistic approach to its delivery environments more than it was before this project started, and specifically, do you associate any of those issues with this research project and the researcher's wider engagement process....discuss?

(1) I can see a connection between some of this work and how we are doing things differently but I would suggest it feels too late for AMP 6 and more suited to preparation for AMP 7.

(3) I would say that the business is thinking about strategic issues rather than process issues and you and your interventions are definitely connected to that change.

(6) In 2012 we were 80k feet up, now at 1k feet with a holistic view. I think we had no scope of context or working reality before. Now sharing programme with mandatory frameworks, couldn't have imagined that in 2012, allowing supply chain engagement to monitor the supply chain for us. Only used to be noise, now dealt with, work it out amongst key partners, framework gives governance and streamlines processes to suit an effective delivery environment. Focusing on supply chains, AMP6 as test ground, I would be absolutely devastated if in AMP 7 we had 4 reports from each partner, we should have a single view, not us doing it, KPI the relationship, market manage, market governance and make them do it, need to change not do what we did in AMP 5.

(15) Yes, actually looking at things strategically, is that purely down to the project, no, but suppliers pressing, involved with governance, challenging the pipeline and our processes certainly yes. We had to create definitions to be able to procure, MDs wanting the chief exec to focus on procurement process, we as a team with you of course had to not only translate, challenge and deliver an improvement on AMP 5.

It's hard to see the difference in what we are doing and what we might have done without you here because we did it together, you'll always be the bearded wonder to me.

If one focuses on the limitations of the project, specifically the extent to which one person can reasonably expect to change something, especially when you begin as a novice in the arena you are investigating, there has been a vast amount of activity off the back of this project. Is the business doing things differently due to this project, yes, are those things in their best interest and mine as a bill-payer, yes, could they do more, most definitely.

7.4 My reflection on the interviews

To give a brief summation of my own takeaways from the interview process prior to consideration of methodological appropriateness, there was of course a tendency to focus on the researcher rather than the project content, and this is a reflection on the approach. By focusing on the 'together', transitioning as a change partner and by being liberal on my phases, I am seen as mike, who also does a PhD. This is a subtle difference in the change journey and for reflecting on change. Interviewees may feel they see the person, but I feel as more of a conduit for the research approach rather than a knowledgeable 'other', and they in fact see the content and the approach as valuable. So there is a takeaway that separation of researcher and content is required, so people see the knowledge as theirs, not that they are accessing a knowledge owner who releases it to them. This expands on the issues of communication and perception of the interventions to the wider business, it is maybe this element of personal knowledge ownership that has restricted elements of the change journey to being more about the imparter, than what is being imparted.

There was however an understanding of the study and the associated interventions as positive, but with many interviewees unable to build a connection with their working lives. It is this connectivity between the approach and working reality which is of real

note. Still, through an extensive embedding process, the content and the focus on competency building continues to be seen as separate from working lives. This may connect to the personal element discussed above, but there is little doubt that whilst a lot of change took place, a lot of that change is linked to 'me', and I would have hoped for slightly more separation in that regard.

Of particular note, the project extensively impacted on co-designers and their working, with intervention participants aware of positives and things being different, but not sure what to do with it. Consequently, one might ascertain that the methodology was successful at an interpersonal change level, but less capable at wider communication and broader change, instead focusing on changing the people directly so that they in turn go and change delivery practices. This is somewhat unsurprising with the adoption of socio-technical systems, and one might expect that should the process be started again, with a non-novice (I would resist other descriptions) then the impacts could be far greater, but this is again the nature of the work and the extent of possible exposure in line with a full time PhD.

To close, I always expect more of myself and am likely to continue to feel that more could have been done. But when I reflect on the approach in addressing the two basis premises of this project, and the value of the outcomes, with the improved capabilities of UKWASC within the client function especially, I can't help but see the project as a resounding success.

7.5 Consideration of the nature of the methodology as being appropriate to the situation

An important aspect of the project in terms of both its intent, but also its selection of tools is the appropriateness of the methodological framework employed in respect of the situation. While much of this report discusses the appropriate selection of methodological tools and the wider approach, it is important to provide a reflection on

the key aspects of the project that addressed the forming of warrantable assertions methodologically.

7.5.1 The formation and use of the TPCA

The TPCA emerged as a vehicle through which to engage with an ICO and from which a researcher could both change the ICO, but also create a reflective change model simultaneously. This two pronged approach required a series of tools that would allow me as a researcher to address my principle research aims, whilst also being able to form a contribution back into knowledge. This meant building a research vehicle through which I could build rigour into my processes and reflections, but also a framework through which I could remain flexible enough in my activity to be able to engage socially and keep my focal work relevant to the ICO.

At this point in the thesis, the numerous layers of reflection, process and analysis might seem overkill or in some sense distracting from the project aims. But I as a researcher am likely more natural science than I would like to admit, but could not accept more hard sciences approaches as appropriate vehicles through which to conduct a project of this type. The layers of analysis and reflection therefore are my way of building an approach that responds to the project needs and those of the academic community, as well as those of the focus situation, in this case, the ICO. While some may argue that the transition of PO into AR and so forth as just a broader Action Research approach, components such as modelling, the representation of the new AMP6 IDS and closedown interviews relating back to the change approach are not pure AR. The TPCA is a change approach, with elements of academic focused 'validity' built in, and it is this connectivity between the social and the academic where the TPCA has proved appropriate for the project.

It has allowed me as a researcher to straddle a very fine line between embedding in the social world and maintaining a connection with academia. I cannot lie that it is perfect, I'm sure there is a different way to 'slice' the problem, or indeed that this project has in anyway been easy, I've accrued a number of grey hairs I'm not rushing to point out. But the TPCA mechanism has represented the most appropriate framework through which I

could perceive conducting a project of this nature, and would not hesitate to suggest its use by others investigating a project of this type, and its associated challenges. Whilst the TPCA approach can be communicated as 'generally' appropriate, three aspects of this project represent direct responses to the issue of appropriateness, the building of the CMP, the use of STS and the espousal of researcher transition from AR into PAR, using the psychological contract as a communication medium.

7.5.2 The building of the Change Management Protocol (CMP)

The CMP represents a direct 'in project' response to the issue of methodological appropriateness. There was a need to structure a process that would separate research from consultancy, as well as aiding in the design and planning of associated interventions. Explained in further detail by Appendix B, the CMP acted as a bridge between the optimisation focused interventions, the drivers of the business, the wider TPCA as well as being coupled with the work of the initial phases and that which was drawn from literature.

This tool served the project well, in terms of being revisited for example opposed to continuance, a premise that must not be forgotten for the interventions. To not forget of the project in general, is that of theory in action, not action to create theory, and the CMP served to facilitate this well.

7.5.3 The utilisation of Socio-Technical Systems (STS) for intervention

An important aspect of the project in action is that of joint optimisation of social and technical processes to aid in the effective delivery of infrastructure. Rather than intervening to **improve something**, the project focused on **optimising delivery**. This difference is central to the nature of the interventions and the utilisation of STS. Literature tells us that it is the alignment of softer aspects of delivery that enable the use of more advanced and strategic approaches to the market place. Simply building a 'good contract' is not enough. When we consider more serial and relational forms of delivery, success is premised on more than just the processes and arrangements put in place, but

the managerial processes, cultural aspects and in short, the people that facilitate the use of these vehicles.

Without the identification of STS from the literature as a premise upon which to direct interventions, the methodology for this project in the researcher's opinion would fall short. The **TPCA** defines the **approach**, the **participatory tools** of PO, AR and PAR coupled with associated reflection tools such as modelling represent the **method**, while **STS** represents the **tool** to be used, with **Strategic Procurement Management Competence** being the '**what**'. This differentiation is central to the change approach. It is the opinion of this researcher that each can be used in isolation, but such an approach would not suit the premise of this project. It was far from easy to frame these strands of change into differing themes for example, and the researcher cannot present an example of such ever taking place, but it is presented here that this was the 'better' thing to do.

7.5.4 The evolution of the researcher's psychological contract

An important element of the data collection process was a reflection that I had in fact transitioned from utilising AR into applying PAR. Across the phases of the project this is most aptly summated as the 'they' of PO, the 'we' of AR and the 'I' of PAR. Discussed at length within the methodology section, the later three interventions focused on a PAR approach of constant action and reflection opposed to more definable cycles as with AR. The nature of the working relationship between researcher and UKWASC was akin to the formation of long term unspecified 'contracts' between myself and the organisation, leading to high levels of commitment and stability in the 'relational' contract form.

The issue was that in honesty, I had begun to look at the situation differently and began to consider aspects of my own action differently. This represented a transition from not only how I saw the business and my role within it, but how I was treated and my interactions too. When describing the UKWASC business for example, I began to say 'we', not 'they'. I consequently reflected on how I was using the research tools at my disposal and to what extent they represented an appropriate approach to the project and its aims. In the opinion of the researcher, the nature of PAR differs from that of AR,

and I had in fact transitioned in working relationship across the interventions and moved away from direction. PAR also served as mechanism through which to focus on some areas of intervention that had far more impact than the initial AR plans had suggested.

The result being, an in project change that responded to situational reality, as well as the demands and opportunities of the project. Had I have continued with AR I would have reached a similar state of completion, but had I not committed to the transition into PAR, and then realised that I had in fact done so, the project would have been less successful, and most certainly a less accurate reflection of reality.

7.6 The formation of Warrantable Assertions

What the preceding sections have aimed to highlight is the manner in which the conduct of the research has been appropriate for essentially reaching this point, the closure of this study and the presentation of noteworthy contributions into knowledge and action unearthed by 3+ years of activity. Through my extensive efforts to disprove them via the methodological framework adopted for this project, the following contributions present the locally generated knowledge of value to the projects' aims supported by the content detailed in earlier sections that has buttressed the project journey. The following contributions are consequently split into five sections:

- *Category 1:* Warrantable assertions on the barriers within an ICO hampering the effective delivery of infrastructure;
- *Category 2:* Warrantable assertions on improving the efficacy of infrastructure delivery practices within an ICO;
- *Category 3:* Warrantable assertions on the methodology used and its variations;
- *Category 4:* Warrantable assertions about myself; and
- Locally generated knowledge of generalisable interest.

Warrantable assertions are made about the **specific client system** and **people, systems and change** for **both** of the projects' aims. Due to the nature of those aims, assertions

about the **methodology used** and about **myself** are **separated** out to cover the **project as a whole**, primarily due to the difficulty in separating out such assertions from one another. The assertions represent an agglomeration of the key analysis streams where appropriate, whilst also identifying singular items that merit consideration in isolation.

To avoid duplication, readers are directed towards Chapter 5 regarding the nature of warrantable assertions. Additionally however, a further section is included here that presents the communication of knowledge that may be of generalisable interest to others, should they wish to expand on the work undertaken in this study, or wish to find solace in the work undertaken as a representative contrast to their own work. Such readers may wish to see this study as a pilot, or accept that it is a warrantable representation of judgements made that they do not share. Whatever the rationale, whether it be in truth making or supporting another's assertions, no attempt is made to generalise, but to expand on how the assertions made here may have connectivity with other ICOs for example.

For clarity, the assertions made adopt two key words used in the following manner:

- The '**Approach**' includes the Three Phase Change Approach and the associated Strategic Change Model;
- The '**Project**' describes the entire PhD activity, from project inception to closure.

7.6.1 Warrantable assertions category 1

Warrantable assertions on the barriers within an ICO hampering the effective delivery of infrastructure

7.6.1.1 The specific client system

1) By having a variation of abilities across the ICO, resulting in a need to address fundamental behaviours and processes, there is the false belief that the ICO is advanced in relational delivery approaches, representing a mismatch in perceptions and practice.

2) The ICO does not maintain a holistic picture of the delivery environment, instead focusing on end to end process requirements within functions.

3) The ICO does not maintain a connection between the needs of internal business clients with certain procurement vehicles, they are consequently not utilised appropriately and represent an 'end of the line' decision making process. This leads to the underutilisation of more advanced forms of relational and serial contracting, representing only a rationalisation of procurement activity for a single project / bespoke design focused traditional delivery process.

4) This ICO utilises poorly defined incentive and measurement structures to support a programme view, rather than a range of collaborative engagements between client and supply chain that embrace new ways of working.

5) The ICO's attempts to mitigate cyclical and discontinuous investment patterns within the marketplace lack efficacy, resulting in low long term investment stability within the supply chain and the perpetuation of more aggressive procurement relationships.

6) The ICO considers that relational delivery practices reduce competition, that they generally cost more to operate with the supply market only concerned with maintenance of fiscal return. The ICO consequently engages the market via mismatched risk transfer, working collaboratively for smaller scale works and maintaining a distance from the supply chain for larger more complex works, avoiding more collaborative procurement arrangements accordingly.

7.6.1.2 People, systems and change

7) The ICO sees the marketplace as a fixed entity to be drawn upon, not worked with and as external to the business. A result of which is the propensity to 'place' requirements into the marketplace without consideration for the whole delivery chain, inclusive of their own asset management community, the extent of available market skills, or indeed if the ICO has the skills to marry up to such requirements.

8) Whilst seeking to advance their skillsets and improve on previous practice, the ICO does not address a desirable future state that encompasses strategic engagement. The ICO instead focuses on improvement upon previously acquired value, not what they should or could be doing as an approach.

9) In designing new procurement vehicles, the ICOs use of representatives rather than wholesale departmental engagement results in a mismatch between systemic social and technical requirements and the personal drivers and opinions of individuals. This is exacerbated by alignment to regulatory requirements and reactive force fitting of embryonic delivery strategies that are communicated as developed.

10) By operating in silos, the ICO does not understand the implications of project based organising, instead perpetuating traditional delivery approaches, poorly underpinned by lean principles and a failure to maintain a golden thread to the requirements of the business and internal clients. By maintaining a handover approach in delivery, there is a proclivity towards addressing process hurdles, rather than focus on the best interests of projects and delivering them effectively under a programme view.

11) The ICO maintains a disparate group of internal clients with differing goals and requirements. They consequently utilise the market place in a reactive fashion via a maintenance of master-servant relationships internally across an already disconnected delivery team. This results in project to project thinking that does not consider aggregation and supply chain engagement issues across operational silos. The ICO thus operates a hierarchical approach to knowledge identification, importance and solution formation within these silos. This perpetuates a self-preservation culture that makes little effort to align superordinate and subordinate goals due to the lack of an appropriate 'market engagement methodology' being followed, understood, formed or adhered to.

12) Little consensus exists within the ICO around the difference between portfolios, multi-projects, programmes, projects and their management. A

consequence is the proclivity towards the utilisation of single project thinking, coupled with reactive approaches towards aggregation strategies and a disconnect with a holistic view among those involved within the delivery chain.

7.6.2 Warrantable assertions category 2

Warrantable assertions on improving the efficacy of infrastructure delivery practices within an infrastructure client organisation

7.6.2.1 The specific client system

13) The ICO treats construction activity as separate to wider supply chain spend, irrespective of the competency levels within the construction focused elements of the business.

14) The ICO responds to regulatory pressures in accordance with the transition between regulatory control periods, and does not maintain a drive towards change and improvement beyond meeting the goals stipulated by that process.

15) The ICO does not maintain a holistic ownership of change activities, meaning that beyond the focal areas of the organisation where change is enacted, there is a failure for the activity to be holistically adopted outside of that change fulcrum.

7.6.2.2 People, systems and change

16) Change within an ICO may be experienced across an interventionist approach to varying degrees, with aspects of change becoming incorporated into practice. Such adoptions are linked heavily to the use of more integrated action tools such as participatory action research and the willingness of ICO participants to change their own practice.

17) When seeking to change an ICO, one must address their understanding of functional versus project based organising, the extent of their knowledge around social, cultural and behavioural aspects of delivery, as well as the extent of proclivities towards single project organising and procurement practices.

18) When seeking to change an ICO, one must address their knowledge around strategic delivery options, their specificities and respective enactment costs. Furthermore, one must address the ICO's connectivity between construction and non-construction spend activities, associated approval processes and governance procedures.

19) Change within an ICO must focus on the entire client delivery chain, involving all of those affected in the delivery process. It must also be collaborative and be communicated through a simplistic medium to allow entry into the process by a range of different ICO delivery chain members.

20) Change within an ICO must consider those involved as individual change agents who essentially act like positive contagions within the delivery practices of others, changing the process in operation. One must focus on the alleviation of barriers to their activity opposed to the pure provision of tools through which to do something differently. It is important that the ICO change agents' activity is seen as in the best interest of their own practice, and thus a separation between the goals of the researcher and the knowledge being used is required, with the change initiator not acting as the gatekeeper of the knowledge in action. The ICO change agents therefore need any such imparted knowledge to be accessible for their own practice.

21) Change within an ICO must find common ground with the working activities of those who it affects, whether it be theoretical or practical, in order to break down internal cultures that may seek to circumnavigate the impact of programme level thinking. This can be done by building a collaborative focus between participants without a defined goal or output. Participants must create the change together with equal equity in the actions of the change, helping one another to share the same view and to focus on working in the same direction, rather than the creation of something that affects another, or that one defines to another.

22) Change within ICOs must address the penchant of delivery professionals to distance themselves from the requirement to change their own delivery practices.

Instead preferring to either wait until a change process is over and they can continue as they once did, or to fail to put works into an actionable reality during the change exercise and thus hamper its impact.

23) When conducting change within an ICO, one must give appropriate consideration to the organisation being made up of four primary sub-systems, namely that of goals & values, technical, structural and psychosocial systems. A blurred boundary exists between the ICO and the marketplace, with a further fifth sub-system being that of the managerial that is responsible for enhancing Strategic Procurement Management Competence in the delivery of infrastructure.

7.6.3 Warrantable assertions category 3

Warrantable assertions on the methodology used and its variations

24) The Approach was successful in changing the view of strategic delivery vehicles as being rationalised market approaches only. Instead, informing the view of them as requiring differing organisational approaches exacting engagement and joint process optimisation to varying degrees in order to be successfully utilised.

25) The Approach was effective in advancing understanding around the transitional nature of procurement vehicles, and the extent to which different existing and proposed delivery strategies engage with, blur or redefine the perceived boundary of the ICO.

26) The Approach was able to identify and communicate the forthcoming regulatory control period as a transition period for the business opposed to a phase of stagnation.

27) The Approach was successful in changing the practices of the primary delivery function within the focus ICO, leading to a more effective delivery environment compared with that at Project initiation. While not marrying onto the view of the desired state of competence, the primary delivery function, which served as the

fulcrum for activity of the Approach, showed the most significant increase in maturity and skills in delivery.

28) The Approach was successful in assisting the design and formation of a new IDS within the focus ICO for the forthcoming regulatory control period, as well as working towards its optimisation in implementation following its procurement.

29) As part of the Approach, the CMP serves as a vitally effective tool in setting engagement terms between researcher / change agents and their focal contexts. In terms of limiting scope, addressing potential Project deviations, maintaining relevance to theory, action and practice, avoiding consultancy arrangements, identifying appropriate engagement closedown points, presenting a structured rationale for intervention and as a medium through which to put theory into action.

30) The Approach serves as a sustained and committed catalyst for effective engagement through which to conduct a change activity within an ICO. Resulting, in the main and where adopted, in changed practice in infrastructure delivery.

31) When utilising the Approach it is important to give appropriate consideration to political impacts, the need for sustained alignment between researcher / change agents and focus ICO, as well as understanding the need to be reflexive and adaptable over what can become lengthy engagement periods.

32) The Approach is conducive to changing the nature of the change relationship as entered and any associated psychological contracts that were formed, requiring an adaptation of the tools used within the Approach.

33) As part of the Approach, Socio Technical Systems is an appropriate theoretical basis upon which to construct interventions within an ICO by facilitating joint optimisation. In counteracting the silo nature of delivery, it is important however to be able to communicate and conceptualise theories and models of change for consumption. This is to negate the inherently challenging nature of intervention on

the principle of professionalization in isolation upon which the ICO delivery chain is premised.

34) The Strategic Change Model is an effective vehicle through which to intervene within an ICO to improve Strategic Procurement Management Competency. It allows for interventions and associated activity to focus on core principles and a singular theoretical construct opposed to negative aspects such as internal politics, issues of bounded rationality and historical dogmatism towards certain principle agent problems.

35) As part of the Approach, the utilisation of a third party researcher is an effective strategy through which to enhance the formation of change activities. Whilst such an approach does not inevitably amend the focus of change activities within the ICO, it does result in modified outcomes. It is important however that one addresses the nature of the co-worker relationship and any personal agendas to improve the efficacy of one's activities.

7.6.4 Warrantable assertions category 4

Warrantable assertions about myself

36) This Project has changed my view of what defines a working professional, expanding assertions of working experience, training, qualifications and professional titles as definitional and practical boundaries of a person's organisational value. People, employees, participants and friends offer so much more to an organisation if one chooses to step outside of more mechanistic views of the working environment.

37) This Project has allowed me to change the activities of others for the better, beyond a theoretical framework of organisational improvement and efficacy through optimisation, but via personal engagement and enhancement of the self, the individual and their relationship with the technical world. I learned that one cannot expect to share my journey with others, but that I can aid in facilitating their own journey.

38) Through this Project, and by conducting interventions armed with a particular theoretical framework, irrespective of any other knowledge base I may have had, I was not only able to explore the focus context and address the Project aims, but I was also able to explore my impact on it, my own practice and my own perceptions of the nature of the world.

7.7 Locally created knowledge of generalisable interest

The following presents two strands of reflection upon which one could glean generalisable interest. They purposefully expand on the view of Dewey, expressed by Boyles, that inquiry be of some value, and ultimately present some form of potential. While the creation of assertions in isolation can be perceived as achieving the goal of value, the following presents the framework through which one might wish to address the potential of this work. The following discourse is consequently split according to the implications for theory and the implications for action.

7.7.1 The assertions and their potential implications for theory

Additions of interest, but not contribution, include the implication of this study for theory. The first of which is the nature of silos in delivery, the resultant disconnect with internal requirements and the utilisation of procurement as a rationalisation of traditional delivery practice. This work expands on the work of Emmett and Crocker (2008) for example who advise delivery practices as being silo driven, top down and hierarchically aligned. While one can maintain that the process is silo driven, those silos are in fact process driven rather than hierarchical, resulting in a mismatch with internal client needs, rather than a disconnect with colleagues, somewhat more akin to the views held by Mazet and Portier (2010) and Vrijhoef and Koskela (2000). This supports the people focus of some literature but goes further to suggest that 'more committed' people are in fact restricted by a mismatch in organisational governance approach via the prevalence to maintain lean thinking across project level oversight.

While the work of Belassi and Tukul (1996), Frimpong et al. (2003) and Ikediashi et al. (2014) for example is important in understanding the factors affecting the success of a project itself, often focusing on it 'in action', rather than its inception, the paucity of literature focusing on the internal operations of the client function, beyond that of identifying that there is indeed a problem (Flyvberg, 2005; HM Treasury, 2010), gives the issues highlighted by this study particular importance. Beyond the list style identification of Lando (2011), albeit helpful, there is little surprise that the issue of a disconnect with the premise of joint optimisation within the client function is missing within the literature as an example. This is an expansion on the silo theme again, but in terms of knowledge, and provides a rationale for the underutilisation of delivery vehicles that has blighted UK infrastructure delivery to date.

Unexpectedly, this project has presented an expansion to the view of barefoot empiricism that the researcher held onto as somewhat defined. While the premise of barefoot empiricism is on the replacement of old with new due to inappropriate use or underutilisation. Within the focal situation, it was identified that the selection of the replacement was not about 'newness' at all. In fact, the replacement was about identification with a theme, such as the insertion of competition over cooperation, with project partnering via a framework a 'better' fit. While one can find connection with the factors in selection identified by Murdoch and Hughes (2002) for instance, there is little doubt that the more significant factors identified by Luu et al. (2003) are misaligned to practice. The issue is that of understanding within the ICO coupled with the force-fitting of procurement methodologies to suit business directives. Furthermore, the misuse, even by dedicated professionals of components such as lump sum versus reimbursable contracts and the nature of project scope, presents that the bounded rationalities and experiences of ICO personnel in education and skill alone falls significantly short of the conclusions drawn from more distant studies.

Another significant element of the work is the lack of strategic and supply chain thinking in delivery. The chasm between construction trained and supply chain trained personnel is vast, with the integration of the two representing a significant challenge to the industry. Couple this with the lack of connectivity and understanding in delivery around

a programme level view and the difference between functional and project based organising and the rationale behind embossing SPMC is clear. Much of the literature falls short however in either focusing on asset management with delivery supporting it, or delivery in isolation with no consideration for more commodity focused spend practices. The opportunity to reduce transaction costs in this arena of research is significant.

With regards to changing delivery practices however, a number of constructs from this project are worth espousal at this point. The use of pragmatism in change for example represents a significant component of the Approach. By assembling change approaches for appropriateness opposed to a theoretically defined future state, the Project has been able to focus on optimisation of what is in front of the researcher opposed to being hampered either by a lack of something, such as a technical skill, or by attitudes and politics. If one reflects on Mason's (2007) view of organisational system complexity increasing over time, then reflexivity and the ability to amalgamate seemingly spurious issues into a coherent whole should naturally be the cornerstone of a change exercise. Granted, many change strategies are intentionally vague, look no further than Kotters eight steps for example, but this serves an important purpose. While pessimists may, this researcher potentially among them, suggest that such vagueness is to facilitate consultancy, it also serves to allow for responsiveness and situational specificities. This is an important aspect of the TPCA. It allows for the insertion of an appropriate theoretical framework to facilitate a change activity, it is not predicated on that specific theory.

7.7.2 The assertions and their potential implications for action

A core element of this project is the extent to which it has been conducted within the single scenario with no attempt made to generalise from the findings. However, it is reasonable to present that one may wish to draw on the study findings when investigating other such ICOs, but with respect given to the nature of those organisations. An expansion of this idea is via figure 7E which depicts the commonalities in the delivery of infrastructure services found across IDS'.

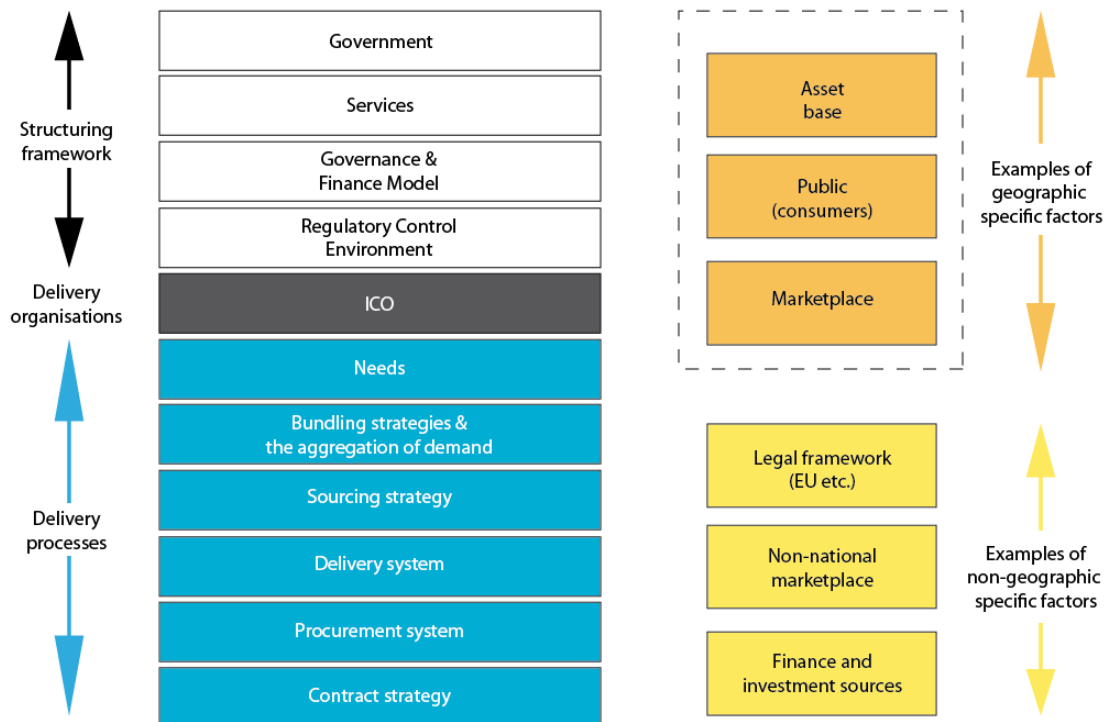


Figure 7E - The commonalities in the delivery of infrastructure services via IDS

(Source - Author)

It is reasonable to presume that under the same structuring framework, providing the same service and influenced by similar external factors, that the Project would have found certain congruencies with other water sector ICOs. An expansion would be to find correspondence with other sectors, such as rail, nuclear and ports under the same UK structuring framework. Contrasting scenarios would fall under differing geographic circumstances, structuring frameworks, such as in France or the USA and the nature of their ICOs. Commonality might be found however in the application of delivery processes, or the influence of non-geographic factors such as legislation. A further expansion would be to isolate the delivery process and vary the study of ICO, structuring framework and external factors for example.

A direct expansion would be into either other sectors under the same structuring framework, or the same sector under a differing structuring framework to allow one to cross analyse the different cases. The issue is from which part of the Project one would place most value in expanding on the Project assertions. Both the Approach and the

identified problems are single case specific, but the issues may find prevalence within geographically neighbouring ICOs providing the same service as UKWASC for example, or national service providers operating across similar localities whilst under the same structuring framework such as Network Rail (rail - national) or Sellafield (nuclear - regional). A purposeful resistance is made to not stray into suggesting that one 'will', but instead suggest where it is most reasonable for one to 'look'. This is more a suggestion that to either corroborate or expand on this study, these would be good places to start, but potentially not end. A shortcoming of this study is its categorisation of the external factors and internal ICO focus. An expansion might in fact be on the external factors to the ICO rather than rationalisation of other ICOs into an investigation framework, or into the elements influencing the ICO, or into completely contrasting ICO scenarios.

One concluding note however is on the methodology used. It does not hold allegiance to the delivery of infrastructure, should one utilise a differing theoretical framework and focus on childcare for example, and the improvement of literacy among under 11s in after school clubs, the premise of the TPCA is still of value. The TPCA is non service, non infrastructure specific, it is about change within any structure or organisation to which theory can be applied and action is relevant. Expansion on the use of the TPCA then, whilst embedded in the theory which helped create it, would be to assess its usage outside of this Project, and its applicability to the improvement and enhancement of contrasting scenarios. A word of warning would be on the utilisation of intervention however, as expansion on theory into a framework that can be tested via a nested systems approach has been vital to the delivery of this Project. Specifically the identification of Risk, Cost, Selection, Governance and Innovation to allow cross reflection in analysis of competence building. So while one may wish to conduct single interventions to 'test' this Project, and a rationale can be made, should one wish to assess a differing problem however, such as the provision of welfare facilities for autism sufferers, then one must re-assess the theoretical basis, such as the use of colour, tactile surfaces, light and security to improve that scenario. It is reasonable to present the TPCA as a useful change approach, but no warrant is provided on the appropriate application of theory however outside of this Project.

7.8 Chapter summary and linkages

What this chapter has presented is a structured response to the data I collected with UKWASC colleagues outlined within chapter 6. It is envisaged that readers will appreciate the efforts made to cross reference the creation of warrantable assertions suited to a localised study of this nature, and be able to consider such assertions as valid within the academic realm. It is anticipated that readers will have an understanding of the structure that led to the creation of the assertions, but also how the study adapted to its situation and my own reflections and responses as a researcher accordingly. While to some this may be the first step on a journey, and to others a potential over complication, this study has centred on action, but always with a connection to theory. The following chapter will focus on closing this particular research journey, but it is hoped that this study will facilitate the beginning of other studies, the continuation to look at action as a sphere of appropriate concern for research, and towards the constant challenge of one's own understanding of what can be achieved.

CHAPTER 8 CONCLUSIONS, RECOMMENDATIONS AND CLOSING REMARKS

8.1 Chapter introduction

To bring the thesis to a close, this final section discusses the aims and objectives of the study in light of the adoption of the study approach, as well as the corresponding impact of the identified assertions. The judgements made at the outset of the study are of value here, and while they may have been revisited following Phase One of this study, their value to our understanding of the operation and change of ICOs remains essential. The study has presented four key elements to this point, part two (Chapters 2 & 3) that define, explain and expand the focal area of study, part three (Chapter 4) that develops the theoretical framework for application within an ICO, part four (Chapter 5) and the development of the research approach as being appropriate to the project's goals, and parts five and six (Chapters 6 and 7) and the actually conduct of (and reflection on) activity. The following therefore aims to act as the anchor to the project in assessing the objectives in light of these key parts. For clarity, this section addresses:

- Conclusions – reflecting on the study's objectives;
- Recommendations – reflecting on the assertions and the project as a whole; and
- Closing remarks – an aid to those reading on what this project has represented to me, but also to others

8.2 Conclusions

The primary aims of this study can be simplistically expressed as, what are the problems, and how can we do something about them? To support these fundamental goals, the reporting of the thesis is aligned to the study objectives (see Table 8.1), opposed to direct followership of what has been an extensively action oriented piece of work.

| Research Objectives | Thesis structure |
|--|---|
| To identify what constitutes a strategic approach to infrastructure delivery | Parts Two and Three: Literature Review and Research Approach |
| To ascertain the elements that make up Strategic Procurement Management Competence | Parts Two and Three: Literature Review and Research Approach |
| To identify the factors that hinder the adoption of a strategic approach to infrastructure delivery | Parts Two and Six: Literature Review and Research Data |
| To facilitate the creation of a new Infrastructure Delivery System (IDS) in the regulated UK water sector | Part Six: Research Data |
| To develop and validate the use of the Three Phase Change Approach (TPCA) within an ICO in bringing about real world change | Parts Two, Four, Five and Six: Literature Review, Research Methodology, Research Data and Analysis in isolation |
| To develop and validate the effectiveness of the Strategic Change Model in enhancing Strategic Procurement Management Competence via intervention within an ICO | Parts Three and Five: Research Approach and Research Data |
| To utilise Socio-Technical Systems (STS) as a basis for intervention within an ICO to facilitate joint optimisation | Parts Two and Five: Literature Review and Research Data |

Table 8.1 – Relationship between thesis structure and the study's objectives

(Source – Author)

This study has investigated the nature of infrastructure delivery, its issues and the problems within ICOs. It discovered that whilst broader higher level problems had been identified, there was no comprehensive framework in place for either changing the way ICOs approach delivery, or a clear understanding of the main premise of the problem. The study progressed to investigate SPMC and the disconnect between what actually constitutes a strategic approach to infrastructure delivery, and the idea of using strategic delivery vehicles as indeed being strategic. In essence the difference between a strategic 'thing' and a strategic 'approach'. The study progressed further into how best to investigate the issue within an ICO, as well as how to simultaneously change the modus operandi of one such organisation. This action, development and change phase not only facilitated real world change and intervention, but also formulated the Strategic Change Model as an expression of the activity undertaken. Unforeseen however was my own development, seeing myself as more of a hard science oriented practitioner at the outset of the project, and some form of pragmatic insider change agent by the projects' close.

To bring the project full circle, and to put the journey of this project into perspective against initial objectives, the following breaks this journey into specific reflections on the projects' objectives.

8.2.1 The identification of what constitutes a strategic approach to infrastructure delivery

Much of the literature on what constitutes a strategic approach to delivery focuses on the use of more advanced and relational forms as in fact being strategic, rather than indeed taking a strategic approach. Deeper exploration into strategic management theory in fact presents the appropriate use of procurement 'vehicles' as being strategic, aligning them to the spend profile of an organisation and its requirements. Further examination of complexity theory, programme management and the aggregation of market demand as drivers for competence building presents that much of the literature in circulation today presenting either the 'next best thing', or 'best practice', is in fact a flawed concept.

This disconnect between supply chain procurement theory and construction procurement theory has been exacerbated in practice, allowing the continuation of the single project view, with procurement being an 'option' to market, rather than a driver for organisational process. This perpetuates the underutilisation of more relational and serial forms of delivery, as well as providing a rationale for, and slight challenge to the concept of barefoot empiricism. While the barefoot empiricist view holds that the next best thing is replaced with the next best thing without ever really understanding why something worked for someone else, in essence, misguided followership of a benchmarking approach. ICOs in fact don't see one relationship as particularly better than another due to the level of heterogeneity in their adoption and design of the vehicles. In short, they never quite adopt procurement vehicles until such time that they merely represent contractual forms, and indeed a blur is conceptualised between different aspects of delivery, such as that between delivery, procurement and contract systems.

8.2.2 The formation of what constitutes Strategic Procurement Management Competence

While a number of authors were key in helping to define this areas of study, the basis upon which I would eventually intervene within the focus ICO was an expanded and somewhat contorted view of that presented by significant authors such as Cox, Townsend, Ireland, Kraljic and IUK. The reason being that as a strategic approach is inherently contingent, and with appropriateness as the primary aim, one cannot utilise specific definitional components in order to apply it successfully. The five principles synthesised for this project seemingly link heavily to the work of Cox and Townsend (1998), and at first glance they do. Via exploration on this project however, there was a disparity between their somewhat project focused components, albeit with a strong linkage to supply chain theory, and the implications of programme level thinking and the influence of temporary multi organisational theory as well.

Importantly, the five principles of SPMC defined by this study are not exclusive of one another, and this is vital when one considers systems thinking principles, especially

those of Socio-Technical Systems and joint optimisation. Effective delivery should be predicated on the appropriate use of tools, procurement options and the alignment of the social aspects that interact with them. To a certain degree, having 'the best' of one thing may not actually align to the appropriate delivery vehicle, such as a relationally focused governance board, supported by relationally driven KPIs such as behaviours and customer relations when the contracting option being utilised is a full risk transfer D&B solution for a non-critical warehouse extension for £250k. The management costs and associated benefits do not marry up to the works, the risks, the expenditure or the complexity of the scenario.

8.2.3 Espousal of the factors that hinder the adoption of a strategic approach to infrastructure delivery

This objective is unique in the sense that it seeks to confirm something identified in literature within the real world, then expand, challenge or support as necessary. Other components of the project seek to identify, explore, test and use in contrast. Beginning in the literature, much is written on the inability of the construction sector to engage with non-traditional delivery approaches such as partnering, with rationales given such as professionalization leading to industry silos, the geographical specificity of works, the network nature of the industry, discontinuous demand issues and the extent of differing client requirements as select examples. In the delivery of infrastructure however, where the client base is more rationalised, their demands more continuous and the extent of geographical concern typically more defined, coupled with their provision of more constant and specific services such as roads, water and tracks etc., there is little in the literature around why such organisations continue with their predilection towards more traditional delivery approaches akin to the wider construction sector, if not worse so.

The dearth of literature on the decision making processes within an ICO has been explored in this study, and the most significant factor to be identified is the rationale for the continuation of internal silos and traditional practices, especially the chasm between social and technical aspects. With technical the remit of delivery, and social the remit of 'business' focused professionals with no connect between the two. This rationale is

seemingly predicated on the disparity between delivery practices and the demands and drivers of large organisations, as projects become entities in their own right, rather than outputs in the service of business outcomes.

As the disconnect grows between professionals and the understanding of business processes outside of their professionally trained remit, the 'safe' response is to stick to their education and focus on the traditional aspects of projects, focus on the technical and stick to what they 'are there to do'. The consequence is that concern is not on why is this project in the best interest of the business, or indeed that it may be a small cog in a large engine, but what are the needs of 'the' project and how is the business helping. This creates an odd scenario whereby the technical aspects of delivery become the concern, not the importance of the issue. A technically challenging £250k job may spark the interest of technically focused silo professionals with no connection to the £100m scheme that has poorly defined solutions as that is 'with someone else'. The continuation of the split between technically trained professional and the needs of the systemic organisation, as well as changing it, continue to hamper the adoption of strategic approaches as professionals fail to see the value.

8.2.4 The creation of a new Infrastructure Delivery System (IDS) in the regulated UK water sector

The initial aim of the project was the facilitation of change management via the creation of a new IDS within UKWASC. While this premise was adapted as a project approach, this driver was maintained as an objective of significance in relation to the study goals. Referred to as the model as exited / the AMP6 model / the AMP6 Service Delivery System / the AMP6 IDS, its formation represents a plethora of different aspects to delivery, but more so serves to represent a version of operational reality. In contrast to the work of Awuzie in espousing the Viable Infrastructure Delivery System as an effective way to test viability in delivery of government objectives through projects for example, deploying Beer's Viable Systems as a theoretical representation of viability, the model for the project is descriptive of the operational reality and informative of the change from the model as entered.

The goal was not to define a new conceptualisation of a system, or indeed test if the process satisfactorily transforms inputs into outputs. The goal was to change the system as entered, and communicate that something indeed changed, and that change was predicated on something tangible, in this case Strategic Procurement Management Competence. This is by no means a challenge to the VIDS work, but an expression that the two projects do not serve the same goals. Consequently, while the VIDS was tested on its ability to transform effectively, testing the real world reality through it as a construct, the model as exited for this project espouses the manner in which the AMP6 IDS has facilitated change, and that indeed a new Service Delivery System is in operation. The revised delivery environment which it communicates is evident in the transformation from the AMP5 model (model as entered), insofar as the internal client plays a key role in delivery and delivery vehicles are expressed as business extensions (to various degrees).

It is also possible to gain an insight as to where the project impacted, and the manner in which that impact extends into the business. It was important through literature to conceptualise the Service Delivery System to facilitate the building of the model, arming participants with the important aspects for consideration, and the change in perception of operational reality between AMP5 and AMP6 is evident in the creation of the new AMP IDS.

8.2.5 The development and validation of the Three Phase Change Approach (TPCA) within an ICO in bringing about real world change

While the TPCA as an approach was born out of the literature on change and populated with research tools, it was necessary to emboss it during the project with three important additional layers of activity. Namely, the Change Management Protocol (CMP), the closedown interviews and the nature of my own reflection on the data collected. These were not originally formed as part of the approach and were developed to (1) facilitate effective change based in theory via the CMP, (2) validate that activity had indeed taken place with knowledgeable insiders / participants, and (3) that the data collected and change undertaken could be separated from the experiences of colleagues

so that I as a researcher would be able to make independent contributions to knowledge.

While the TPCA may have been expanded, it was in fact improved. This key element of development and understanding the nature of appropriateness in participatory research is fundamental to the success of the TPCA in bringing about warrantable change in the real world that is of academic interest. It is evident within this report that the TPCA was an effective approach in bringing about change, but without the flexibility of additional constructs, that change may not have been either warrantable, theoretically grounded or independent in terms of knowledge creation. It is this '2.0' version of the TPCA that proved successful, not the modification of it as an approach, but the expansion of the mechanisms within it.

8.2.6 The development and validation of the effectiveness of the Strategic Change Model in enhancing Strategic Procurement Management Competence via intervention within an ICO

Somewhat of an expansive objective of the study, this required not only the espousal of actionable principles that could form the basis of intervention, but also the reformation of those principles over time. For example, Innovation was initially primed as Standardisation, akin to the Cox and Townsend description. While I found this too limiting at the time, there was little need to change it as a definition until it was necessary. The same applies to performance, I struggled with the concept of Governance and Performance Management as separate concepts, and the CMP was revisited a number of times to merely test the 'what if' of whether Governance was split into two components, requiring further intervention. The rationale for the split could not be made, whilst this does make the argument somewhat as to the scale of the Governance intervention.

Armed with the principles through which to intervene, the Strategic Change Model was born out of espousal of Strategic Procurement Management Competence under one encompassing view, it was tested through intervention and generally developed with one foot in theory, and one foot in actionable testing. Bob Dick (1995, 1997) advises that

we continually revisit theory, accessing new content as we go and deem necessary. Indeed the action research literature is a flood with this principle of reciprocity between theory and action, and the method, the outcomes and the resultant change model reflect this approach. To varying extents, the Strategic Change Model was built during the enactment of the TPCA, either by initially forming it in Phase One, testing and reforming in Phase Two into Phase Three, and confirming its applicability again in Phase three.

A connect between the interventions and their focus on Strategic Procurement Management principles defined within the model are evident, if only in the manner the AMP6 IDS focuses on the different aspects of procurement vehicles and the central aspect of the internal asset management client in delivery. Such change is not in the entire remit of this project however, and no attempt is made to say that the AMP6 IDS is purely because of the Strategic Change Model, but the closedown interviews do outline how participants made a connection between the principles of this project and their working lives, and thus the Strategic Change Model did have an impact in this regard.

8.2.7 The utilisation of Socio-Technical Systems (STS) as a basis for intervention within an ICO to facilitate joint optimisation

A key aspect of this project was the identification of joint optimisation as a change principle under which to understand appropriateness as part of a strategic approach. While appropriateness is linked to the identification and usage of particular components of the strategic approach, joint optimisation, opposed to optimisation in isolation, focuses on the best use of an organisations' skills, enhancing them as necessary, as being as important as selecting the right strategic procurement vehicle. While the IPR (HM Treasury, 2013) sets out that understanding the social complexities and abilities of an organisation is important, it does not extend into how one gets an organisation to do something about it. While this study is not a direct relation to the nature of the IPR, some of the general principles are shared, such as understanding the different aspects and complexities of more advanced delivery systems for example. The element of

intervention however on the identification of components that facilitate delivery and how to use them differently is most certainly a contrasting aspect.

Take for example intervention 5 investigating programme optimisation under the principle of innovation. The premise was on doing something differently within the function to facilitate the effective utilisation of the strategic partnering vehicle UKWASC had designed. The activity was not solely about a technical expansion of activity, the management and utilisation of an optimised pipeline of activity, but also the social aspects of what such an activity means, and the personal aspects of seeing the supply chain differently, engaging with a programme view and what collaborative working means. This was more than just identifying something that should be done, such as taking a programme, cutting it a particular way, getting the supply chain to price and then communicating the saving as gospel, that would have continued the silo technical only aspect. The development of the human aspect in tandem is where the utilisation of STS was vital in intervening, because no amount of technically isolated exercises would have resulted in people actually doing anything different about it.

8.3 Recommendations

From testing the judgements made at the outset of this study, to the formulation of warranted assertions in relation to the study's activity, a number of recommendations for further investigation, action and consideration can be made. Whilst careful to not present such in terms of generalities, the following is segmented into areas that may represent value to others born from this study. The recommendations are namely for:

8.3.1 Clients

To consider the nature of their role in the delivery of infrastructure, and their ability to dictate the relationships formed within the broader construction industry. They are central to the identification, implementation and expansion of 'better' practice, and it will have a benefit to their balance sheets accordingly. Too much is made of the next best thing, opposed to utilisation of the next best thing in light of everything else. By

failing to appropriately adopt initiatives, the traditional silo approach reigns supreme as a safety net, opposed to being another tool in the strategic procurer's arsenal. It is also for clients to take the lead and avoid followership, both in change and in the utilisation of better practice. Understanding the breadth of options available is pivotal in understanding how best to utilise the ones an organisation needs. It is also important that client organisations maintain a direction, a fulcrum of activity and an underlying message, as well as how they intend to achieve it. Simply spending less, or aligning to one's customer needs are too lightweight as concepts and fail to turn the ICO juggernaut in the choppy waters of uncertainty, and this hampers the progression and implementation of change. One cannot simply say, be better, one must in fact do things better, over and over again, and then start again.

8.3.2 Professionals

To consider the relevance of their training and the role they play within wider delivery. A key aspect of this is the impact of bounded rationality and the extent of one's professional desire to see themselves represented in the work they are a part. This manifests as a Quantity Surveyor needing to see a programme, a bill of quants or an agreed schedule of rates as 'part of a job', or an Architect needing to put their 'twist' on a design, or Project Manager needing to substantiate passing a particular governance gateway. Without these components professionals begin to question the impact they have on delivery. For example, should professionals determine a client need not build anything, and just 'paint it', saving the client £X million. The architect need not design anything, the QS not measure it or the PM deliver something, and thus one can ask, what are you there for? We in fact need to perpetuate a culture of what isn't done as much as what is. Those professionals saved £X million, they are defined by effective inaction as much as effective action. The premise is on the removal of ineffective action and wasteful inaction and the professionals upon which we rely to deliver our works should not only change the way they look at problems and their roles in solving them, but also how they are judged in terms of success.

8.3.3 The industry

To consider the master servant nature of relationships that predicate a delivery environment driven by discontinuous demand. A response is for organisations of certain typologies to offer ‘the full range’ of services, say a contractor or a designer. The industry is beset by a series of jack of all trades type operators who either do not fully understand the extent of what they offering, or think they need only to ‘get in’ to sway the focus back onto a more amenable agenda to their modus operandi. This ends up masking a lot of good practice within the industry, engenders a torrent of mistrust and restricts industry wide development. There is little surprise that organisations with more stable, invested supply chains begin to reap supplementary benefits, such as across customer service, health and safety, training and reduced overheads. The issue is such approaches are not easy, and the start is most certainly the more difficult element. Detractors may argue that outside of infrastructure the construction sector is beset by its singular nature, where one can argue as to whether that is the fault of clients who draw from a disparate sector, or the industry for not presenting a united front? Others may challenge scale, and the relevance of ‘all this’ to the local builder, but what if an ICO has extensive small scale maintenance demands, should they be aggregated through a larger provider of services, or via a vehicle that provides access to a broad array of small scale providers? If discontinuous demand and disparate service levels were addressed, then the industry could tackle the agglomeration of transactional wastes that act like a giant windbreak to the industry, both in terms of costs and the sector’s ability to improve its skills in a more wholesale manner.

8.3.4 Education programmes

To consider the silo education of professionals. As I have experienced in my own education, proven across my working and research focused life, education programmes, especially for professionals, essentially make sure that you are indeed a professional in your field, that you represent the field accordingly and that you protect it from either disrepute or dissolution. Little attempt is made to remove the barriers or challenges that face a profession by aiding another, the battle is to control fee income in the open

market, and within client organisations, to maintain political importance and workload. In both circumstances, the drivers are largely similar. The issue is education, or at least learning. I myself had to 'unlearn' that I was an architect, and in fact realise myself to be a problem solver, a facilitator and an effective systems thinker. Our professional definitions not only limit our potential within the wider industry, but also our abilities to enhance the skills of others, address barriers to effective delivery and to address what actual skills gaps.

8.3.5 Research

To consider the opportunity the participatory methods have not only in identification, but in implementation of change. Research has taken to competing with consultancy in the actionable arena and this creates a blurred line between appropriateness and betterment. Consultancy plays an important role in industry, presenting 'best' practice or conducting a specific activity an organisation requires, the issue is that the 'requestor' (often clients) need fully understand the extent of what is being asked for in order to consider the validity of what is being offered. This is the void in which academia and research should sit. Research represents the epicentre of all optioneering, nothing can be deemed valid unless an extension of something or a new formation. In both situations, one must understand the context and validity in relation to something else. Put simply, it is research and the role of academia to help arm organisations with the ability to understand if they should go left or right, it is often the consultant that then helps them to indeed turn left.

8.3.6 Policy & legislation

To consider the role it plays in change within the industry. While legislation can be perceived as forming barriers in some instances, think only of the EU procurement legislation as an example, it can in fact help to serve a greater good, such as the removal of oligopolies in the aforementioned example. The issue however is action, much literature, policy and guidance places no negative impact on the operation of organisations to 'force' changed practices. One can argue that legislation merely stops people from doing things 'wrong'. A connection between policy, guidance and 'better'

practice needs to place itself in operational reality. A prime example is the road and streetworks act, it stipulates core depths for tarmac replacement etc. and the manner in which councils should and can test compliance of reinstatements. A public need represented by an actionable requirement. Procurement legislation does as much via PINs, PQQs and ITTs etc., but what about the decision making process that leads to such an activity? How do we monitor, advise or even understand the rationale put forward prior to a procurement activity? The Chartered Institute of Purchasing and Supply provides guidance for example, but its legislative focus is on contracts, not guidance on what to contract. Whilst this is a broad topic and potentially fraught with pitfalls as a debate (obvious ones including scale of task and the nature of the free market), let me make an argument for the Infrastructure Procurement Routemap, and the involvement of Leeds University. The work in the main is a strong response to problems identified in the Cost Review (HM Treasury, 2010). When putting those good ideas into action however, its use by this researcher was met with derision, leading to questions of 'do we have to', and 'it doesn't relate to us'. Whilst somewhat in small scale isolation as an example, the IPR's successor, the Project Initiation Routemap, in all its glossy colour is virtually unheard of within UKWASC. Yes it is slightly watered down, but one can ask what isn't that is practicable. The issue is that such good work hasn't reached the 'coal-face', and there does not seem an intention or mitigating strategy as to how to bridge that gap.

8.4 Closing remarks

As a closure to this project, it would be remiss of me to not present what this project has meant to me, but also how it has changed those who have come into contact with it. Whilst involved in a whole array of contrasting activities, from social inclusion to technical communication, I struggled with what to close on for this work. A discussion with the new industry supervisor on what a warranted assertion represents was the forerunner, with a refresh of some of the behavioural workshop outcomes also posing a worthwhile entry for me personally. However, one comment continues to merit

reiteration, summing up the project in a simple quote from the industrial supervisor during our closedown interview:

Without you we wouldn't have the EMG, and that's the big ticket item for me.

Not only did the project facilitate the creation of the Executive Management Group (EMG), a relational contracting governance medium for senior staff (client and contractors) through which UKWASC would not have otherwise engaged; but it also highlights how UKWASC would not otherwise have identified such a mechanism as viable, valuable or indeed worthwhile. This project was about identification and worthwhile change, change predicated on improving competence and the utilisation of joint optimisation to do so. Not only was a significant gap in the delivery relationship identified, it was addressed, it is premised on the constructs of a strategic approach, it builds on the ideas of joint optimisation through intervention and is addressed in reality. Action detached from this project, the researcher and to continue far beyond the closure of the study.

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Appendix A: Publications Overview

Potts, M, Awuzie, B, McDermott, P and Stephenson, A (2014), 'Engendering Change within a Water Infrastructure Client Organisation: A Participatory Action Research Approach', proceedings from the 5th *International Conference on Engineering, Project and Production Management*, Port Elizabeth, South Africa, 26-28 November 2014.

Potts, M., Awuzie, B., McDermott, P. and Stephenson, A., 2015. Engendering Change within a Water Infrastructure Client Organisation: A Participatory Action Research Approach. *Journal of Engineering, Project, and Production Management*, 5(2), p.71.

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Appendix B-I: Reports Overview

This page presents an overview of the reports that have been intentionally omitted from this thesis for the purposes of submission due to commercial and ethical sensitivity issues. **FOR VIVA, REVIEW AND STORAGE PURPOSES**, copies of the aforementioned reports will be made available to examiners and the University.

- **Appendix B - The Change Management Protocol**
 - 23 pages
- **Appendix C - The Participant Observation Report**
 - 41 pages
 - Conducted between November 2012 and March 2013
- **Appendix D - The Skills / Maturity Benchmarking Exercise - Round 1&2**
 - 46 pages
 - Conducted in January 2013 and October 2015
- **Appendix E - The Risk Intervention Report**
 - 36 pages (Action research)
 - The activity was conducted between January-April 2013
- **Appendix F - The Selection Intervention Report**
 - 129 pages (Action research)
 - The activity was conducted between March 2013 and August 2014
- **Appendix G - The Governance Intervention Report**
 - 293 pages (Participatory Action Research)
 - The activity was conducted between February 2013 and January 2015
- **Appendix H - The Cost Intervention Report**
 - 184 pages (Participatory Action Research)
 - The activity was conducted between February-June 2015
- **Appendix I - The Innovation Intervention Report**
 - 39 pages (Participatory Action Research)
 - The activity was conducted between June 2014 and October 2015

Appendix J: Semi Structured Interview Guideline



SEMI STRUCTURED INTERVIEW GUIDELINE

A Strategic Change Model for the Delivery of Infrastructure in the UK

Name of organisation:

Name of interviewee:

Position held:

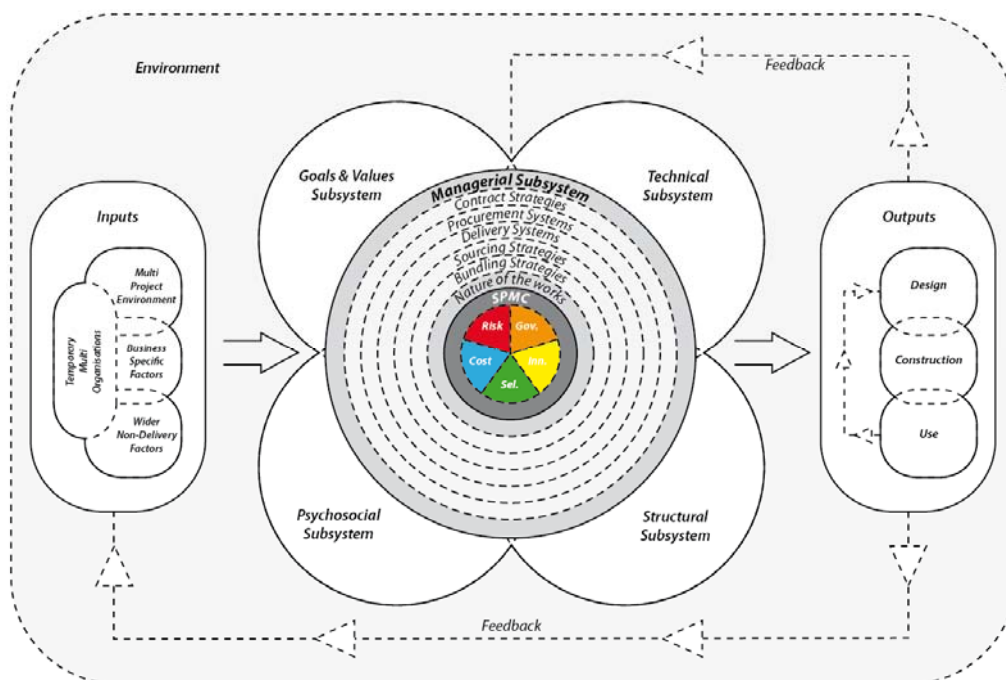
Date of interview:

Start time:

End time:

Intervention & Role:

The Strategic Change Model



The intervention to which this interview relates can best be described as:

General Information and validity of the Strategic Change Model (all)

2. Does the strategic change model make sense in terms of being a transformative process based on inputs and resulting in a change in outputs?
3. Can you understand the boundary of the Infrastructure Client Organisation (ICO) as being a formation of four primary subsystems?
4. Can you relate to how the management of portfolios, multi-projects, programmes and projects differs within an ICO when engaging with the marketplace?
5. Focusing on strategic procurement principles, can you relate to where the current delivery arrangements would be sat within the model?
6. Based on your experiences within the ICO, do you feel the organisation changes its delivery approaches to suit procurement arrangements, or uses them as a secondary item to supplement internal delivery processes, such that, do you think the recent arrangements for AMP6 are making the most of the supply chain and maximizing value for the business?

The nature of the Intervention (Co-Designer questions or Participant questions)

Co-Designer

7. Do you think that the participation of a third party researcher aided in the formation of the particular solution?
8. How did you see the researcher, as a co-worker for example or more like a consultant....discuss?
9. Do you think that aspects of the intervention would have been different if the researcher had not been involved....discuss?
10. Do you think that the researcher focused on the strategic aspects of the intervention, specifically the alignment of delivery and organisational processes....discuss?
11. Do you think the researcher brought a differing perspective to the solution, specifically in terms of being external to the situation, but without a specific agenda....discuss?

Participant

6. What were your opinions of the intervention....discuss?
7. Do you think that the work helped focus on the strategic alignment of the organisation to its delivery arrangements....discuss?
8. Do you think that having someone integrated within the organisation, but not an employee helped focus the output towards appropriateness for the situation rather than being manager or business led....discuss?
9. Do you feel that that the researcher had a pro-active impact on the intervention, specifically focusing on non-political issues and instead on the improvement of the organisation's delivery arrangement / practices....discuss?
10. Did you see the researcher as being in the best interest of the business....discuss?

The impact of the work on the business (all)

11. Do you think the intervention has had a positive impact on the delivery practices of the organisation....discuss?
12. Do you see the researcher as more of an employee now than you may have done earlier in the process....discuss?
13. Do you associate any positive or negative business changes with the researcher and the outputs of the intervention....discuss?
14. Do you think the business has been proactive in engaging with the outputs and subject matter of any part of the intervention, specifically with regard to improving issues / processes from before the intervention started....discuss?
15. Do you think the business is focusing on a holistic approach to its delivery environments more than it was before this project started, and specifically, do you associate any of those issues with this research project and the researcher's wider engagement process....discuss?

Appendix K: Research Participation Overview



RESEARCH PARTICIPATION OVERVIEW

You are hereby invited to take part in this research project; however, before you decide to participate or not, please read the following information to aid in your decision to participate. The information contains a brief overview of the project as well as a description of the purpose of this interview and the parameters of your selection.

THE RESEACRH

Title: A Strategic Change Model for the Delivery of Infrastructure in the UK
Student / Researcher: Michael Potts
Email: m.potts@edu.salford.ac.uk / mike.potts@uuplc.co.uk
School: School of the Built Environment (SOBE) at the University of Salford
Academic Supervisor: Professor Peter McDermott
Industrial Supervisor(s): Andrew Stephenson / Christopher Lane
Industry Partner: United Utilities Plc.
Course of Study: Doctoral Research (PhD)
Funding: Industrial Case (iCase) award from the Engineering and Physical Sciences Research Council (EPSRC)

PURPOSE OF THIS STUDY

This study is concerned with the creation of a new Infrastructure Delivery System via the use of participatory methodologies to facilitate organisational change management. Fundamentally structured around Strategic Procurement Management, Socio-Technical Systems and Participatory Methods, this study is concerned with bringing about real world change in the delivery of infrastructure within an Infrastructure Client Organisation.

WHY WERE YOU SELECTED TO PARTICIPATE?

These interviews are concerned with assessing the impact of the research process in bringing about real world change. Therefore, you have either been selected as a 'Co-Designer' of the research process and worked with the researcher in creating and delivering interventions, or you were one of the many 'Participants' who either took part in, or were affected by the interventions. Participants have been

selected to give a diverse overview of the various components of the research project. Your role and relevance to specific interventions is as follows:

Intervention: (e.g.) **3 – Governance – Incentives, KPIs Governance and Collaborative Working**

Role: (e.g.) **Participant**

DO I HAVE TO TAKE PART?

The decision to participate is entirely up to you. If you take part, a copy of this information sheet will be for you to keep and you will be asked to sign a consent form.

NOTE: Should you wish to take part now, but later decide to withdraw your participation you may do so, without need for explanation. Any data and/or corresponding information will be destroyed in accordance with your withdrawal. Should you not wish to take part from the outset for any reason this is entirely up to you, and an appropriate replacement will be sought were possible.

WHAT WILL HAPPEN IF I TAKE PART?

A semi-structured interview will follow based around reflecting on the effectiveness of the research process for this project, as well as any further information you may wish to share. The concern of this research is the improvement of the delivery of infrastructure by aligning organisations to the appropriate use of procurement vehicles.

WILL MY DETAILS AND INFORMATION BE KEPT CONFIDENTIAL?

All information from interviews will be kept in the strictest confidence. You will be identified by a research code, such as ICO406. Any information about your details will be removed from reports and publications. This research follows the UK Research Integrity Office (UKRIO) code of ethics.

WHAT ARE MY OPTIONS NOW?

- To participate or not;
- You may request a stoppage, continuance, delay, break or future resumption as you wish;
- You can refuse to answer any questions during the interview;
- You can ask for any information to not be published in the report or subsequent publications.

Thank you, and for any further details, please contact:

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Appendix L: Research Participation Consent Form



RESEARCH PARTICIPATION CONSENT FORM

Title: A Strategic Change Model for the Delivery of Infrastructure in the UK

Student / Researcher: Michael Potts

Academic Supervisor: Professor Peter McDermott

Industrial Supervisor(s): Andrew Stephenson / Christopher Lane

| | Please tick where appropriate | | |
|--|-------------------------------|----|-----|
| | YES | NO | N/A |
| I confirm that I have read and understood the information sheet (Research Participation Overview) for the aforementioned study and understand what my contribution will be. | | | |
| I confirm that I have been given the opportunity to ask questions with regard to the delivery process and any ancillary matters which may arise as a result of the process. | | | |
| I hereby do agree to participate in the interview phase of the study for the sole purpose of generating study data. | | | |
| I agree to the interview to be recorded by the interviewer. | | | |
| I agree to the use of anonymised quotes and codes to protect my identity and promote confidentiality in any publication relating to the data provided. | | | |
| I understand that my participation is strictly voluntary and as such I reserve the right to withdraw at any point of the research process without need for justification to any persons in any form. | | | |
| I hereby AGREE to participate in this research study. | | | |

Name of participant:

Signature:

Date:

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