A Framework for Providing a Lifelong Social Security System for The Operational Workforce in the Construction Industry in Sri Lanka

PhD Thesis

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Dedication

This PhD thesis is dedicated to

Capt M G Kularatne and **Mrs L L Piyawathee Kularatne**

for their invaluable and lifelong sacrifices for the setting up of benchmarks in Sri Lankan construction industry

Acknowledgement

It is a great pleasure for me to be able to offer my acknowledgements and gratitude to all the individuals who were involved in my PhD journey and who helped me in various ways to make this PhD a success. Many names will always remain in my mind and richly deserve my gratitude.

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List of abbreviations

AFSL	:	Armed Forces of Sri Lanka
ASB	:	Accounting Standards Board
ASC	:	Accounting Standards Committee
BFSL	:	Building Forces of Sri Lanka
CCI	:	Chamber of Construction Industry Sri Lanka
CID	:	Criminal Investigation Department of Sri Lanka
CPP	:	Canadian Pension Plan
EPS	:	Earnings Per Share
EU	:	European Union
FIDIC	:	International Federation of Consulting Engineers *(Fédération Internationale des Ingénieurs Conseils)*
FOC	:	Free of Cost
FRS	:	Financial Reporting Standards
FS	:	Funded System of Social Security
FTZ	:	Free Trade Zone
GBP	:	Great Britain Pounds
GCE A/L	:	General Certificate of Education (Advanced Level)
GDP	:	Gross Domestic Product
GOSL	:	Government of Sri Lanka
HEIs	:	Higher Education Institutions
HM	:	Her Majesty's
HMRC	:	Her Majesty's Revenue and Customs
HR	:	Human Resources
HSE-UK	:	Health and Safety Executive
ICE	:	Institution of Civil Engineers
ICTAD	:	Institute for Construction Training and Development
IT	:	Information Technology
JCT	:	Joint Contract Tribunal
JIT	:	Just in Time
JPS	:	Japan Pension Service *(Kokumin Nenkin)*
LTI	:	Lost Time Injuries
M&SC	:	Major and Specialist Constructors
MOENZ	:	Ministry of Education, New Zealand
NCASL	:	National Construction Association of Sri Lanka
NDC	:	Notional Defined Contribution

NGO	:	Nongovernmental Organisations
NVQF	:	National Vocational Qualification Framework
PAYG	:	Pay As You Go System of Social Security
PPE	:	Personal Protection Equipment
PR/SS	:	Pension, retirement benefits or Social Security
SBD	:	Standard Bidding Document (Sri Lanka)
SLQF	:	Sri Lanka Qualification Framework
SLRs	:	Sri Lankan Rupees
SME	:	Small and Medium Scale Enterprises
SSAP	:	Statements of Standard Accounting Practice
USA	:	United States of America
US-SSS	:	United States System of Social Security
WBI	:	World Bank Institution

Declaration

This thesis is submitted under the rules and regulations of the School of the Built Environment, in the University of Salford in partial fulfillment of the requirement for the award of a degree of Doctor of Philosophy (PhD) by research in Management, Economic Research and Information Technology.

While the research was in progress, some of the research findings were published in referenced journals and conference papers prior to this submission (please refer to Appendix G).

The researcher declares that no portion of the work referred to in this thesis has been submitted in support of an application for another degree of qualification at this, or any other, university or institution of learning.

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Abstract

Construction is a projectised industry. One of the important resource requirement for construction projects is availability of operational workforce for its physical production. Hence, operational workforce is a critical deciding factor for the success and failure of construction projects.

The construction sector in Sri Lanka is suffering from a shortage of required operational workforce for its physical operations even though the unemployment rate in Sri Lanka is about 5.2%. Researching further highlighted that “work” and “pay” are only the surface factors, hiding underneath them a multitude of different problems and psychological needs of the workers similar to an iceberg. In addition to the shortage, lack of an organised structure for human resources commenced delivering time, cost and quality related behavioural constraints to the construction industry of Sri Lanka since circa 1980’s.

The aim of the research is to develop a sustainable framework of lifelong social security system for the operational workforce of the construction industry in Sri Lanka without increasing the prevailing construction costs. The hypothesis is minimising the resource wastages and behavioural impacts of the current practice by introducing a secured future life through a new system of lifelong social security [PR/SS] to the operational workforce. Required finances for providing a social security system be anticipated to salvage from the recovery values of material and time wastages and demand and supply impacts generated as repercussions of behavioural practices of the current operational workforce.

Research instruments used for gathering primary and secondary data for evaluating the financial impacts of behavioural constraints were questionnaire survey and audited financial statements. About 400 questionnaires that premeditated to calculate the finical impacts of the social behaviors of the construction operatives via ‘degree of importance’ and ‘relative important index’ were distributed to higher management of contracting organisations in Sri Lanka. A further request were made to the contracting organisations to provide audited statements for past five years as well.

From the research, it was identified that unavailability of a human resources structure is a major constrain for construction industry in Sri Lanka. Salvaged finances that could derive from the removal of the transitional layers of risk multiplication and removal of behavioral constrains of the construction operatives, are sufficient to finance a lifelong social security system for themselves. Based on the research findings, a framework for the Building Forces of Sri Lanka [BFSL] was developed to overcome from the interim thinking pattern of the current construction operatives. In the current system, contracting organisations are not capable of providing required training to the operatives. With the implementation of BFSL with the strong intervene from statutory organisations; a trained team of operational workforce can be developed to face any situation of the construction arena in Sri Lanka.

Chapter : 1 Introduction

1.1 Research background

Construction is a project initiative industry. Temporary and systematic management framework from inception to completion in order to procure an unique product, service or a result, which has defined start and end dates, is called Project Management (PMBOK, 2008). Construction is listed under the heading of 'Supply of Goods and Services' by financial professionals (Governer, 2010, p. 53). However, construction is generally considered as an industry because it creates a product that exists physically. Putting up a shelter to provide living accommodation or any other built environmental or developed environmental structures that facilitate a better quality of living for humans falls under the banner of the construction industry. In current society, the quality of living is considered a highly important requirement. The construction industry plays an important role in obtaining a good quality of living (Klakegg, et al., 2013).

The construction industry can be summed up as the provider of the built environment including the maintenance of properties. Each aspect of construction is unique and specialised. A project may be presented to a client as a complete single project after performing a range of coordinated activities by the construction team of the project. Furthermore, every project of the construction industry is unique and of high value. Because of this range of activities, standardisation of the industry has failed despite several attempts over the past few decades (Murdoch & Hughes, 2008). Each project can be likened to a temporary 'factory' with variances in design, materials, geography, operational conditions and infrastructure facilities. For this reason, each project has to be operated by a tailor made team of people who are specialised in the areas of the specific requirements within the project.

Construction is generally considered to be as a complex industry and, inevitably, there are no boundaries for its operational activities. Complexity is a major inherent and a salient feature within construction as argued by John Murdoch and Will Hughes (Murdoch & Hughes, 2008, pp. 1 - 10) because of the following factors:

- The relationships between the parties involved are not always clear.
- The boundaries of the construction industry are uncertain.

Murdoch and Hughes argued in 2008 that the parameters within the construction industry could expand from the renovation of a dwelling house to the construction of an Olympic village or an Expo City. Such constructions will contain a series of multiple projects incorporated into the master plan that may be beyond the imagination of an individual in addition to the typical complexes of hotels, fully climate controlled sport stadiums and leisure and residential complexes with artificial lakes and islands. The demolition of any previously put up structures is also considered as an element of the construction industry.

1.2 Operational workforce

Construction can be considered as a human driven industry. There are 300,000 firms working in construction industry as Small and Medium Scale Enterprises (SMEs) in the UK according to a study carried out in 2010 by the Equality and Human Rights' Commission of Manchester. The Sri Lankan construction sector employs 8.2% of the total workforce or 682,000 people including the sectors of mining, quarrying, electricity, gas and water supplies according to the reports produced by the Central Bank of Sri Lanka (CBSL, 2014). There are over 2,000 registered contractors (ICTAD, 2013) in Sri Lanka at present.

General labourers, skilled workers, physical production workers, blue collar workers, artisans, craftspersons, tradesmen, operational level workers and the like to classify the operational workforce in the construction industry. These operational workers represent members of the working class who, generally, perform manual labour and earn an hourly wage or output based remuneration.

According to the findings of the Equality and Human Rights Commission (through their research), 8% of the total workforce in the UK or three million people belong to the construction sector (EHRC, 2010).

Construction is, generally, a male dominated industry. In the USA, females' contribution to the construction sector is 4.3% (Swinney, 2005). Sri Lanka has about the same figure of females in construction, at 3% (Pathirage, 2008). Males within families in Sri Lanka generally bear familial responsibilities that include sourcing the requirements of their dependents (Gorman, 1999). The majority of the operational workforce in the construction industry in Sri Lanka are local migrants who have

moved from villages to the urban areas (Rasseedin, 2011a). They often work within remote locations and usually meet their dependents once a month.

The fundamental concern of this research is to bring to light what would happen to the construction industry if the industry keeps on neglecting the operational workforce who bring the desires of the employers blended together with the innovativeness of architects, strengthened by engineers, enumerated by quantity surveyors, documented by contract administrators into reality according to the sequence molded by planning engineers through builders and contractors (Wijewickreme, 2010).

1.3 Justification of the research

The construction industry is quite diverse when considering an evaluation of the different determinants of the firms worldwide, and each is unique in terms of their economics. The industry is comparable to a ladder with rungs ranging from the ground all the way up to the ceiling. At the lowest rung, it is possible to see local industries with a concentrated number of firms, each employing a few operatives. They are small in nature and deal with construction on a domestic scale and with routine maintenance work. Progressing up the rungs there are the larger organisations with branches that functioning nationally and, at the top, international organisations.

The complications discussed above have to be taken into account when a contractor is attempting find out the basic cost of a construction project in order to forward an offer to a prospective employer or to a client. The exclusivity of each project and the temporary nature of the industry are important points that need to be considered when pricing a construction project.

In the construction industry, value generating activities are organised in a continuously changing environment with preset goals, budgets and periods. (Gustavsson, 2013) The majority of construction projects (whether buildings or infrastructures) are pursued in collaboration with many different organisations irrespective of their nature. Owing to the vast parameters of construction, even a small scale house renovation may require the involvement of several vocations and professionals. Inter-organisational collaboration has become necessary for

construction (Gray, 1985). In most situations, the construction industry needs the cooperation of more than one institution to resolve the construction constraints. Some samples that are common to the industry are administration, architecture, chemical processing, communications, cost and project management, electrics, environmental factors, human resources management, information technology, legislation, machinery, manufacturing, automotive, mechanics, mining, minerals, joinery, safety and suppliers.

Researches related to construction labour productivity are of at great interests to the academics and professional practitioners. There are around 30 various trades (Appendix A) directly related to the construction activities excluding the trades of other major supportive trades such as communication, mechatronics, electromechanical, building management and air conditioning (Kadir, et al., 2005).

Humans have three basic needs, namely food, shelter and clothing (Sekar, 2011, p. 9) . The second of these is provided by the construction industry. A shelter provides long lasting and secure lodging where physical and mental relaxation can take place.

A recent study document in United States of America stated:

> *"Many construction workers face periods of layoff due to the seasonal nature of the industry, economic fluctuations in the building trades, and the fact that construction jobs tend to be of limited duration. Because this occupation is socially marked as masculine, male and female workers' emotional response to unemployment is likewise expressed in highly gendered terms, which can negatively impact family life. Based on research with unionized building trade workers in California, this paper will explore the ways in which gendered norms and behaviors impact worker stress, and by extension couple conflict, during periods of unemployment. In particular, we will describe the ways in which these conflicts become precipitated by, and expressed through, a habitus of masculinity that affects both male and female construction workers".*
>
> (Duke, et al., 2013, p. 293)

Behavioural complications have become the norm within the construction industry in Sri Lanka according to some recent studies (de Silva, et al., 2010; Wijewickreme, 2010 and Chandradasa & Ekanayake, 2011) and can create stakeholder dissatisfaction. The following statement (Webb, 2007) highlights the attitude of the construction industry towards the operational level workforce. The key problem is, if everybody does the same, who is going to fill the places on the first few rungs?

> *"Our society says no one should start from the bottom of the ladder. Get an education and start a few rungs above. This is fine for people with the resources to acquire the skill that put them in the lead, but there will always be people needed at the bottom, they will always be willing to fill those slots and there will always be people without the resources to start at a higher level. Society seems to think, anyone who starts at the bottom will stay there. There is no reason to stay at the starting position. With aggressive attitudes, individuals can move up, but they need to know how."*
>
> (Webb, 2007, p. 9)

General labourers, physical production workers, blue collar workers, artisans, craftspersons, operational level workers etc. are used as the operational workforce in today's construction industry. Many researchers have identified the factor of scarcity of labour (Operational Workforce) as one of the key factors in project delays (Pathirage, 2008; Samarakoon, 2009; Wijewickreme, 2010 and Chandradasa & Ekanayake, 2011). Delay is one corner of the iron triangle (see Figure 1.1) (Atkinson, 1999) i.e., time. Another corner is 'quality' that is impacted upon by workmanship. As depicted in Figure 1.1, it is apparent that the third corner 'cost' depends on the inputs of the operational workforce (generally members of the working class who perform manual operations and earn hourly wages or an output based income).

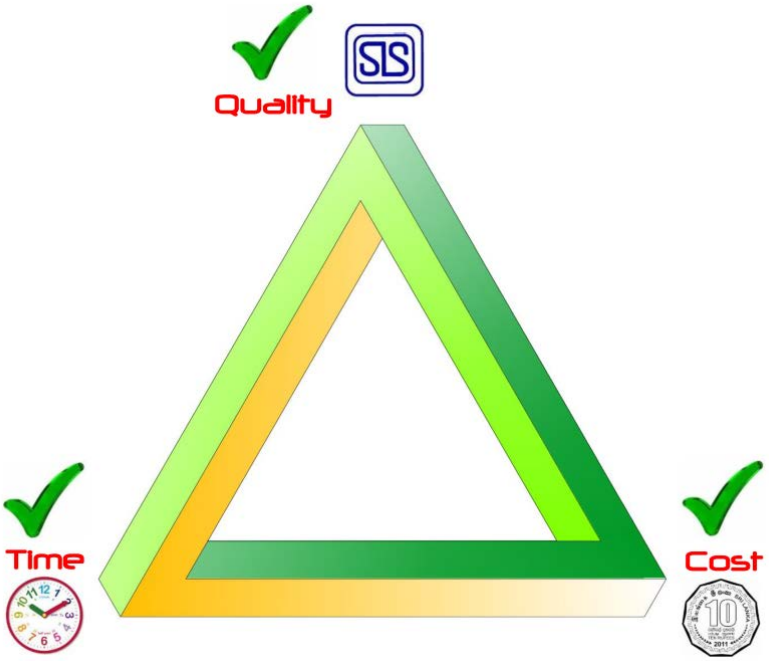

Figure 1.1 : The Three Dimensional Iron Triangle
(Source: Wijewickreme, et al., 2014)

The Rethinking Construction Report produced by Sir John Egan (Egan, 1998) (at the request of the Prime Minister of the United Kingdom) identified seven areas where attention should be given by the construction industry during the 21st century. The following recommendations were made in the Report by Sir John Egan:

A. Capital costs to be reduced by 10%
B. Construction time to be reduced by 10%
C. Predictability to be increased by 20%
D. Defects to be reduced by 20%
E. Accidents to be reduced by 20%
F. Productivity to be increased by 10%
G. Turnover and profits to be increased by 10%

Some of the significant areas (B, D, E and F) identified in Sir John's report can be directly related to the behaviour of the operational workforce. Therefore, the researcher's aim and objectives for this research will be developed in order to underpin these criteria. If cost overruns could be minimised and a share of the salvaged finances could be reinvested in order to provide improvements for the

people working in the sector, then a win-win situation for the parties involved could be developed (in line with number 8 of the Millennium Development Goals which were established by the United Nations in the Millennium 2000 (Sachs & McArthur, 2005)).

Physiological Contract is a study by Chandradasa & Ekanayake (2011) looking at the behaviour of the operational workforce described an “Iceberg” model to demonstrate that most human problems cannot be seen from a surface view (Businessballs, 2013). In many cases, that is possible to see as “Work” means “Pay” only. It is possible to view ‘work’ as meaning ‘pay’ only. The hidden part of the iceberg contains many other problems (as shown in Figure 1.2) which may be larger, heavier and dangerous for the industry.

Figure 1.2 : The Iceberg Model of physiological contracts

(Source: Businessballs, 2013)

Achieving the desired time, cost and quality requirements of the clients is always a challenge (Atkinson, 1999). A major difficulty is managing the behavioural problems of the operational workforce. This study is focused on developing a responsible operational workforce by eliminating their disturbing behaviour through introducing a social security system in the construction industry of Sri Lanka.

1.4 Research problem

Customer dissatisfaction can be identified as being when a customer becomes disappointed when his/her original expectations regarding a particular product or service are not met (Raadt, 2010). Construction customers extensively expect several complicated returns due to the complex nature of the industry (Murdoch & Hughes, 2008). Stakeholders can either be individuals or grouped representatives of organisations, that are involved in the desired project (Raadt, 2010). Quality, time and cost are generally considered as the 'iron triangle' (depicted in Figure 1.1 in this thesis) of the construction industry, although not exclusively so (Atkinson, 1999). Time overrun, cost overrun, disputes, arbitration and litigation are the major areas where customer dissatisfaction could occur (Aibinu & Jagboro, 2002). The ultimate result of not having a reliable operative workforce would be the collapse of relations and disappointment generally, between the contractors and stakeholders.

Amongst all the other factors, currently, human resources is becoming the determining factor for the success or failure of projects (Gunawardena & Jayawardane, 2001; Jayawardane & Pandita, 2003; Pathirage, 2008, Samarakoon, 2009 and Praveen, et al., 2013). The industrial and construction sectors are suffering from a shortage of required human resources even though the gross unemployment in Sri Lanka is 5.2%. As a male dominant industry (Swinney, 2005), capably educated (below GCE A/L) male population of 4.7% of Sri Lankans are among the unemployed categories that are reluctant to join the construction industry (DCSL, 2012, p. 20; Table 5.4). The same contribution is 3% in Sri Lankan context (Pathirage, 2008). Because of this, contractors are facing difficulties in satisfying their stakeholders. From previous studies (Gaminiratne, 2004; Pathirage, 2008; Samarakoon, 2009; Wijewickreme, 2010 and Chandradasa & Ekanayake, 2011), it can be identified that the behavioural impacts of the operational workforce have come to a level where upon the industry needs to focus some attention. It is an essential need to the construction industry in Sri Lanka, in order to resolve the identified issues relating to the behaviours of the operational workforce discussed in Chapter 4.3 of this thesis.

Construction workers generally work in remote locations and may see their dependents only once a month within Sri Lankan context. Since the primary concern

of the male operatives is their dependents, retirement benefits and social security are fundamental necessities because, even in case of a temporary disability, the whole family might be led towards financial difficulties, as they do not have access to pension, retirement benefits or social security (PR/SS) systems, as compared to developed countries.

According to recent statistics (CBSL, 2014), it appears that the construction industry is not a popular industry of choice for the youth of Sri Lanka. The suitably educated but unemployed male population (up to GCE A/L) in Sri Lanka is about 5.7%, but it appears they are reluctant to join the construction industry (DCSL, 2012, p. 20; Table 5.4).

It appears that youngsters prefer to join the armed forces rather than enter into the construction industry after school education (even if this means they have to risk their lives in frontline operations) and thus make provision for their dependents even if they die. If they are fortunate enough to survive, then they will become eligible for a lifelong pension scheme after completing 22 years of military service. If they do not survive, their dependents will receive the benefit of a government pension scheme. Hence, military operatives are free from worrying about their dependents as soon as he or she has joined.

A study carried out by Wijewickreme (Wijewickreme, 2010) identified a number of behavioural problems with respect to the operational workforce in Sri Lanka, as illustrated in Table 1.1.1 below.

Table 1.1 : Ranking of the Behavioural Problems of the Operational Workforce

(Source: (Wijewickreme, 2010)

Rank	Description	%	RII
1	High labour turnover	11.43%	0.63
2	Poor quality of workmanship	11.34%	0.62
3	Temporary or irregular attendance	11.29%	0.62
4	Lack of trade knowledge and skills	11.24%	0.62
5	Lack of cost concerns	10.34%	0.57
6	Irresponsibility & lack of reliability	10.29%	0.56
7	Unfair demands for wages or rates	9.96%	0.55
8	Adamant behaviour & lack of loyalty	9.58%	0.52
9	Reluctant to learn & training	9.20%	0.50
10	Carelessness & safety concerns	9.06%	0.50
11	Sudden unethical demands	7.59%	0.42

From the results, it is apparent that almost all the identified negative effects will have considerable impact on the construction industry with regard to dealing with the requirements of managing the iron triangle (Atkinson, 1999). Because of the recent growth in the construction industry, demand for labour has risen while the supply seems to be insufficient.

Due to the insufficiency of labour, prices for labour have increased over time, which ultimately increases the cost of overall construction. Labour costs capture almost 12% of the total construction cost when it comes to infrastructure projects and the same becomes almost double (or 20% to 25%) when it comes to building projects (depending on the quality and complexity of the finishes) according to the calculations based on the Building Schedule of Rates (BSR) issued by ICTAD.

It is said that tacit knowledge is central to the construction industry, developed through generations within Sri Lanka (Pathirage, 2007, p. 21) and there is a risk of its strengths being diluted. De Silva et al. (2010), have argued that behavioural complications have become the norm within the construction industry in Sri Lanka according to the recent studies. The situation is not necessarily limited to the construction industry; there are also many other industries that indicate similar negative effects (Rasseedin, 2011a).

In Sri Lanka, a former journalist of the *'Agence France Presse'* (AFP) was murdered in February 2014 by a "Paint bass" who did undertook pre Christmas renovations to her residence (The Island, 2014). This murder is an only a single example of many similar situations of burglary related murders by casual operational workers (of a floating nature) who do not have any secured source of regular income.

It is, therefore, considered to be important, to focus on providing a framework for a lifelong social security system for the operational workforce for the betterment of the construction sector in Sri Lanka. Thus, this research is aimed at developing a framework that can provide a lifelong social security system for the operational workforce of construction industry in Sri Lanka. This task will be placed on a platform that will not increase the prevailing construction costs. Funds will be earned by utilising and simulating the cascade effect or multiplied risk allowances inherently allowed in different procurement strategies. The framework anticipates addressing

current industry issues from motivating school leavers to join the construction industry and, thereafter, looking at training and career development for them through fulfilling the five hierarchies of human needs i.e., physiological needs; safety needs; social needs; esteem needs and self actualisation, introduced by Abraham T Maslow in 1943. Through a sustainable framework of social security, it is planned to offer a time, cost and quality orientated operational workforce to the construction industry in order to provide greater stakeholder satisfaction. This is with a view to developing a dependable operational workforce to fix the loose corners (of the iron triangle) within the construction in Sri Lanka; without such a fix there is stakeholder dissatisfaction relating to time, cost and quality of construction sector.

1.5 Aim and objectives

Based on the observations of the research problems, the following aim and objectives were set forth for this research study.

1.5.1 Research aim

The aim of this research is to develop a framework that can provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka.

1.5.2 Research objectives

The research aim will be achieved through the following objectives:

a. Identify the behavioural factors of the operational workforce in the Sri Lankan construction industry that affect the time, cost and quality of the construction outputs.
b. Explore the current social security systems that are applicable to the operational workforce of the construction industry.
c. Determine the causes for the unavailability of a proper, sustainable and lifelong social security system for the operational workforce in the construction industry.
d. Identify the risk multiplications' areas to use as a fund raising mechanism by critically evaluating the current construction management process.

e. Develop a framework for a sustainable lifelong social security system for the operational workforce in the construction industry in order to deliver a greater stakeholder satisfaction.

1.6 Scope and limitations

The construction industry can be differentiated from other industries due to its own characteristics, such as but not limited to: product immovability; a high volume of non mechanisable production; heavy investment values; lengthier financial void periods; high financial gearing; long term contractual obligations; temporary nature of projects; operations in open environmental conditions, remoteness, moving workstations for employees; a lack of long term repeat stakeholders etc. (McCrary, et al., 2006). Resources and managing techniques should be able to deal with the aforementioned differences. Due to a high volume of non mechanisable production, human resources management plays a major role in the industry, and this can be complicated due to open environmental, remote, or moving workstations.

The scope of this research is limited to the manual operatives deployed for the non mechanisable work activities that are commonly addressed as the wet trades within the construction industry. Such wet trades generally include waterproofing, formworks, reinforcements, concreting, brick works, rendering, tiling decorations etc. The input requirements of the manual operatives are comparatively less when compared with the assembling activities such as facade erections, joinery, structural steel works and so on.

The research area and framework to be developed will be limited to employees within the construction industry in Sri Lanka and to the stakeholders therein as well, since socio economic situations vary greatly between different cultures, political scenarios, economic backgrounds, and industry practices.

1.7 Brief overview of the research methodology

In this research, both quantitative and qualitative research data are collected. Inevitably, the mixed method or the balanced approach (Amaratunga, et al., 2002) became the most appropriate research methodology for the data analysis within this research. It is said that combined approaches such as utilising both qualitative

and quantitative research methods are generally stronger than individual approaches provided that the research design is extensively structured to integrating both fieldwork and surveying research data (Gable, 1994). The proposed framework of this research may require validation before implementation. This research utilised several research layers, as depicted in Figure 1.3.

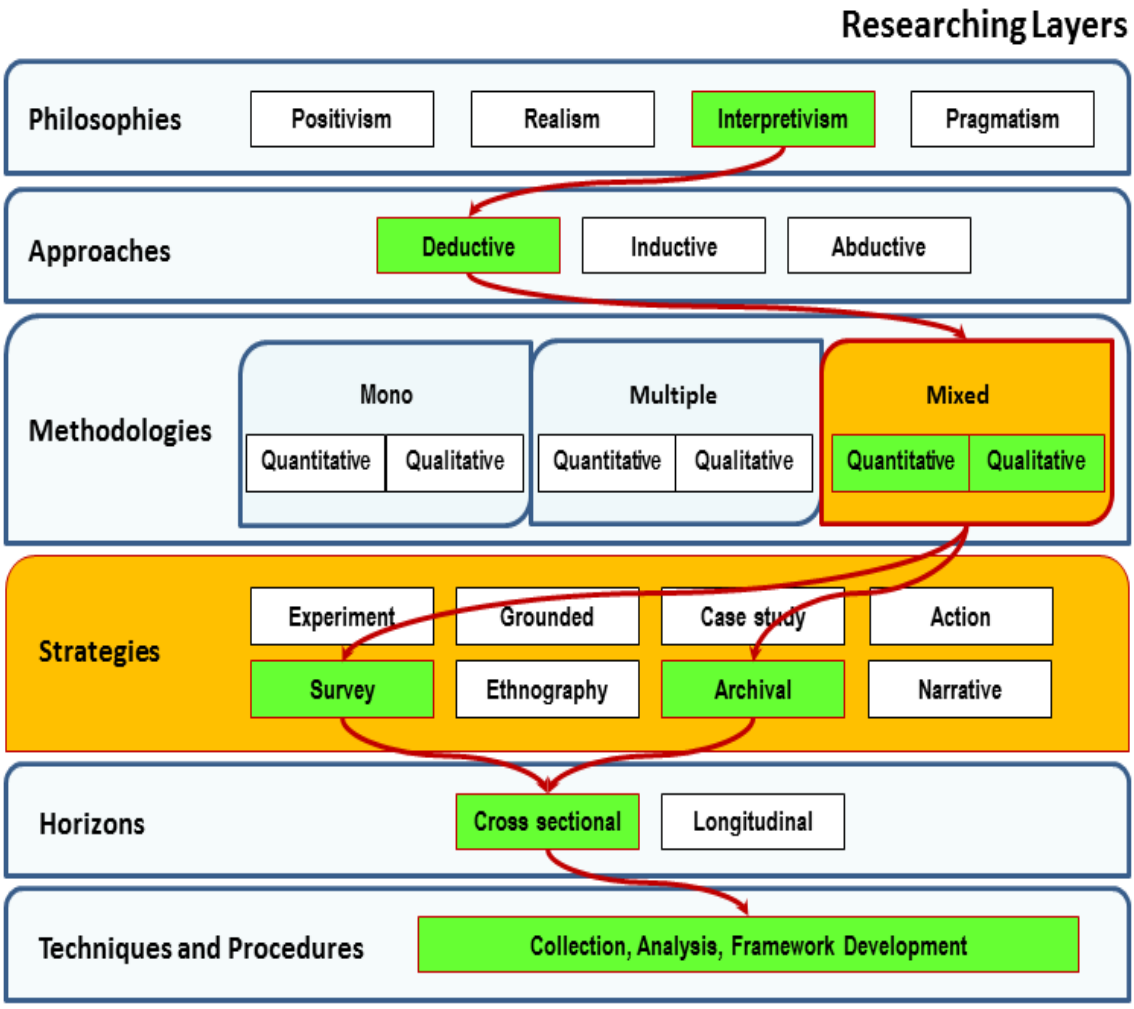

Figure 1.3 : Researching Layers

Accordingly, the structures of the research questionnaire and the data collection methods were adjusted with a view to developing a multi paradigm approach that was compatible with qualitative and qualitative data collection strategies.

1.8 Structure of the thesis

This thesis comprises six chapters. These chapters and the work undertaken are presented in the Research Flowchart depicted in Figure 1.4 and in subsequent discussions.

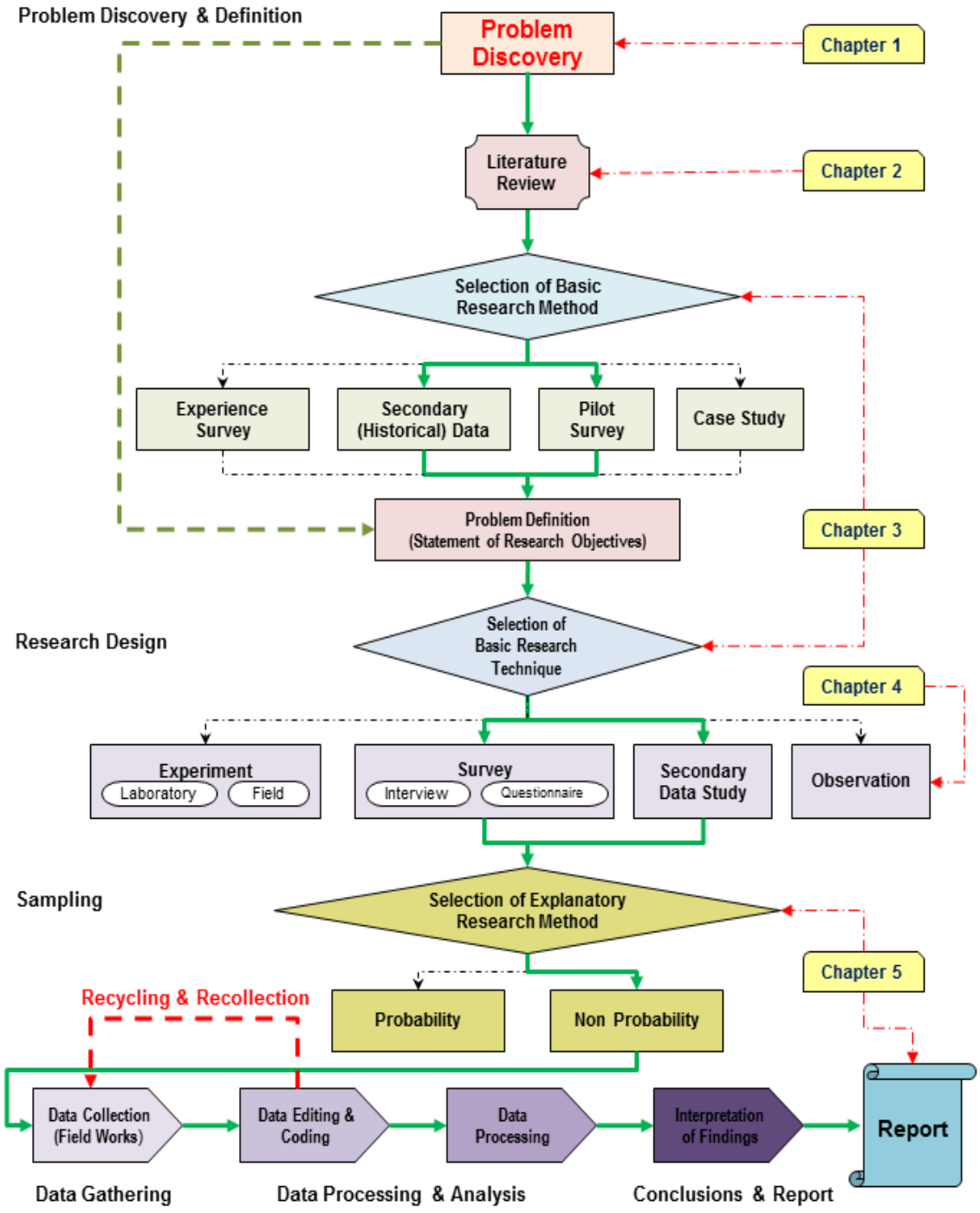

Figure 1.4 : Research Flowchart

1.8.1 Chapter 1 - Introduction

The introduction presents the background to, and the justifications for, the research. The chapter also presents the research problems and a rationale of the study. The chapter then presents the aims and objectives of the research and sets up the parameters and the scope limitations of the research as well.

1.8.2 Chapter 2 - Literature syntheses

Chapter 2 presents the literature syntheses and primarily aims to review, discuss and summarise the different natures of the previous studies relating to this research. Scrutinising these studies and linking them in order to avoid repetitive studies and exercises was an integrated part of this exercise.

1.8.3 Chapter 3 - Research methodology and data collection

The discussion on research methodology outlines how the research was carried out while maintaining ethical parameters, logical arguments, constraints' management etc. Discussing the suitability and adoptability of the recognised research options was an integral part of this exercise. Under the sub heading of Data Collection, the chapter explains how the data collection was carried out in an ethically acceptable manner. The procedures that were adopted for the questionnaire survey and the techniques used to obtain the required secondary are explained.

1.8.4 Chapter 4 - Data analysis and findings

The data analysis chapter of this thesis contains the outcomes of all the calculations that were carried out for this research. Maintaining the simplicity of the calculations was a primary consideration throughout this exercise since this research is considered as social research. It was anticipated that this research should reach out to a wider public, not just to mathematicians; hence the need for maintaining simplicity. All the findings are tabulated and presented either as tables or as graphs (where applicable).

1.8.5 Chapter 5 - Proposed framework for PR/SS in Sri Lanka

The proposed framework presents how the research aim and objectives were achieved. As expressed in section 1.5.1, the aim of this thesis is to develop a framework that can provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka. Furthermore, this chapter outlines how the other research objectives can be achieved as well.

1.8.6 Chapter 6 - Conclusions

The conclusions' chapter expresses more generally about how the research topic relates to the context of this research thesis by means of evaluating and elaborating the importance of the research topic. Furthermore, it presents suggestions for future research activities and recommendations on theories or practices.

Chapter : 2 Literature syntheses

2.1 Introduction

In this chapter on literature syntheses, it is intended to discuss and summarise the different natures of the previous studies related to this research. Accordingly, the literature synthesising for this research commences firstly by describing the outline of the construction industry in Sri Lanka. Thereafter, the discussion moves forward and introduces the employer's roles and responsibilities within construction activities prior to their commencement, during construction and after the construction stages. Construction procurement together with related economic and micro economic considerations are discussed thereafter. Subsequently, there is a discussion on the key consideration of this research, which is the operational workforce in the construction industry in Sri Lanka. An introduction to current behavioural problems and their relationship to the operational workforce in Sri Lanka is presented via a detailed discussion of two viewpoints, namely from the employer's angle and from the employee's angle. The discussions are narrowed to the lack of a proper social security system in Sri Lanka and the consequences thereof. Subsequently, there is a focus on the global scenarios concerning social security and the inherent challenges therein. Finally, the chapter is concluded after a discussion of several recognised theories.

Scrutinising previous studies and linking them in order to avoid repetitive studies and exercises was an integrated part of the literature synthesising exercise. Synthesising can generally be defined as combining several, and non unique, ideas and viewpoints into a single and mixed nature article. Furthermore, a synthesis is a document that briefly presents several sources in a structured manner for gathering the literature together on a single topic and making useful recommendations, which can connect practice to an academic thesis. Synthesising the previous studies carried out by other researchers in the same, or similar subject, parameters was of prime importance at the commencement of this review. This examination of previous works by other researchers eventually provided the necessary guidance for this research in terms of avoiding mistakes, in avoiding repetitive exercising and in clearing the path towards the research goal. Maintaining the referencing

legitimacy and the reliability of the sources was a major concern. There were many sources wherein the required literature for this research study could be found.

> *'The literature review is one of the earliest stages in the research process and it amounts to a significant proportion of thesis content.'*
>
> (Naoum, 2013, p. 34)

Whatever the source, expanding knowledge relating to the research area is an essential requirement (Lalithadheera, 2012) prior to commencement of any research. According to the discussions of Shamil G Naoum in 2013, defining a flow chart for any research helps to undertake the following:

- Selecting the research purpose and selecting the research area.
- Avoiding duplication of research previously carried out.
- Finding the gaps within previous researches.
- Developing the researcher's mind and gaining an insight into dissimilar viewpoints.
- Establishing the research fundamentals.

Most importantly, literature synthesising acts as a compass that allows the researcher to find a path towards achieving the aim and objectives. This researcher's literature review parameters were to review previous studies relating to social security, the construction sector, social security theories' models and frameworks that are being used in different geographical areas including in Sri Lanka.

The four objectives expressed in Section 1.5.2 of this thesis require identifying, primarily "… the behavioural factors of the operational workforce in the construction industry that affects the time, cost and quality of construction outputs". Subsequently, exploring the social security systems that are currently applicable to the operational workforce in the construction industry is another basic requirement of this research. Further objectives that have to be taken into account during the literature review is the objective for carrying out investigations in order to discover the causes for the unavailability of proper, sustainable and lifelong social security systems for the operational workforce in the construction industry. The objective of critically evaluating the current construction management process to identify the

risk multiplications areas that can be used as a fund raising mechanism too shall amelgameted in to that as well.

One of the major hurdles found in the literature synthesising was to find the key responsible areas within the construction industry". The following factors were recognised as requiring further discussion:

- The construction sector in Sri Lanka
- The employer who instigates the building project.
- Recognised methods of procuring construction works
- The economic features of the construction market
- The micro economics' considerations applicable to the construction market
- The operational workforce or job performers in the construction industry
- The behavioural problems of the operational workforce
- A detailed review of the operational workforce
- The question as to what is social security and its related consequences
- Social security consequences in Sri Lanka
- Social security models and frameworks in developed countries
- European, American and Latin American frameworks

A detailed review of the literature is presented below.

2.2 The construction sector in Sri Lanka

The introduction chapter to this thesis provided an overview of the research topic that sets the stage for presenting the construction industry as a highly defined specialist industry. This section presents the background to the Sri Lankan national construction scenario and the characteristics of the people in the construction sector, economic criteria and macroeconomic features.

The war that has been rapidly destroying Sri Lanka for 30 years has now ended and the country is now opening its arms towards rapid economic growth. The construction sector (as a sub segment of the industrial sector) is reaping much benefit from this rapid economic expansion and a major percentage of the total investments in the country is being utilised in the construction industry at present. Although the construction industry is listed under the heading of 'the supply of goods

and services' by financial professionals (CBSL, 2011, pp. Chapter 2, 57), it can primarily be considered as an industry due to the physical existence of a product at the end of a project.

Gross Domestic Product (GDP) relating to the construction sector was some SLRs 250 billion (1.25 billion pounds sterling) circa 2012. This highlights a growth of 21.6% within the construction industry when compared with GDP development amounting to 6.4% and 10.3% increase in the construction arena. This growth commenced in 2009 soon after the defeat of the Tamil Tiger terrorists in Sri Lanka. It picked up initially with infrastructure developments. State sector organisations (such as the Chamber of Construction Industry in Sri Lanka (CCI) and the Institute of Construction Training & Development (ICTAD)) along with the support and cooperation of other accredited agencies within the local construction sector such as State owned construction entities and private sector construction organisations registered with ICTAD played a major role in this achievement. Additionally, several multinational contracting organisations and developers provided support and initiatives by bringing in investment projects via the Bureau of Investment in Sri Lanka (BOI) and providing technological advancements' schemes. A noticeable number of casual contractors also participated in construction activities on a small scale in the country (specifically in the sector of individual dwelling units, renovations and maintenance).

According to ICTAD, the subdivisions that make up the total construction industry in Sri Lanka are as follows:

- Buildings
- Highways
- Bridges
- Water supply and drainage
- Land drainage, irrigation and infrastructure
- Low land reclamation and dredging
- Storm water drainage
- Groynes, revetments and reclamation buildings

All the categories in this list can broadly be classified as infrastructure except for building construction that mostly includes private accommodation and commercial buildings and accounts for 50% of the total investments of the industry. Buildings, water supply and drainage are mostly undertaken by private sector firms whereas telecommunication, power and energy are ventures that are undertaken by the governing body. It has been stated that 77% of the 2010 construction projects were above SLRs 50 million in investment value (Wasantha & Jayasinghe, 2013).

The building sector faced a colossal drop in activities circa 2009 due to the economic recession and the high lending rates faced by private sector entities. This considerably oppressed the growth of the sector. Over the past few years, it is apparent that the sales of apartments have slowed down significantly and new projects have hardly been developed due to global concerns over the property market. A few of the already commenced projects progressed sluggishly while most of the others were simply abandoned due to a variety of compelling reasons mostly linked to the economic downturn. The housing approval index that lists new build, alterations and reconstruction projects of the Western Province has been moving upwards in number since 2009. In the meantime, the SL Government has initiated many housing projects, especially in rural areas, through the National Housing Development Authority (www.ictad.lk, 2015). In 2014, the Urban Development Authority of Sri Lanka initiated, via the “Urban Regeneration Project”, converting the urban sprawl shanties to vertical housing structures in order to maximise land usage in Colombo and in the suburban areas; this being a means of relocating underserved settlements in the city of Colombo.

Sri Lanka has one of the highest road densities amongst Asian countries; as at 2009, it consisted of 1.6km/km^2 (RDA, 2014). Density figures indicating road kilometers per population exceed the similar indicators for both Pakistan and densely populated Bangladesh as well. Despite the widespread and dense road networks, mobility is a major limitation in Sri Lanka’s existing cargo and passenger carriage. To overcome this issue Government policy (as depicted by the National Road Master Plan (NRMP) on road development) is currently working on improving road and transport management. These activities involve the private sectors of the country in building a national highway system and an effective road network.

Examples of major road development projects presented by Damith Wasantha and Samudrika Jayasinghe in 2014 include the Southern Expressway with an investment value of SLRs. 60 Billion, the Colombo to Katunayake airport expressway and the Colombo Outer Circular Highway Project with an investment value of SLRs. 82.6 Billion.

Although there are efforts to improve the road and rail transport networks in Sri Lanka, a major obstacle was met in the mining and aggregate production areas. River sand used in the industry drastically increased in price when government restrictions were tightened to reduce the illicit mining of the riverbeds in an effort to minimise environmental damage. Obtaining licenses for the transportation of sand and oil have been introduced which further increases the price of the resources. Another drawback that hinders development is the insufficient local production of cement and over half of total cement requirements for the industry has to be imported.

2.3 Employers in the construction industry

According to the arguments of Murdoch & Hughes in 2008, construction is an industry led by the employer or the client. For this reason, the majority of the problems that occur on a project automatically become the critical challenges faced by the construction contractor. This is one of the major unique factors of the industry.

Most construction projects arise as a direct result of prospective employers approaching the industry, rather than the industry marketing its products. This does not mean that individual firms do not market themselves. They obviously do. However, their marketing is generally intended to differentiate their services from others in the field and to persuade employers who have already decided they need the services of the industry to select that particular company, rather marketing used to persuade the public to buy the products that the industry produces. The major exception to this concept, and the closest that the construction industry gets to mass production and a large consumer market, is in speculative housing. However, even then, total sales to individual customers will be small, with little opportunity for repeat business.

The construction industry has many different types of employers:

- Experienced employers who have detailed and in depth knowledge of the construction industry (e.g., Government and other public sector organisations, Property developers, hoteliers and the like).

- Inexperienced employers or private individuals who may build occasionally or once in their lives (e.g., individual builders of houses and factories).

Employers decides to undertake broad construction programmes for different reasons:

- Property or development companies that are looking for investment opportunities to make a profit from the sales or letting of completed buildings.

- Industrial and commercial employers that are looking to construct facilities in order to carry out their business/businesses.

- Private individuals who are looking to provide themselves with somewhere to live.

- Public sector employers who are looking to procure public works.

These various types of employers have different motives for undertaking construction projects and they all have their individual priorities and expectations from the construction industry.

- It is unexceptional that every employer considers that his construction project is extremely important. Therefore it has been said that:

  > ‘Every building ever built arose from a carefully premeditated decision *which was usually of the utmost importance to the person who made it.’*
  >
  > Powell (1982, p. 1)

- Many employers in construction work undertake large investments in terms of both time and money. All employers rely, to a greater or lesser extent, on the construction team (the contractors and the consultants) that they employ to solve their problems for them. Experienced employers who build regularly and have considerable experience of the construction industry are generally

able to analyse and articulate their problems for themselves. However, the role of the construction team includes helping their employers or the client to identify what their problems are, especially in the case of inexperienced employers who have little or no experience of the operational mechanisms of construction.

- Irrespective of the quality of the drawings and the models, until the project is constructed, many employers, even some of the most experienced, have difficulty in visualising what the completed project will look like and how well it will work, and therefore how likely it is that it will actually meet their needs.

John Murdoch and Will Hughes (2008, p. 20)

Since construction is a costly and lengthy process, each construction project is essentially a single activity with only one opportunity to satisfy the employer. Yet a number of studies over the years, including the reports by Sir Michael Latham (2009) and Sir John Egan (1998), have shown that, historically, the construction industry in the UK has a poor record in this respect. While things have undoubtedly improved in recent years, there are still strong likelihoods that completion will be late and/or the work will cost more than the employer was originally led to believe. In some parts of the world, there are considerable problems with quality control and there are possibilities that the completed work may fail to satisfy the employer's functional needs. If the failure is serious, it will almost certainly be very difficult and very costly to make the necessary modifications.

Construction employers also demand progressively shorter contract periods leading to the need for a greater degree of pre contract planning by contractors. In many cases, it can be observed that the pre contract design works are incomplete at the time the tenders are invited (Smith, 1994). Adding to the degree of uncertainty posed by the project, from the construction contractor's point of view, this often gives rise to the need for variations during the course of the work as well. Variations are extremely disruptive, particularly when the contractor is working on a tight timescale and, consequently often involve expensive claims for additional payment (Holman, 2004). Employers are not likely to be very pleased if, on completion of a project, they are asked to pay large sums of money arising from the variations caused by problems that could have been avoided at the design stage.

In the light of all this, the prime objective of all construction employers ought to be to seek to choose a construction team that can offer the best possible solution for their particular requirements including:

- Functional performance
- Time
- Cost
- Quality.

Each of these four criteria will carry different weightages for different employers on different schemes and most employers will wish to compare several alternatives in order to secure the best all round solution. This implies some form of competition. For many construction projects, the important aspect of such a competition is largely limited to price. A number of contractors each submits a bid for a project and the winning contractor is usually the one submitting the lowest price. Such competition tends to be limited to the construction contract itself, with professional firms such as architects, engineers, quantity surveyors etc. being appointed to carry out the pre contract work based on some generally agreed scale of fees (Powell & Mole, 2003). More recently, it has become the norm for many employers to seek for competitive fee bids from their professional consultants as well.

In addition to the problems of construction projects including the uniqueness that previously mentioned, contractors submit competitive tenders to cope up with the demand and supply of the commercial market place. The problems and risks are obvious and that can be summarised through the following:

> *'Under the competitive bidding system, the contractor is forced to make a "short sale" of his resources. In effect, he is selling a finished commodity – a building, for example – which he does not yet have and which does not even exist at the time the sale is made. The contractor is gambling that he will, within a prescribed time, be able to furnish the end product at the price originally set.'*
>
> (Park, 1979, p. 37)

From previous discussions earlier in this subsection, it is apparent that the execution and administration of the employer's role in a construction project is an

important responsibility. A minor error or negligence may lead towards an exciting result. For this reason, the employer is required to participate proactively in control the basic needs required for the project, including the operational workforce that is deployed for any construction activity and not all the requirements can be covered by papers and samples.

It is important for the employer to have some knowledge of the various alternative options that are available for procuring construction work as well knowing how to receive major benefits and this is discussed in the next subsection.

2.4 Procuring construction work

Traditionally, construction projects are procured by competitive tenders put in by contractors to fulfill the requirements of the industry's clients. According to the findings of the research by Preece (1994), contractors can improve their chances of acquiring access to projects via various forms of advertising and marketing, although such actions are not as successful as they are for the industries engaged in the process of manufacturing.

To overcome from the constructions of construction procuring contractors are testing various strategies such as:

1. In the developing world, the trend for owning property has stimulated the construction industry to open up new avenues in the sale of speculative housing on the open market. Additionally, the industry also produces office space and industrial parks. This venture is almost similar to that of producing consumer goods similar to the manufacturing industry and many of the basic rules of economics come into play. As the case in other industries, speculative development too has its ups and downs such as:
    a. Contractors are able to reduce their need for contract work when they are involved in speculative building projects.
    b. The capital for such a project must be financed by either the contractor or the contractor's partners until the initial units are let or sold.

    Funding for this type of project can be erratic compared with one commenced from a tender where the employer will usually fund the project and payments

are received on a monthly basis depending on the amount of work completed. Furthermore, this kind of venture can be a gamble of sorts for the contractor depending on the fluctuations of the property market.

2. As with all businesses, contractors in the construction industry will try to procure a steady stream of work from a limited number of regular customers. These commissions may sometimes be in the nature of maintenance and routine work rather than large projects but the contractor is always prepared to maintain the relationship. Such clients provide the mainstay to a contractor's business and, typically, the contractor will provide a special service to these regular clients in terms of reliability, accuracy, promptness and in terms of the fee charged for these projects as well.
3. Some contractors provide an arrangement of sole responsibility for a project where the design and construction of a project is undertaken by the contractor in order to facilitate the role of the client. They accept full responsibility for the design as well as the construction work in order to maximise price arrangements, accuracy and client satisfaction. This practice is usually undertaken by a contractor in an effort to broaden their clientele and is widely used for the simpler types of buildings. However, currently, there has been a drift towards more multifaceted buildings employing this method.
4. Another method employed by contractors to expand their horisons is to merge their business with a larger association. Usually projects thus acquired are public works of infrastructure, then the government authorities lack resources to initiate but which are expected to yield a worthwhile income upon completion. Examples may range from simple highways, bridges and tunnels (usually those that work under a toll system) to the more complex structures such as power stations and the like. Where the electricity generated can be sold to produce an income. Both the design and construction of such a project is undertaken by the construction corporation using private resources and, in return, they receive a period of concession to operate the utility for a pre decided period. At the end of this time, the ownership of the utility is transferred to the public authority accountable for it.

These projects are rapidly growing in popularity and have come to be known in variants of acronyms incorporating the general ideas of Built, Operate and Transfer or BOT Projects (Walker, 1993). Although the notion of BOT is appears to be relatively new, the first factual BOT project is reported to have been the Suez Canal.

Examples of popular completed BOT ventures include the Channel Tunnel between Britain and France (Anderson & Roskrow, 1994) and the Dartford Bridge. The UK Private Finance Initiative employs similar procedures but the process is micro controlled by the government. Developments of this nature are of high risk to the contractor but do return a high turnover.

These examples indicate that there is no hard and fast rule for procuring construction projects as long as the contractor is willing and confident to undertake projects. Since procurement is somewhat related to Building Economics, such requirements are described in the next section.

2.5 Economics of construction

In general economic terms, the construction market is characterised by a large number of sellers (i.e., construction firms) competing for a small number of comparatively high value orders. Therefore, it can be stated that the construction industry companies are applying a market based economic strategies.

A perfect market economic theory states that a characteristic of competitive markets of this type is that the market mechanism is essentially regulated automatically. Thus if there are too many firms chasing few orders, then the prices will eventually tend to fall. The less efficient company will fail to secure enough work at a price that enables them to remain profitable and, if this situation continues, they will be forced to leave the industry. In theory, this process will continue until the number of firms in the market place, the market price and the amount of work available will reach a balance of sorts. Conversely, if the demand for construction services exceeds available capacity, then the prices, and hence profit levels, will rise and more firms will be attracted to enter the market until the status quo is reached again.

In the construction industry, however, such perfect market conditions rarely, if ever apply, and the market does not, therefore, behave precisely as economic theory predicts that it should. One of the main reasons for this is that construction is a longstanding business. Even for ‘fast track’ projects, the timescale for most major construction work from initial inception and feasibility study through completion and occupation of the building to the completion of the final account is likely to be measured in years.

The construction market, as a whole, therefore has considerable kinetic energy. Experiencing a policy of nil intervention or low intervention by government, in general, it tends to lag behind movements in the economy as a whole. The effect is that, in a recession, the construction sector may still appear to be strong and moving ahead even though the rest of the economy is slowing down. Conversely, when the economy as a whole begins to recover, the lengthy lead times required to start major construction projects results in construction appearing to be weak while the rest of the economy appears to be gaining momentum.

Given these circumstances, it is very difficult for the construction market to adjust quickly to changes in demand. Whilst there might appear to be an obvious need for construction in order to improve the social and living conditions in many parts of the world the need will only be translated into an economic demand for the construction industry when someone is willing to pay for the work.

The fragmented nature of the industry has some advantages in that the industry can cope fairly well with a fluctuating demand in the short term. If demand fluctuations become too large or occur too quickly, then the construction market as a whole becomes unpredictable; subsequently, the prices charged become erratic and difficult to assess.

It can be seen that the industry reacts comparatively slowly to conditions of falling demand. If the demand falls rapidly, firms compete increasingly fiercely for the available work. Because of the fragmented and specialised nature of the industry, construction firms cannot easily switch their resources to operate in other markets. Therefore, contractors tend to leave the industry only as a last resort. For this reason contracting organisations will try to stay in the business for as long as

possible usually by progressively reducing profit margins within new tenders while attempting, at the same time, to reduce direct costs to a minimum often by shedding staff in the hope that things will improve. If demand continues to fall or remains static at low levels then eventually the market mechanism will come into play and the less competitive least efficient firms will be forced to leave the industry. This phase generally occurs some time (months, perhaps even years) after the initial fall in market demand began. Sometimes, the industry's production capacity is likely to exceed the amount of work available. In the case of a severe fall in demand, the reluctance of individual firms to leave the market except as a last resort may mean that a substantial number of firms eventually all leave at the same time. Much of the companies' workforce will attempt to move to other industries. The eventual collapse of the industry may appear to be both sudden and dramatic.

On the other hand, if demand begins to rise relatively quickly from some stable level, the reverse applies. Since construction requires specialised technical knowledge and skills, it is not easy for new firms to enter the market quickly. It is also not easy to rapidly expand the pool of skilled labour required, particularly if the many skilled workers have established themselves in other industries. As demand rises, therefore, two things tend to happen:

- Because construction is a long term activity, existing firms will be reluctant to expand and new firms will be reluctant to enter the industry until they can be sure that the increase in demand will be sustained. The capacity of existing firms is exceeded and their tender prices and profit levels will tend to rise. The clients might expect to experience a substantial period of higher than expected tender prices. In addition, because firms can afford to be more selective about the kind of work they are prepared to take on, the rise in tender prices for particularly complex or difficult projects may be even higher than the average for the market as a whole. At the extreme, there is a danger of local construction markets, where the number of contractors is comparatively small in comparison with the number of projects on offer, with the consequent dangers of price fixing, collusion on tender prices etc.

- Large numbers of relatively unskilled or semi skilled workers are recruited into the industry to cope with the increased demand. Quality standards and industrial productivity tend to fall.

As indicated, eventually the market mechanism will operate again and more firms will enter the industry and/or the capacity of existing firms will be deliberately expanded and the status quo will again be restored. Note, however, that, in the case of major fluctuations in demand, a substantial period of stable demand levels may be required before the status quo can be restored, the supply and demand sides of the industry is again in balance, and the market price for construction work becomes reasonably predictable once more.

Clearly, therefore, if the construction industry is to remain healthy the average demand for construction work must be at least reasonably predictable and, hopefully, constant. Major fluctuations of demand within a comparatively short time, or extended periods of demand uncertainty, can cause serious problems in matching demand and supply, and thus in predicting the market price for construction work.

Some method of predicting possible future fluctuations in demand for construction work might therefore be a useful tool for contractors to use in their forward planning. Most analyses of this type are based on historical projection supplemented by subjective 'expert' judgement. Oshabajo & Fellows (1991) have shown that it is possible to take advantage of the fact that changes in construction demand generally lag behind the fluctuations in other key economic indicators particularly related to ROCE [Return on Capital Employed] and to the changes in interest rates. Oshabajo & Fellows go on to formulate a mathematical model, which they claim is appropriate for short term forecasts of between three and four quarters. The nature of microeconomic calculations are further discussed in the following section.

2.6 Microeconomic considerations

From the conventional economic theories, it is recognisable that all firms will attempt to keep costs and income in equilibrium by assessing the likely demand for their product(s) together with an assessment of the market price for the goods produced and then gearing supply capacity to suit. When it comes to construction, it is

important to review the level of applicability of these economic theories and how could apply them to the construction industry.

All firms, including construction firms, have some fixed costs that they have to pay whether or not that they produce anything at all, as well as certain variable costs that are directly related to the volume of output. In construction, the amount of fixed costs varies according to the nature of the firm. A general contractor that relies on subcontracting most of the work may have relatively low fixed costs perhaps comprising only office rentals, staff salaries, company cars and the cost of financing any working capital. An excavation and earthworks contractor may have a large amount of capital tied up in expensive plant with an associated plant yards, workshops etc.

The problem with fixed costs is that they tend to rise in steps. A certain level of fixed cost might be adequate for a certain range of production capacity. When the end of that range is reached a further increase in capacity will require that fixed costs increase by a larger amount than a marginal increase in production would justify. The revised level of fixed costs then applies for the next range of production and so on. Fixed costs may also be difficult to adjust quickly and changes in them, therefore, tend to be considered only in the medium to long term. This highlights that, when plotting a short term costs' map of a firm against production capacity, it is common to see a 'U' shaped curve with the bottom of the 'U' representing the optimum production level where the cost per unit of production is at its lowest. When the cost per unit of production at low levels of production tends to be high, it falls to a minimum at some optimum production capacity and tends to rise again, where production approaches the high end of the range. Therefore, it is clear that to maximise profits for a given product price level a firm needs to operate as closely as possible to the optimum unit cost (Hillebrandt, 1985).

When it comes to the construction market, this feature of profit maximisation does not seem practical since demand is potentially unpredictable. In the short run, the cost curve will be unique for each firm and, in theory at least, it is important that all firms know what their actual cost per unit of output is. Each company in the construction market will have its own short run cost curves, which indicates total value of production ought to aim for maximum profitability as depicted in Figure 2.1.

At any instant in time, each firm may be in a different trading position but all firms ought to attempt to maintain their production at the optimum. This is possible to observe when maintain the results of previous tenders of the competing organisations.

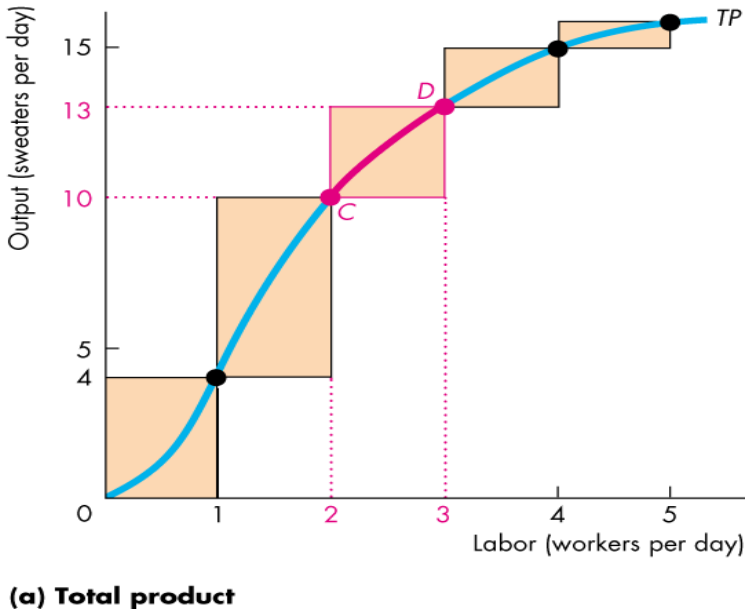

Figure 2.1 : Short term profit maximisation curve
(Source: Hillebrandt, 1985)

For firms operating towards the left and the end of the curve, i.e., with production levels below the optimum, the costs per unit of production are high. In the short run, these firms must attempt to increase production in order to drive costs per unit down. In a tendering stage, this means submitting lower prices and thus winning more work but the price must never fall below the firm's minimum cost level. If the minimum cost at which the firm can tender is still above the market price, i.e., if the firm is still not successful in obtaining work, then it must attempt to reduce fixed costs in order to move its optimum level of production closer to what it can realistically achieve.

Firms operating towards the right hand end of the short run curve ought only to tender at a rate that represents a true reflection of their unit costs. Such costs will normally be higher than the market rate since firms will usually be tendering against those operating at, or below, optimum capacity. It is, therefore, less likely that they will be successful but if they are successful then they will have secured the work at a price that allows them to cover their true costs. If they do obtain the work, then

they may gain valuable intelligence about the state of the competition and this may help them to decide whether they should plan for expansion and an increase in fixed costs.

Self recognising the optimum efficiency of any firm is difficult because contractors trend to maintain such cost data very confidentially and sensitively with only with a few of the persons at the top level of management knowing this information. A theoretical economics answer could be calculated by the use of marginal analysis techniques. Marginal analysis compares the increase in revenue generated from the last small rise in output (the marginal revenue) with the relevant costs of production (the marginal cost). If the firm is in a healthy operating situation, then the marginal revenue will exceed the marginal cost, but the difference between the two will tend to decrease as the firm approaches towards the limit of its fixed resources. When marginal cost exceeds marginal revenue, then the firm will no longer be efficient. For this reason, it is important for construction companies to operate at maximum efficiency (i.e., the fixed resources of the firm are being used to their maximum) when marginal costs and marginal revenues are at an equal level.

This technique works well in manufacturing industry where output volume can be closely monitored, controlled and varied in the short term. However, as has been pointed out by several commentators (Rutter, 1993), construction does not work like that. Construction projects are generally large, indivisible, and each individually comprises a high proportion of the firm’s turnover. Therefore, the concept of marginal analysis as a precision decision analysis tool in deciding whether to tender for new work does not operate very well within the construction industry.

The difficulties involved in applying techniques developed for use in manufacturing engineering to the construction industry have caused many firms simply to ignore economic analysis altogether, but such action risks throwing away the potential benefits as well. Standard economics’ techniques such as marginal analysis can give an idea of a firm’s efficiency, but the nature of the construction business means that it is very difficult to use such techniques with any great degree of precision.

The workforce in construction has considerable differences to a factory oriented assembly line production. The operational workforce of the construction industry is discussed in the next section.

2.7 Operational workforce of the construction industry

A person that works in the construction industry, especially one engaging in manual work as opposed to the planning or managing of projects, is known as an operational worker.

A construction worker is a tradesman or labourer and, by tradition, is considered as an unskilled tradesman or a professional employed in the physical construction of the built environment and its infrastructure. The term ‘construction worker’ describes an abstract concept signifying all those involved in construction or those performing the actual work. All construction workers associate themselves with some subcategory section of ‘construction worker’ such as carpenter, mason, plumber and the like (See Appendix A - Trades in construction). Construction workers should (as anyone in an occupation that involves possible head strikes, heatstroke, frostbite, other weather elements, or hazardous contaminants) always wear protective hard hats, giving birth to the descriptive term "hard hat worker". Trained capabilities on ‘Manual Dexterity’ (Matsubayashi, et al., 1992) or coordinated and repetitive usage of fingers, hands, wrists, arms and legs are important requirements to undertake construction work.

While most construction workers learn on the job as an informal apprentice to an experienced tradesman, formal apprenticeship programmes are common, particularly in developed countries with trade unions. When it comes to the Sri Lankan construction industry, the availability of such skill development programmes are at a low availability or nonexistent level. Due to the unavailability of such apprentice programmes and a lack of motivation on the part of young school leavers to join the construction industry, the scarcity of construction operatives is gradually increasing from a bad situation to a worst situation.

Several quotations that highlight the status of the operational workforce in the construction industry in Sri Lanka are presented in the next sector of this report.

2.7.1 Operational workforce in the construction industry in Sri Lanka

Because of the recent growth in the Sri Lankan construction industry, demand for labour has risen while the supply seems to be insufficient.

> *"It is observed that the Labour Productivity has come down in almost all the sectors as a result of the increased number of employees engaged, without a substantial or no increase in Value Addition. This may have been caused by the volatile nature of employment in the construction industry, where labour migration and shifting takes place, especially in the informal sector."*
>
> (Pathirage, 2008, p. 11)

Due to the insufficiency of labour to meet the demand, the prices for labour have increased over time that ultimately increases the cost of overall construction. Labour costs capture almost 12% of the total construction cost when it comes to infrastructure projects and the same becomes almost double (or 20% to 25%) when it comes to building projects depending on the quality and complexity of finishes.

> *"The national working poverty incidence (13.7%) has been exceeded by the production industries of Agricultural, Construction and Mining workers who hold 21.1%, 18.1 % and 21.8% poor workers in respective categories when studying the poverty across the main industry categories of the workers occupied".*
>
> (Rasseedin, 2011a, p. 67).

From the facts expressed in this literature review, it is apparent that the operational workforce or the job performers in the construction industry in Sri Lanka are demonstrating uncontrollable and unpredictable behavioural patterns.

The researcher studied the common behavioural problems relating to the operational workforces. The findings of such studies are described in the report prepared by Wijewickreme (2010). A general introduction to the common behavioural problems of the operational workforce with regard to human related activities are presented in the next section.

2.8 Behaviourism (What does it mean?)

Behaviourism is an approach to psychology that focuses on an individual's behaviour. It combines elements of philosophy, methodology, and psychological theory. It emerged in the early twentieth century as a reaction to depth psychology, and other more traditional forms of psychology, which often had difficulty making predictions that could be tested using rigorous experimental methods (Watson & Rayner, 1920). The primary tenet of methodological behaviourism is that psychology should only concern itself with observable events.

Behaviourist philosophies shifted somewhat during the 1940s and 1950s, and has done so again since the 1980s (Skinner, 1953). Radical behaviourism is a conceptual variant that acknowledges the presence of private events including cognition and emotions and suggests that they are subject to the same controlling variables as are observable behaviours (Skinner, 1981). From early psychological theories in the 19th century, the behaviourist school of thought ran concurrently, and shared commonalities, with the psychoanalytic and Gestalt movements in psychology on into the 20th century. Behaviourism then began to differ from the mental philosophy of the Gestalt psychologists in critical ways (Pavlov, 1941). Its main influencer, Ivan Pavlov, investigated classical conditioning that depends on stimulus procedures to establish reflexes and respondent behaviours. Edward L Thorndike (1927) and John B. Watson alongside Rosalie Rayner (1920) rejected the introspective methods and sought to restrict psychology to observable behaviours. However, according to the arguments of Skinner (1981) who conducted research on operant conditioning established, that using antecedents and consequences to change behaviour can emphasised on observing private events.

In the second half of the 20th century, behaviourism was largely eclipsed because of the cognitive revolution. During this time cognitive behavioural therapy evolved and this procedure has demonstrable usability in treating certain pathologies such as simple phobias, Post Traumatic Stress Disorder (PTSD) and addiction. The application of radical behaviourism, known as applied behaviour analysis, is used in a variety of settings including in organisational behaviour management, in fostering diets and fitness and in the treatment of such mental disorders as autism and substance abuse (Ward, et al., 2009). Some behaviourism and cognitive

schools of psychological thought may not agree theoretically yet have complemented each other in practical therapeutic applications such as in clinical behaviour analysis.

2.8.1 Behavioural effects on production and resource sharing

Since circa the 1980s, it has been observed that there is an increase of interest among behaviour analysts regarding a paradigm in cultural anthropology known as cultural materialism. This perspective suggests that all behaviour ultimately rests on the relationship between the natural environment and the methods used to obtain resources needed to maintain survival and a high standard of living, known as the mode of production. In one experiment, it is said that some scientists in this area have overlooked one valuable resource and manipulated the amount of resources dyads that could harvest within blocks of five trials and across six conditions. Since the behaviour consisted of harvesting and allocating resources, token retention and a survival analogue were made contingent on resource sharing. It was seen that five of the seven dyads shared resources and no sharing occurred when participants could harvest sufficient resources to survive independently (Ward, et al., 2009). Such opportunities were integrated into this research where optimal foraging research is discussed along with potential applications in real world social issues.

The prediction and control of behaviour is usually driven by the behaviour analytic theory (Skinner, 1981). As such, behaviour analysts are required to consider ways of enhancing the prediction and control of real world behaviour. One source of such enhancements come from behaviour analysts and has increased the interest in cultural anthropology in the present study (Lloyd, 1985; Vargas, 1985; Malagodi, 1986; Glenn, 1988; Malott, 1988; Malagodi & Jackson, 1989 and Glenn, 2003). According to the said findings, behaviour monitoring is an essential element from the beginning of the development of an experimental methodology in order to investigate relations between behaviour analysis and cultural anthropology.

2.8.1.1 Behaviour analysis and cultural materialism

According to research undertaken by Marvin Harris (1979), behavioural analysts typically examine the behavioural environment that relates to “holding constant” or

survival contingencies. Contrarily, the cultural anthropological paradigm known as cultural materialism examines the behaviour of human populations relating to survival as a dynamic variable. Whereas behaviour analysts assume survival in their research, cultural materialists do not.

Prior to discussing the essential concepts of cultural materialism it is required to consider that one could conclude that the behavioural environment relations are nested within a culture whose characteristics are largely influenced by the means by which the members of the culture acquire the resources needed for survival. Cultural materialism could therefore, assist behaviour analysis by examining the effects of survival on behaviour in detail. For this reason, potentially, increasing the prediction and control of behaviour could reach to an unknown level (Skinner, 1953 amd Sidman, 1960). Furthermore, behavioural analysis could benefit cultural materialism by exposing its concepts to rigorous and practical experimental methodology in all the parameters of behavioural sciences.

2.8.1.2 Essential concepts of cultural materialism

Interactions between the mode of physical production and cultural materialists by members of the same team may lead towards creating cultural obstructers such as within farming, construction assembly line manufacturing etc. or various types of employment that usually need team cooperation to ensure a success rate (Harris, 1977). Furthermore, this could towards genetic modes of reproduction (i.e., means by which the members of a culture influence population growth, such as mating patterns and nutrition) as well forming the primary impetus in cultural development (Harris, 1979). Additionally, an expanding population requires production intensification (i.e., work to produce more food, water and energy), and temporary or lifetime improvements in the quality of the standards of living (i.e., bringing more into life and the environment), and eventually the expanding population requires further intensification to accommodate this larger population and, simultaneously, depletes the surrounding resources.

Once again, it is important to highlight that such intensification or depletion cycles will probabilistically determine the rest of a population’s interactions that are divided into a tripartite scheme such as that depicted below:

1. Infrastructure (i.e. the mode of production and reproduction).
2. Structure (i.e. behaviour relevant to orderliness among populations, such as family structure, political organisations and police).
3. Superstructure (i.e. the recreational, sportive and aesthetic aspects of behaviour, such as art, science and advertising).

2.8.1.3 Production efficiency: the negative correlation

Several economic egalitarianism examples can be identified in hunter gathering societies which illustrate *"infrastructural contingencies"* (Glenn, 1988, p. 171) or how modes of production and reproduction can affect a population and the probability of sharing resources (e.g., giving food to one another). Such apparent situations can be identified via a negative correlation between production efficiency and resource sharing.

The evolution of the social world commenced with hunter gatherers' reliance on animal migratory patterns which set the conditions for a relatively mobile existence as well as economic egalitarianism according to the arguments developed by Harris (1979). In hunter gatherer cultures, the probability of any individual having a successful hunt was relatively low, whereas the probability of any group member having a successful hunt was relatively high. Thus, while any one individual hunter may have been incapable of surviving or generating a high standard of living, members of the group relying on each other for resources when others came up short ensured everyone's survival and standard of living. Having a mobile existence also led to highly mobile structures (e.g., caravan homes) which mitigated the follow two situations:

1. The number of disputes between groups (i.e., disputing parties could simply move to another location).
2. Hierarchical class type structure. The high protein/low carbohydrate diet also decreased fertility in these groups that slowed down population growth, thereby reducing the demand for resources.

The preceding example seems to describe a negative correlation between production efficiency and resource sharing. The present study sought to create a simplified experimental analogue to investigate a few possible aspects of this

complex relationship within the framework according to the previous discussions of Harris (Harris, 1977) and (Harris, 1979) according to the Intensification/depletion cycles that appear to be an inherent property of resource population relations. Dual aspects of resource production were deliberately manipulated in the study for further experimentation as depicted below:

1. Percentage of trials with resources available for harvesting
2. Within the above percentage (Item 1), the range of possible resources made available for harvest.

These discussed results may contribute to an increased understanding of some of the specific features of production efficiency that affect resource sharing.

Following Harris's experimental studies (Harris, 1977) (Harris, 1979), several behavioural educational studies initially commenced to acquire the said proposition and resources. Thereafter, came Skinner's (1981) proposition that considered the fact that behavioural constraints divert to a contingent that relies on a behaving organism that requires resources to survive. The entire behavioural constraints in this study comprises allocating resources in a laboratory analogue procedure.

The participants utilised for several recent studies seem to require further education with regard to the harvesting functions, to laboratory based resources and to meet the analogues to survival contingencies before any extra resources can be allocated towards tokens as well. Token retentions utilised in the 'recent' presumably studies can be observed as a laboratory based "standard of living" If a participant's survival contingencies were not met then they could not continue and they lost all the tokens earned in the current condition as well as any stored resources. Sometimes it was noted that not even a single participant could meet their survival contingencies individually. Thus, under certain conditions, if any one participant wanted to survive and retain salvages or the tacit knowledge (Pathirage, 2007) from the dyad, members would have to share resources.

2.8.1.4 Impact of behavioural constraints

These literature syntheses may provide a general methodology for a programme of research in order to systematise behavioural analysis and cultural materialism.

Some previously discussed optimal foraging studies such as those by Pietras & Hackenberg (2001) and Pietras & others (2006) have argued for the investigation of aspects of survival in relation to resources. Even though recent studies have important methodological differences concerning the ways in which the resources were utilised, the general subject matter is somewhat similar and warrants the consideration of a methodological fusion in further studies.

While behavioural analysts have been studying behavioural environment relations, further considerations have also been given by them to commencing examining the directions of behavioural relations to resources and survival. Furthermore, these researcher's studies would have been the first to attempt an experimental analysis of cultural materialism. Therefore, there is a need to provide due support for the future development of such research in the areas identified as struggling (according to the current methodologies as well). However, it can be observed that there are several programmes that are already in place and grant support to several research studies that are testing the generality of behavioural principles under the contingencies of survival. If the current studies spark a programme of research, applications to real world phenomena seem likely and present day examples will be required to provide an illustrations of the types of phenomena that may become relevant to behavioural analysts when resource behaviour relations are considered.

To summarise, the most important offering of the current studies resides in their potential for future research towards a more complex understanding of human behaviour. What has not yet been fully appreciated among behaviour analysts is the integral role of resources on an individual's daily life. As Todd A Ward, Raymond L Eastman and Chris Ninness suggest, "for the most part, the modern cultural environment in which behaviour is nested cannot exist without some sort of income to 'purchase and maintain' that environment" (Ward, et al., 2009, p. 22). Furthermore, the resources for survival that are the focus of current studies are required but these resources constitute the very stuff that comprise virtually every contextual condition in which the modern human behaves. Thus, Marvin Harris (1977) has managed to place resources at the base of cultural development in his studies in 1977 and 1979. At the infrastructural level, resources promote survival

but resources are required to transform into motivations that take on endless forms such as the farmer’s plough, the infant’s crib, the artist’s paintbrush.

2.8.2 Behavioural problems of the operational workforce

Human behaviours refer to the range of behaviours exhibited by humans. These are influenced by culture, attitudes, emotions, values, ethics, authority, rapport, hypnosis, persuasion, coercion and genetics.

The behaviour of people and other organisms, or even mechanisms, falls within a range with some behaviour being common, some unusual, some acceptable, and some outside acceptable limits. In sociology, behaviour in general is characterised as having no meaning, as not being directed at other people and thus is the most basic human action. Behaviour in this general sense should not be confused with social behaviour that is a more advanced action, as social behaviour is behaviour specifically directed at other people. The acceptability of behaviours depends heavily upon social norms and it is regulated by various means of social control. Human behaviour is studied by the specialised academic disciplines of psychiatry, psychology, social work, sociology, economics and anthropology.

Human behaviour is experienced throughout an individual’s entire lifetime. It includes the way they act based on different factors such as genetics, social norms, core faith, and attitude. Behaviour is impacted upon by the certain traits each individual has. These traits vary from person to person and can produce different actions or behaviour from each person. Social norms also affect behaviour. Due to the inherently conformist nature of human society in general, humans are pressurised into following certain rules and displaying certain behaviours in society that conditions the way people behave. Different behaviours are deemed either acceptable or unacceptable within different societies and cultures. Core faith can be perceived through the religion and philosophy of an individual. It shapes the way a person thinks and this, in turn, results in different human behaviours. Attitude can be defined as "the degree to which the person has a favourable or unfavourable evaluation of the behaviour in question." One's attitude is essentially a reflection of the behaviour one will portray in specific situations. Thus, human behaviour is greatly influenced by the attitudes we use on a daily basis.

2.8.3 Behavioural problems in the Sri Lankan construction industry

As listed in Section 1.4 above in this thesis, fourteen impositions affect the constructer's risks and liabilities with regard to stakeholder satisfaction. Remedies deployed by the employees such as target works, incentives and production base payments etc. have not been seen as effective propositions during the recent past.

> *"Conventional solutions for improving labour productivity concentrated on giving wage incentives to motivate the workers to work harder. But these alone are not expected to address the root causes of low labour productivity, relating to health, worker attitudes, education, and the like".*
>
> (Rasseedin, 2011a, p. 93).

Victoroff (2005) argued that the unavailability of a functioning social security system could lead to an increase in criminal and terrorist activities due to a lack of confidence because human nature has not changed. There are interlocking trends such as the globalisation of commerce, information transfer, and travel that have changed human requirements. Disparate economic and ideological competition in sharp relief and facilitates cooperative aggression may widespread with the arrival of compatible collaborators.

2.9 Detailed expression of behavioural problems

A study was carried out among operational workers (Wijewickreme, 2010), their immediate supervisors, project managers and company directors to trace the roots of barriers to attracting an operational workforce into the construction industry in Sri Lanka. From the said study, poor retirement benefits were identified as the major reason that causes the current operational workforce to think of a different industry other than construction for their ongoing careers. According to the survey's findings, 6.25% of the operational workforce in the construction industry are above retirement age but are still working due to the absence of an effective and lifelong social security system. According to 'A Theory of Human Motivation' (Maslow, 1943), which has been previously discussed, 6.25% of the over aged operational workforce in construction industry should be on the level of Self Actualisation (Wijewickreme, 2010). However, in the Sri Lankan context they are still fighting for their basic 'Physiological Needs' such as air, water, food and sleep and some time

to fulfill the day to day requirements of their dependents such as children, grandchildren, or maybe even their parents.

Therefore, it can be argued that the operational workforce will not become a commodity anymore. Human resources should not be treated as being similar to other commodities that can be mobilised and demobilised as with a Just in Time (JIT) activity sequencing within the supply chain management process. As collaborators within the construction industry, they become eligible to share profits (Wijewickreme, 2010), (Chandradasa & Ekanayake, 2011), (Samarakoon, 2009). The best profit can be considered the 'Retirement Benefit' that the construction operatives desire at present. The researcher's aims is to conclude, what would be the future of the construction industry if the operational workforce was continually be kept unexposed to their carrier and life development without resolving their needs and the same is discussed in the following subsection.

2.9.1 Employer perspective

One of the crucial difficulties experienced by the construction contractors and builders in Sri Lanka is the fulfilling of their general obligations expressed in the contract documents. One particular matter of concern is that when a project is nearing its completion stage, the operational workforce tends to move out from the current project seeking new employment. In addition to the key factors of time, cost and quality, there are other endless requirements. Some of the other requirements are aesthetics, operational flexibility, confidentiality, transparency, accountability to stakeholders, the claim orientation of the contractors, appropriateness, functionality, ergonomics, sustainability, recyclability, safety, durability, obsolescence, life cycle analysis, procurement methods, comparison with existing products etc.; all these factors affect construction projects since construction is considered as a complex industry according to the arguments of Murdoch & Hughes, (2008).

Precedence of behavioural constraints of construction operatives may vary depending on the nature of the stakeholder's requirements. Thorstein Veblen (1914) argued for, and elaborated upon, his own hypothesis through the book *'The Instinct of Workmanship and the State of the Industrial Arts'* stating that commercial establishments are in a primary battle with human inclinations or natural tendencies

to behave in a particular way in order to achieve useful effort. Veblen's point was that an excessive amount of human energy is being wasted through incompetent institutional management.

Due to the unavailability of a proper and lifelong retirement benefit scheme, operational workforces have presented some behavioural problems that adversely affect stakeholder satisfaction according to the research of Samarakoon (2009), Wijewickreme (2010) Praveen, et al. (2013) and the newspaper "*Divaina*" (2014). Such behavioural problems are:

1. High labour turnover.
2. Poor quality of workmanship.
3. Temporary or irregular attendance.
4. Lack of trade knowledge and skills.
5. Lack of cost concerns.
6. Irresponsibility and lack of reliability.
7. Unfair demand for wages or rates.
8. Adamant behaviour and a lack of loyalty.
9. Reluctance to learn and training.
10. Carelessness and safety concerns.
11. Unethical impulsive demands.

Responses to the counter queries as well as the clarifications received from the questionnaire participants were useful and enabled the researcher to weigh the impacts of these responses fairly and reasonably in order to develop a logical foundation for the research. Negative factors, summarised through the research by Wijewickreme (2010), were investigated in depth and were rationalised during the data collection stage. Such data being collected from the individuals that participated in the questionnaire survey. Further elaborations on identified behavioural constraints of the construction operatives are given below.

2.9.1.1 High labour turnover

Labour turnover is defined as the frequency of losing employees by an employer according to the perspective of human resources' management. Some generic terms used to identify staff turnover are so called as "how long your employees stay

with your company" or "where your traffic survey data for the revolving door". It is said that a high turnover may be harmful to the productivity of a company if skilled workers regularly leave a company because it increases the company's comparative percentage of an apprentice workforce. Glebbeek and Bax (2004) argued that a balance between apprentices and skilled workers is a better combination.

Many organisations measure their human resources' turnover and compare their figures against industry standards. A common formula used for these calculations is:

$$\%\ \text{of HR Turnover} = \left(\frac{N_{ly}}{(N_{by} + N_{ey})\ /2}\right) 100$$

N_{ly} : Number of employers who left during the year
N_{by} : Number of employers at the beginning of the year
N_{ey} : Number of employers at the ending of the year

Equation 2.1 : HR Turnover Calculation

Annual HR turnover is equal to the count of employees leaving divided by the average gross head count of the employees and then multiplied by 100 (to receive a percentage value). Subsequently, the results are used to compare and assess the strengths and the weaknesses of the organisation and their reactions to the opportunities and the threats.

2.9.1.2 Poor quality of workmanship

Poor, low, bad or inappropriate quality is a generic term (estimated by eye) particularly relating to product finishes. There are some guidelines in this area provided by the British Standards Institution (BSI, 2016) as well. However, generally workmanship is considered as a qualitative explanation of the degree of skill imparted on an object in the process of making a product or getting a job done. From ancient times, workmanship would have been considered and valued as an important human characteristic. According to the viewpoint of economist and sociologist Thorstein Veblen (1914), the sense of workmanship is considered as one of the most important characteristics of people when it comes to evaluating their wellbeing.

From the time assembly line manufacturing was introduced in 1913 by Henry Ford (Iacocca & Novak, 1984) workmanship, was considered as very much centered on the physical production industries. In the contemporary world, it is widely respected by communal people even though the majority of the factory based industrial products are now developed from robotic assembly lines.

2.9.1.3 Temporary or irregular attendance

Irregular attendance can be defined as the lack of consistency in reporting to a regular place where people are required to be present due to legal, social or ethical reasons. The Ministry of Education in New Zeeland considers irregular attendance by children at school as an early indicator of problems (MOENZ, 2011). The situation of irregular attendance can be generalised and applied to several social groups such as the operational workforce's attendance in the construction industry, children's attendance in a school, players' attendance in practice sessions etc. The importance of regular attendance was highlighted in a recent legal case relating to the health industry in a federal court in Florida, USA. According to the court decision, a new case law was established stating that leave for the employees would not allow avoiding regular attendance from now onward or in the immediate future, in situations where regular attendance is an "essential function" of a position. Leave is not a "reasonable accommodation" according to the judgment made in the Daniel Mecca versus Florida Health Services Centre case (2014).

Major causes of this irregular attendance may include a lack of personal interest on the work being carried out, the impact of colleagues, pressure from immediate superiors, an inclination for change as part of human nature, with a view to change the practicing environment and seeking short term jobs with better returns.

2.9.1.4 Lack of trade knowledge and skill

Not having sufficient knowledge and understanding to carry out the works that are assigned to, and agreed by, the party to perform them can be considered as a "lack of trade knowledge and skills" or a lack of "manual dexterity" (Matsubayashi, et al., 1992) by an operational worker.

There are two basic categories of construction operatives, identified as skilled and unskilled. A skilled group of construction operatives are required to perform any of the trades described in Appendix A (Trades in construction) in this thesis. Unskilled groups are required to undertake general duties such as, but not limited to; cleaning and preparing sites, pit and trench excavations, fixing bracings for shoring the sides of excavations, erecting general scaffolding, removing hazardous waste materials (such as lead and asbestos), assisting with the unloading and loading of materials, mixing and pouring works, assisting to skilled artisans and the engineers, that are cooperating with other fellow construction workers, cleaning and tidying works and the maintenance the site and the like.

The expected responsibilities of any member of the operational workforce includes operating and tending small machines, hand and power tools, air hammers, earth tampers, cement mixers and small mechanical hoists, surveying and measuring equipment and dealing with a variety of equipment and instruments.

Lack of cost concerns can be explained as a shortage of interest on the price paid or payable for acquiring a place, product, service or for maintaining a relationship that is of the interest an individual or artificial person. Usually cost is weighted in relation to a currency or as a monetary value.

The negative behaviours of the operational workforce towards cost concerns may lead towards stakeholders' dissatisfaction. A few examples from the Sri Lankan context are:

- Cutting new lengthy timber for survey pegs rather than using reusable offcuts.
- Cutting steel reinforcement without referring to the bar schedule to minimise wastages.
- Mixing cement mortar without considering the fact of the setting time of the cement and the volume required for hourly productivity.
- Cutting ceramic tiles without a design sketch due to a lack of technical knowhow.

These cost overruns have been identified as salvageable fund recovery areas for the development of the proposed framework. Such situations have also been

brought to light by John & Itodo (2013, p. 747). Therein it is stated *"Improvement in building materials management on construction sites has the potential to enhance the construction industry's performance with cost saving benefits"* according to a study carried out by them in Nigeria.

2.9.1.5 Irresponsibility and lack of reliability

Irresponsibility can be defined as not providing the due discipline, attention, care and accountability as and when required by the work being carried out by an individual, group or artificial person. Inability in consistence relating to performance of a person, system or a product for its anticipated assignment or purpose on demand can be considered as a lack of reliability. Not providing reasonable and mandatory explanations as and when notified to do so, by the higher authorities also fall into this category.

Irresponsibility can be easily observed in situations such as late startup or early departure from a workstation, absconding during the lunch break, wasting mixed mortar or using it after the initial setting time, untidy works and cluttered work surroundings; all situations practiced by the current operational workforce in the Sri Lankan construction industry. Ndema (2013, p. 6) stated "dealing with irresponsibility requires tolerance, serenity and awareness of a person's general manners" based on a situation that he faced with his own university students during a road protest over death of a colleague.

2.9.1.6 Unfair demand for wages or rates

Unfair means not in line with acceptable standards, trustworthiness or social ethics. An unfair demand for wages or rates commonly happens just prior to festival seasons such as New Year and Christmas. Sometimes workforces move away from the projects without even closing the open up work activities such as drainage trenches etc. during this period.

Contractors face constraints in retaining their labour especially when they require casual labour in the house renovation market. Stakeholders commonly expect to receive their completed projects prior to festival seasons. However, labour can commence leaving projects since wages and output based rates are fixed in such

a project environment (since there are no binding mechanisms available for the casual workforce). To overcome the situation many contractors offer nonstandard incentives to retain the workforce and this leads to cost overruns for the contractors. For this reason, contractors generally add higher markup percentages for the calculated basic rates in order to safeguard themselves.

2.9.1.7 Adamant behaviour and lack of loyalty

Adamant behaviour can be explained as exhibiting a rigid and rude attitude when dealing with colleagues, teammates, team leaders or immediate superiors. In many situations, adamant behaviour comes together with a lack of loyalty (which can be explained as a combination of faithfulness, trustworthiness, dependability and fearlessness in bearing responsibilities). The 'heat' and effect of people with adamant behaviour and a lack of loyalty is similar to the mechanism of pressure onion explanations given in soil mechanics: 'the further away you are from the object, the less heat you feel'.

As explained by Napoleon Hill (1928, pp. Lesson 2, 65) *"You cannot succeed when surrounded by disloyal and unfriendly associates, no matter what may be the object of your definite chief aim. Success is built upon loyalty, faith, sincerity, cooperation and the other positive forces with which one must surcharge his environment"*. A lack of loyalty is considered as one of the foremost causes for disappointment during the journey of life. When working with people who have adamant behaviours or a lack of loyalty it will always be difficult to agree on deciding a working technique that should be followed by all. For example concerning the workability level of water content in concrete or in mortar for brick laying or for rendering walls, many may want to add more water to ready mixed concrete or mortar on site in order to increase the workability and thus simply neglect the importance of the water cement ratio and its repercussions on strength. If supervision teams begin applying, strict supervision quite often the Sri Lankan hired working gangs will start immediately serving notice of withdrawal.

2.9.1.8 Reluctance to learn and train

It is common for the operational workforce in the Sri Lanka construction industry to be reluctant and to refuse to undergo training even if a course is offered free to the

worker with a fully paid day off. One reason could be that such a worker can lose a few hours of overtime. Over sophisticated venues and unusually smart dress codes could also be reasons for this unpopularity. When trainers have been brought on site to conduct training sessions, three other reasons could be observed:

1. Job performers blocked unskilled helpers attending such courses in order to maintain their prevailing output based rates, their mini monopoly and their pride as a skilled worker (i.e., professional jealousy).
2. Skilled workers (mainly job Performers or JPs) believe themselves to be veterans and undergoing additional training is considered by them as an insult in front of their subordinate unskilled workers.
3. While skilled workers or job performers are on training programmes, unskilled workers automatically switch to ‘idling positions’ on site which affects output based income.

From the observations, it was spotted that reluctance and refusing to undergo training is an endemic problem. A lack of desire to undergo training can be considered as a social myth and a nationwide approach and solution is required to counteract professional jealousy or the complexness of inferiority.

2.9.1.9 Carelessness and safety concerns

Carelessness within the work performed by the operational workforce and concerns regarding the requirements of occupational health and safety can be considered as a part of people’s own attitudes on wellbeing and discipline. This kind of behaviour can generally be grouped under two categories:

1. Impacts on product

   The impact of health and safety on products can further be separated into unexposed, exposed and mixed impacts. In a building foundations and superstructure are unexposed. Joinery and finishers can be grouped within the exposed section whereas roof and wall cladding would come under mixed nature impacts.

To present an example: when hanging decorated door leaves, it is common to shave the top or the bottom edges to adjust it correctly. However, operatives are reluctant to apply a few protective coats of paint to the nonvisible edges and this decreases the life of the door. Output based joiners argue that painting and decorating is not in their scope of work whereas painters say 'if the door leaf can be removed by others, then it can be painted'. Such arguments provide only disappointments where the stakeholders are concerned.

2. Impacts on people

Health and safety impacts on people generally end up as accidents or health related complexities. When considering accidents, the erection and a lack of monitoring of temporary structures and a lack of team working attitudes are the common defaults by operational workforce.

A reluctance to provide due attention to the proper closure and sealing of the exposed edges of rock wool used as roof insulation or to the fire rating of doors can cause long term and unrecoverable health complications to the occupants at large.

Although it is said that carelessness and safety concerns are attitudinal problems, in some situations it can be seen as a contractual mismatch of responsibilities' integration. Since output based subcontract works do not have a well documented contractual framework in a practical scenario, it is often the case that the parties involved are seeking reasons to escape from their negligence and responsibilities.

2.9.1.10 Unethical sudden demands

Unethical sudden demands can be illustrated as seeking (and sometimes undertaking blackmailing for) a lump sum of money to complete an activity that is at a critical point often, in such situations, seeking amount of lump sum money is three or four times higher than the prevailing rates. Such situations are not common within established contracting companies but can be found among the small scale residential construction work directly handled by an owner.

Sometimes in a situation where critical concreting work is being carried out as a night work activity (by the manual moving of mixed concrete through the ‘pan passing’ technique), half way through the activity, labour gangs commence bargaining for a rate revision or for a ‘must have bonus’ to complete the assignment, thus cornering the employer into a difficult and helpless situation.

2.9.2 Employee perspective

Timescales for many construction projects are less than two years. The temporary nature of the employment and a high labour turnover has become common to the industry. Due to a lack of continuity with a single employer for a long period (compared to other physical production industries), many operatives within the construction industry become ineligible for the prevailing social security systems of the country.

The questionnaire survey carried out during the study by Wijewickreme (2010) amongst the operational workforce to identify their viewpoints and the difficulties they experienced showed that ‘Poor retirement benefits’ was top ranked in the identified reasons for selecting the future sector for their careers. The identified constraints of the operational workforce of the construction industry (on the negative impacts of working within the sector) are listed below.

1. Poor retirement benefits
2. Dissimilarities in salary scales
3. Gray areas in career development
4. The temporary nature of the occupation
5. Lack of social recognition
6. Non availability of recreation facilities
7. Being away from families and relatives
8. Political and social influences
9. Safety and sanitary facilities
10. Interpersonal relationships
11. A lack of trouble free communication
12. Influence from dependents
13. Improper gender balance
14. Behaviour of immediate supervisors

A comprehensive discussion of the constraints identified during the study are provided in the following subsections.

2.9.2.1 Poor retirement benefits

Retirement (United Nations, 1948) can be defined as the stopping point of someone's career. Retirement benefits can be explained as an assistance that is received by people who have stopped their career. Null or insufficient assistance received by people who have retired can be expressed as people with poor retirement benefits in general.

2.9.2.2 Dissimilarities in salary scales

The Equality and Human Rights Commission (2010) established "equal pay for equal work" as a concept that indicates that individuals who perform similar work should receive similar remuneration. In Sri Lanka, there are three classes of workers as established by the Wages Board for the Engineering Trade (2012), namely unskilled, semi skilled and skilled. In a practical scenario, it can be noticed that operational workers belonging to semi skilled and skilled categories in the wet trades (such as masons, tillers, renderers, bricklayers) receive greater gross returns than carpenters, blacksmiths and painters. Some office based employees belonging to the clerical or accounts' grades receive lesser gross remuneration than the wet trade operational workforce does.

2.9.2.3 Gray areas in career development

When comparing the opportunities available for career development between the wet tradesmen and joiners within the construction industry and the tradesmen within the electromechanical or mechatronics industries, wet tradesmen and joiners have fewer opportunities. One reason for this is that wet tradesmen need more practical skills than theoretical knowhow. Secondly, wet tradesmen are regularly guided and monitored by a separate technical team on site who have entered the construction industry via a different path. It appears that this said intermediate path functions as a blockage for the career development of wet tradesmen in the construction industry, because Maslow's Hierarchy of Human Needs (Maslow, 1943) is being restricted at this point.

2.9.2.4 Temporary nature of occupation

Work within the construction industry is, because of the nature of the industry, frequently of a temporary type. Due to its inherent nature of utilising a projectised environment (PMBOK, 2008), most of the recognised disadvantages (Usmani, 2013) of such a projectised environment are common within the construction industry at large. Such disadvantages can include:

- Authority and power can make a project manager egotistical
- The work environment can be stressful because a deadline is always present.
- Organisational resources may be duplicated due to the selfishness of project managers.
- Team members have a sense of insecurity because, once the project finishes, they may lose their jobs.
    - Individuals commence to leave a project in its later stages if they can obtain a new project elsewhere.
    - Replacement recruiting for vacant positions is difficult in the later stages of a project.
    - A longer learning curve is required for the transfer of responsibility and in bridging the knowledge gap.
- If the project becomes prolonged, the costs of employees and equipment can increase.
- If an organisation has multiple projects, there will be poor communication and cooperation among the different project teams

2.9.2.5 Lack of social recognition

It is common to judge a person's social status by his appearance in public. Despite their occupational skills and income, the dusty and undignified clothing worn by construction operatives commonly causes them to keep themselves away from the public. One example showing the social discrimination placed on construction operatives is that some restaurants close to ongoing construction sites sell "bigger, better, parceled food" at a discounted rate through a separate window in order to avoid construction operatives from entering their restaurants.

2.9.2.6 Non availability of recreation facilities

Although it is stated in the ICTAD Conditions of Contract (www.ictad.lk, 2015) that recreation facilities are a mandatory requirement, frequently proper recreation facilities are not provided on construction sites due to space constraints. The current situation does not appear to have reached an alarming and demanding level since many operational workforces find their own space that is suitable for group accommodation within suburban towns suitable for daily traveling. Companies sometimes offer reasonable sleeping spaces and supportive transportation mechanisms that are attractive to the work force because it increases their productivity when it comes to output based labour only subcontractors.

2.9.2.7 Being away from families and relatives

Being away from families and relatives appears to have some impact on new workers. Current practice for construction operatives is to work continuously for 26 days and then take four (4) continuous rest days that are sufficient for travelling to, and returning from, any part of the island. Workers are released by noon on the last pre determined working day of the month and then workers need to report to work again on the first working day of the next month before noon after spending four continuous days off altogether. These practices keep the construction operatives away from their families and relatives 85% of the time.

2.9.2.8 Political and social influences

Political and social influences can be regarded as highly influential factors within the construction operatives' profession. It can be observed that many youngsters use different professions on their National Identity Card that are not related to the construction industry. Driver, office assistant, dispatch rider, electrician, computer operator, mortar mechanic and sales representative are among the popular categories of professions used on their identity cards. A majority of them have left their professional status line empty on the identity cards (thus without using a construction related job category).

2.9.2.9 Safety and sanitary facilities

Safety equipment or Personal Protective Equipment (PPE) can be identified as the attire that is used by working operatives to protect themselves from occupational hazards (Beukes, 2014). PPEs usually include safety shoes, safety overalls, full body harness, safety helmets, safety glasses, hand gloves, tool belts, etc. This kind of equipment is rarely issued free of cost (FOC) to the workforce due to its comparatively high value. There is a high tendency for operatives to go missing with the equipment from the workstation on the very first day once such equipment is issued to them because approximate gross values of such PPEs (Personal Protection Equipment) are equivalent to a one month's remuneration of an average operative in Sri Lanka.

Sanitary and hygienic facilities for construction operatives are provided at an underspecified level due to the unavailability of local regulatory standards and the unavailability of an appropriate authority in Sri Lanka when compared with international standards published by institutions such as the Health and Safety Executive (HSE-UK, 2010). Facilities and regulations available for the factory workforces (MED-SL, 2004) in Sri Lanka can be seen reasonable when evaluated against the sanitary and hygienic facilities available for the construction sector.

2.9.2.10 Interpersonal relationships

An interpersonal relationship can be expressed as an enduring and in depth acquaintance or close association between two or more individuals that may be brief or long term. Such a relationship can be developed on many kinds of platforms such as day to day work interaction; solidarity and harmony; love and attachment; business and professional interactions or any other kind of social or political obligations.

Due to the temporary nature of construction that takes place in various locations, construction operatives have trouble in maintaining any long term close connections within society (The Island, 2014). This situation has an impact on colleagues, neighbours, family members, relatives and particularly on their partners. This temporary mania of construction operatives had now been gradually transferred to the thinking, acting, working and behaving patterns.

2.9.2.11 Lack of trouble free communication

Modern society has changed to using mobile telephones as the foremost mode of day to day communication. The compulsory handing over of communication equipment at a site entrance by construction operatives is common within the construction industry. Due to the poor quality of the temporary facilities and the high volume in the daily receiving and returning of mobile telephones by site security, it is common to have a high volume of damages, confusions and faulty exchange complaints on a daily basis, thus creating difficulties for the site administration. This situation discourages the use of mobile communication equipment by construction operatives and, in turn, results in further loneliness and isolation.

2.9.2.12 Influence from dependents

The uncertainty of income and a lack of social recognition can be put forward as one of the key reasons for the bad reputation of the construction operative profession from the families and dependents points of view.

Uncertainty of income can stem from the tropical climate in Sri Lanka. According to the official website of the Meteorological Department of Sri Lanka, there are 188 rainy days per annum (www.meteo.lk, 2014). When it rains, the construction operatives usually lose a productive day. It is common to experience 10 to 15 days per annum of complete site close downs due to rain. Adverse weather situations can cause many half days' working and quarter days' working for construction operatives.

Family members would love to see a smart looking householder departing and arriving from their homes and that is generally hard to achieve in the construction sector. Due to the nature of the construction industry and the bad reputation of its career development structure, it has become common for dependents of construction operatives to place pressure on the operatives to find an alternative profession. It has been commented that "…if I work 'smart' but not 'hard', I can become a manager within the next five years" (Wijewickreme, 2010, p. 10).

2.9.2.13 Improper gender balance

Female participation in the construction operational level is around 3 to 6% in Sri Lanka (Pathirage, 2008; Wijewickreme, 2010; Wijewickreme, et al., 2014). This percentage is around the norm and compares with 4.3% in USA (Swinney, 2005). It is common to see higher percentages of female workers in remote locations at a distance from the capital of Sri Lanka during off cultivation seasons working as unskilled construction operatives.

In the Capital city of Colombo, a low percentage of suburban females can be seen working as light duty cleaners during the testing and commissioning stages of building projects. A major difficulty in recruiting female operatives is providing secure accommodation.

2.9.2.14 Behaviour of immediate supervisors

The behaviour of immediate supervisors may provide one reason for high labour turnover because it is said, *"The supervisor's role is clearly important to the employee, but the exact prescription that should be given to the supervisor to reduce turnover is less obvious"* (Krackhardt, et al., 1981, p. 250). When fresh graduates are deployed to guide skilled craftsperson on setting out and in following up on detailed construction works, many clashes are observed between the parties. Craft persons usually seek authority to finalise the construction details thus following traditional practice on site without any concern for the details provided in the contract documents. Fresh graduates are inexperienced in managing difficult people (Gothberg, 1987) and this usually leads to clashes because they usually, firstly, try to apply their authority rather than utilise man management techniques.

Following a detailed review of both the employers' perspective and the employees' perspective of the behavioural constraints of the operational workforce in the construction industry of Sri Lanka, the next section discusses the Social security frameworks in developed countries.

2.10 Social security frameworks in developed countries

Social security systems were introduced after the Second World War to make sure that elderly would have an income after they finished working (United Nations,

2013). The same systems are still in place as of today throughout the globe and millions of people are receiving social security benefits, particularly in the developed countries. Developing countries to have some pensions, retirement benefits or Social Security (PR/SS) benefits but they are not available for the entire population of a country similar as in developed countries (ILO, 2011). The PR/SS systems that provide a regular income to the elderly is of huge advantage to those who receive the benefits.

According to the findings of Nancy Wagner and Catherine Lovering (2016), someone can retire and receive benefits as early as the age of 62 (2016) in the general context of developed countries. However, the minimum retirement age for government sector employees in Sri Lanka is 50 years for females and 55 years for males. Additionally, nongovernmental employees in Sri Lanka are eligible to redeem their one off entire payment of EPF and ETF (Employees' Provident Fund and Employees' Trust Fund) benefits at the age of 50 years for females and 55 years for the males. Further discussions on the currently available PR/SS systems in Sri Lanka for private sector employees and the applicability constraints of such systems with regard to the operational workforce of Sri Lanka are provided in Section 2.11 of this thesis.

The main advantage of PR/SS is that it gives some mental stability to people because it provides funding (e.g. for food) upon retirement. The USA's Social Security Administration reports indicate that 85 cents in each dollar paid into the system goes to retirees, their families, surviving spouses and to children whose parents have died. The other 15 cents goes to pay people who are on disability (US-SSA, 2013). If someone has, a disease or condition that may limit their lifespan, in such situations it is possible to commence collecting the benefits of PR/SS at an earlier age. Social Security bases its benefits on when someone chooses to retire, putting each individual in control of their finances.

There are seven major developed countries pertaining to three continents according to the country classification of the United Nations Department of Economic and Social Affairs (United Nations, 2013). The geographical positioning of the major developed countries and their respective continental details are shown in Figure 2.2 of this thesis.

Maintaining a formal Social Security system is an essential requirement in maintaining a developed status in the global ranking system according to the Universal Declaration of Human Rights (United Nations, 1948). Before narrowing down the research towards the construction Industry of Sri Lanka, a review of the current global scenarios was carried out.

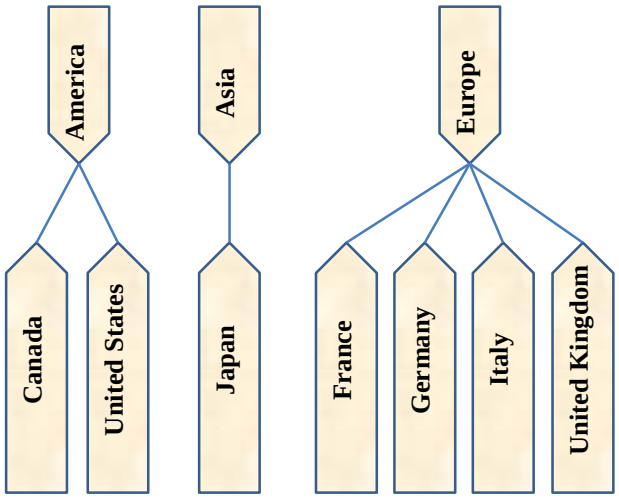

Figure 2.2 : Geographical positioning of the major developed countries

Europe has a greater number of major developed countries than America and Asia. The African and Australian continents do not have any major developed country of UN according to the ruling of the UN.

The UN has listed seven countries as being the major developed economies in the world (United Nations, 2013). When looking at the PR/SS systems within the global scenario, there are primarily two systems. All the European countries and the countries on the American continents have a system based on the PAYG or Pay As You Go system. Accordingly, six major developed countries in Europe and American continents are utilising the PAYG category with the exception being Japan as the only developed country in Asia.

It is common that public pension systems are financed on a pay as you go (PAYG) basis where pensions for retirees are paid by the contributions of the working age population. It is well understood that PAYG systems require a balance between the benefits paid to the pensioners and the contributions made by the active workers. This is generally referred to as intergenerational solidarity. A successful PAYGO

system needs to reflect intergenerational solidarity and long term sustainability as well (Olivares, et al., 2012).

A country by country discussion on the currently available PR/SS mechanisms for all the developed countries (United Nations, 2013) are described in subsections 2.10.1 to 2.10.7 of this thesis. Japan primarily uses an insurance based structure. Because this Japanese variation differs from the commonly used PAYG systems, their PR/SS mechanism is elaborated upon more thoroughly in Section 2.10.3 of this thesis.

2.10.1 Canadian Pension Plan (CPP)

In 1965, the Liberal government of Prime Minister Lester B. Pearson first established the Canadian Pension Plan. In 1965, contribution rates were first set at 1.8% of an employee's gross income per year and a maximum contribution limit was set. By the middle of 1990s, however, this low contribution rate was not sufficient to keep up with the Canadian aging population. As a result, the total CPP contribution rates for both employee and employer together were raised to an annual rate of 9.9 per cent by 2003.

Retirement and pension benefits in Canada are managed by Employment and Social Development Canada, Department of Human Resources and Skills Development Canada (HRSDC, 2013). The Canada Pension Plan (CPP) provides benefits to its contributors and their families (retirement, disability and survivor benefits). The country’s benefit system for retirement covers the entire population through three primary systems:

- Canada Pension Plan at 60 years of age
- Old Age Security at age 65 years
- Disability Plan

There are no major differences in the social security system between British and French parts of Canada (Angers, 1944). Conceptually CPP is a Pay As You Go (PAYG) system similar that in the European and Latin American Countries. From the late 1980s, PAYG in Canada faced financial difficulties for maintaining the mechanism (Zhang & Zhang, 1998). Later a Funded System (FS) was modelled

and suggested to overcome the difficulties of the then current PAYG system due to aging population. Some economic researches have argued that PAYE is a better concept than FS (Ediev, 2013), (Holzmann, 2013) (Billing & Menard, 2013) from the viewpoint of economics.

2.10.2 United States' Social Security System (US-SSS)

The requirement for a social contract has been discussed since the 17th century (Rousseau, 1913). Around 1870 when 50% of the US's adult workers were farmers, the idea of a Social Security System began to formalise (Rezneck, 1935). The formal system of the current US's Social Security commenced in 1935 (during the presidential era of Franklin D. Roosevelt (US-SSA, 2013)) in order to overcome the depression that commenced in 1929 and to assist workers due to the unavailability of required financial resources within the local communities or within private charities to cope with the needs of the American people.

The American scheme was established on a PAYG mechanism that is discussed in Section 2.10.1 of this thesis. According to the studies carried out by (Zhang & Zhang, 1998; Grafstein, 2009 and Sam, 2012), payroll taxes introduced through PAYG principally appertained to the sector of wages and remunerations. However, minor percentages were contributed through the profits of employers according the arguments of some other studies (Hall, 1938).

The benefits of the initial system introduced via the US-SSS were limited to the workers only and dependents were not covered under the scheme (Feller, 1941; Lemkin, 1944 and Witte, 1944). In 1939, a major amendment was made to the system by adding two new categories of beneficiaries: spouses and the children under the age of majority of a retired worker (US-SSA, 2013). Entitlements for spouse or spouse's became difficult to monitor in a country with a large population and with a considerable number of divorces and remarriages.

Currently, US-SSS provides four major Social Security programmes and Medicare plans (US-SSA, 2013) for the employees of the country.

- Retirement
- Disability
- Survivors
- Medicare

Financial deficiencies relating to the US-SSS commenced in the early 1980s (Schieber & Shoven, 1994) and during 1990 to 1998. Some controversies were caused when funds were re invested in arms, tobacco and alcohol manufacturing industries (Statman, 2000). Soon after the Second World War, the population in US commenced booming. During 1951 and 1954, 70% of primary school students were in the 5 to 6 years of age bracket. The American people belonging to 'Baby Boom Generation' (i.e., 1946 to 1964) are now at retirement age. The impacts arising due to this aging population are similar to those facing the Canadian Pension Plan, as explained in Section 2.10.1. The US-SSS had foreseen the financial drought well in advance and had prepared (Schieber & Shoven, 1994) to face its reality.

In addition to the aging population, it appears from the literature that what was not predicted by the US-SSS were other lateral impacts such as the increasing costs of healthcare and pharmaceuticals (Schmidt, 1996), the timing of retirement or the early retirement age, as discussed by (Samwick, 1997) and (Gustman & Steinmeier, 2002). A decline in labour force is another major cause of difficulty in the US-SSS according to a review (Gruber & Wise, 1998) when making a comparison between the US and the international picture.

Due to declining benefits and the increase in the aging population, suggestions for reforming the current US Social Security system are increasingly reviewed.

2.10.3 Japan Pension Service (JPS)

Japan is the only Asian country recognised as a major developed country according to the classification of the United Nations Department of Economic and Social Affairs (United Nations, 2013). However, China, India, Korea, Malaysia, Pakistan, Philippines, Singapore and Turkey are among the under developed major countries in the West and South Asian region (Akyuz, 2010). It appears that Akyuz has avoided analysing the West Asian economies primarily energised and boosted by fossil fuels.

Japan was slow in commencing a social security system (Odaka, 2002) when compared to the other developed countries. It is said that the Buddhist cultural relationship between Taiwan and Japan goes back to the approximately 1 BC. The initialisation of a social security system in Japan was influenced by the lessons learned from Taiwan's social security system (Chandoevwit, 2007). Taiwan is a country that has one of the oldest structures of social security system in the world that was developed in 1901.

From the early years of the twentieth century, Japan initiated converting rapidly from an agro based social structure to a services based society alongside a modernised urban social life by producing high value state of the art industrial production for the international market. These changes brought important implications for welfare and health policies (Tirado & Tamiya, 2014). The Japan Pension Service (JPS or '*Kokumin Nenkin'*) or Workers' Pension Insurance Act was introduced in 1942 as a PAYG system in Japan based on several recommendations and efforts that had taken place since the 18th century (Masayoshi & Foxwell, 1900; Africa, 1915 and Hur, 2009). Later, in 1944, the word 'workers' was changed to 'employees' in order to have a better respectable appearance and to be in line with the traditional Japanese value system for elderly people which emphasises family faithfulness (Tirado & Tamiya, 2014). After the end of Second World War, once again rapid changes were seen in the industrialisation and urbanisation in Japan. Amending, modifying and restructuring the pension scheme from time to time became a necessity (MHLW, 2014, p. 11). Major reformations were introduced in 1954 and in 1961 and a National Pension Act was created in 1959 (Hur, 2009) with universal pension coverage for residents of Japan.

After modifications made around the 1970s for the JPS, the system was capable of addressing personal, occupational and public sections longitudinally. This multi tier social security structure commenced once again facing aging population difficulties (much faster than any other country in the world between 1990 and 2000). The JPS was aware of the forthcoming challenges of the new Millennium due to the influence of the aging population, the impacts of fertility ratios and the declining trend in the workforce and their contribution (Conrad, 2001) (Ogawa, et al., 2008). The JPS had preplanned the Millennium reforms well in advance. During the process of remodeling and reframe working the JPS, impacts generating from household savings were taken into account as well (Horioka, et al., 2007). Several models introduced by researchers such as (NIshimura & Zhang, 1995); (Gruber & Wise, 1998) and (Yashiro & Oshio, 1999) were validated. The primary concern was given to the frameworks where the sustainability (Allianz, 2014) of the mechanism was addressed in depth (Fukawa, 2006). Some features and influences from German frameworks too were utilised when transforming the JPS to suit the aging population.

On some occasions the Japanese did consider and evaluate the PR/SS frameworks on agent based structures (a delegation of responsibility) but less importance was given to this due to high costs of overheads (Chen & Murata, 2010), the risks of sustainability and doubts regarding the stability or longevity.

During the Millennium reformation modelling, the focus was on three major economic sections:

a. Subsistence and healthcare expenditure
b. Survival probabilities
c. Deterministic discount factors

The pension provision validations on the gender based calibrations (males and females separately) proved that Millennium reformation model adequately met the retirement needs of the current elderly at the age of 65 years (Chia, et al., 2008). This age limit set up by the JPS for Millennium reformations is one of the highest in the global scenario.

A timeline diagram of the social security development in Japan is depicted in Figure 2.3.

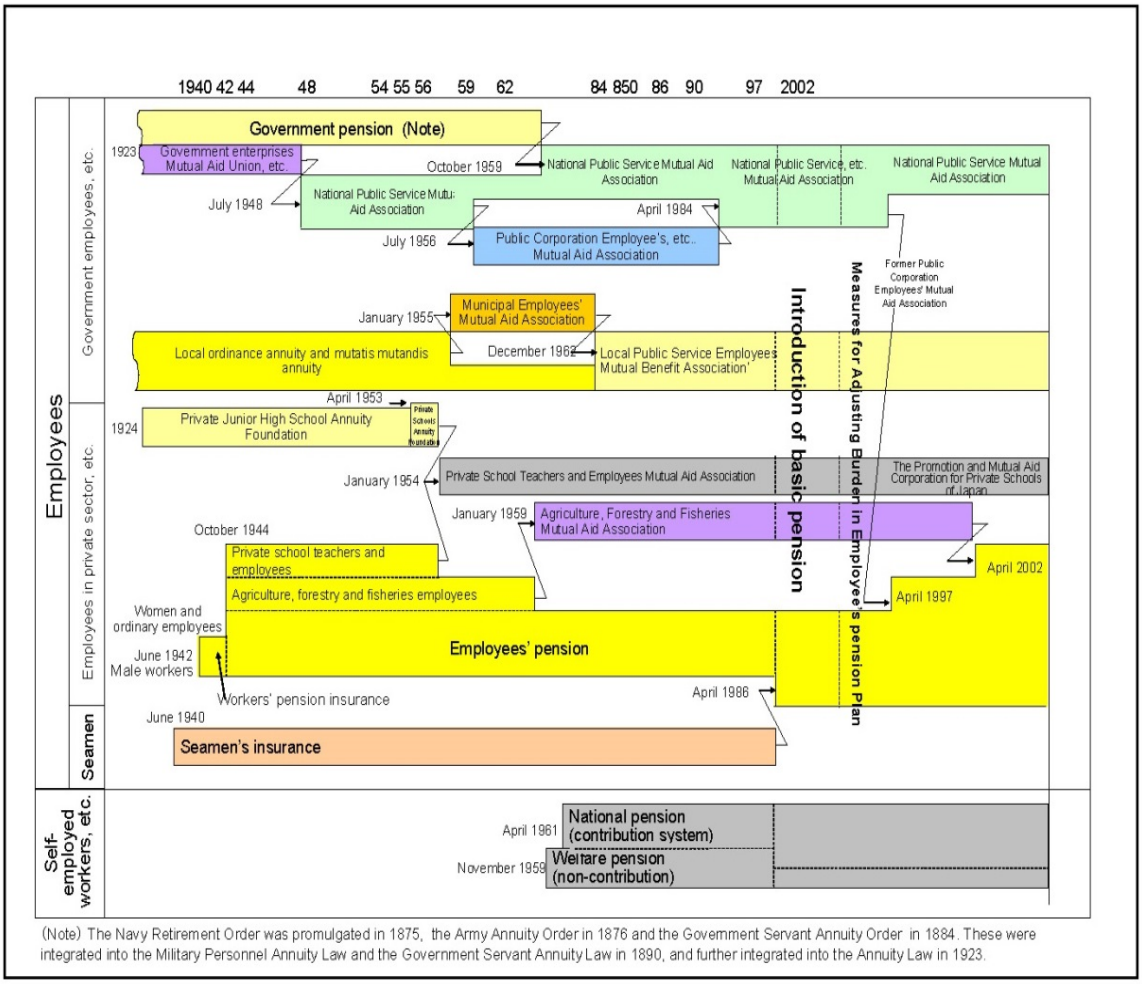

Figure 2.3 : Timeline of social security development in Japan
(Source: JPS, 2014)

A summary of the key chronological changes introduced to the JPS are as follows:

a. 1942 The workers' pension insurance law was enacted
b. 1961 – Introduction of the national pension scheme (Universal scheme)
c. Late 1960s to early 1970s Pension benefits improved
d. 2000 Introduction of the current system

In the current system of social security in Japan, all citizens are covered by public pension and health insurances that are the main instruments of the social security system in Japan. Citizens over and above the age of 40 gain the benefit of a long term care insurance (Kojima, Katsuhisa, 2011). Work related accident insurance and employment insurance are compulsory for employed citizens. Since arrival of the new Millennium, Japan has adopted a social security, scheme similar to an insurance scheme. This can be grouped under the following five headings:

a. Public pension
b. Health insurance
c. Long term care insurance
d. Work related accident insurance
e. Employment insurance

The JPS is a 'must' system for all the registered residents of Japan between the age of 20 years and 60 years (for both native and foreign individuals). The JPS is not merely social security. It is also concerned with the health status of its citizens and it is one of the key determinants within retirement decisions (Oshio, et al., 2011). Information required in order managing, update and review the functionality are obtained through networking with people (Murakami & Tanida, 2011). Similar to the schemes in many other economies in the world, the JPS is based on the 'Pay As You Go' (PAYG) mechanism. Contribution payments must be paid by the employee (various payment options are available such as via banks, post offices, retail shops, online etc.) continuously for a minimum period of 25 years in order to become eligible for Japan's retirement benefits' service. Some exceptions are available for people who have trouble with delayed or defaulted contribution payments. The retirement benefits have a lifelong validity once people are eligible for the service.

The Social Security System in Japan has been managed by the Japan Pension Service or 'Kokumin Nenkin' since 1 January 2010 (JPS, 2014). The JPS has a two tier structure that further distributes its benefits into three combined categories of matrix to address a variety of vocational and social patterns.

The system is supported by four government Ministries:

a. Ministry of Health, Labour and Welfare
b. Ministry of Finance
c. Ministry of Public Management, Home Affairs, Post and Telecommunications
d. Ministry of Education, Culture, Sports, Science and Technology

An overview of the JPS is depicted in Figure 2.4 (MFJ, 2014). In the Figure 2.4, the national pension is the first tier and the base structure (which is supported by the Ministry of Health, Labour and Welfare.

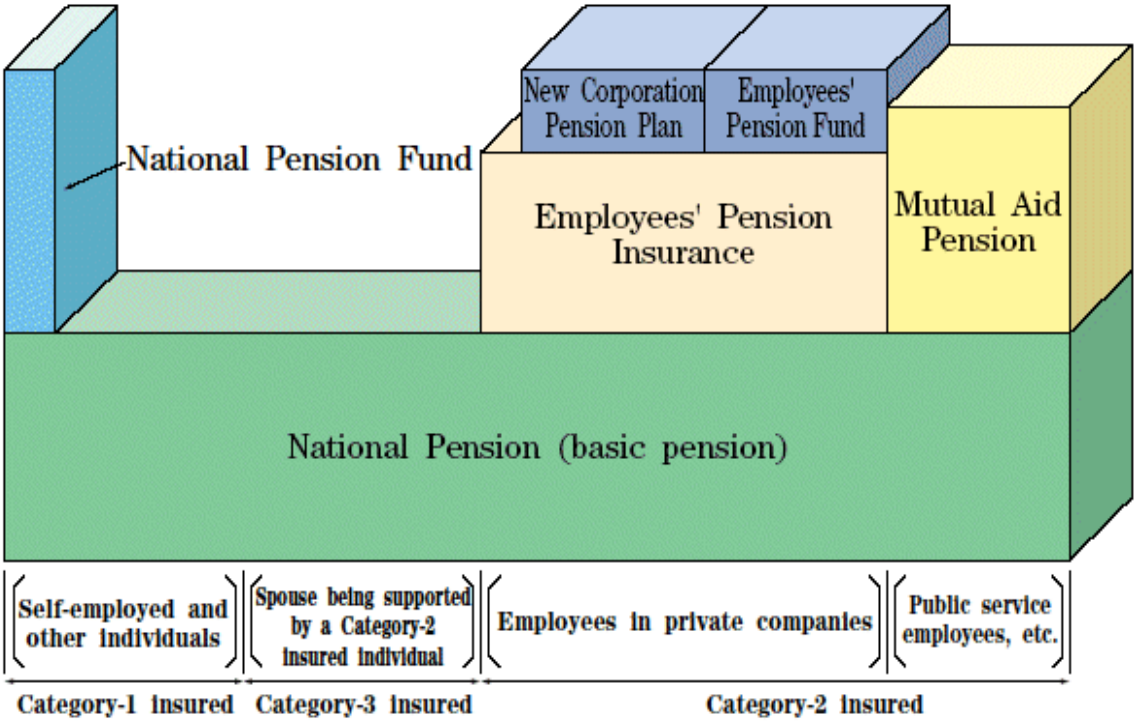

Figure 2.4 : The Japan Pension System
(Source: MFJ, 2014)

Depending on their occupations, people are classified into three categories in the National Pension System or the base tier. The same categorisation group will

prescribe the additional benefits that an individual can apply for, as tabulated in Figure 2.5.

<table>
<tr><td colspan="2" rowspan="2">Occupation etc.</td><td colspan="3">Schemes and premium</td></tr>
<tr><td colspan="2">Scheme</td><td>Premium</td></tr>
<tr><td colspan="2">Self-employed persons, farmers, students, etc. (those of 20 years and over – under 60 years old, excluding those shown in the following columns)</td><td colspan="2">National Pension
[No. 1 insured person]</td><td>14,660 yen per month
(fixed amount)
* The premium is increased by 280 yen each year and finally fixed at 16,900 yen.</td></tr>
<tr><td rowspan="2">Emplo-yees</td><td>Employees under 70 years old in private sector covered by the Employees' Pension Insurance (Private company workers etc.)</td><td>National Pension
[Category-2 insured person]</td><td>Employees' Pension Insurance</td><td>15.704% of total remunerations that combine monthly income and bonus
(Premium is evenly borne by employers and employees.)</td></tr>
<tr><td>Public employees and private schools' teachers and employees</td><td>National Pension
[Category-2 insured person]</td><td>Mutual Aid Pension</td><td>The premiums vary according to the Mutual Aid Associations, ranging from 12.230% to 15.154% of one's monthly income and bonus. (employers and employees bear evenly)</td></tr>
<tr><td colspan="2">Full-time housewives etc.
Dependent spouse of the employee (wife or husband), who make a living mainly by the employees' income)</td><td colspan="2">National Pension
[Category-3 insured person]</td><td>The insured pay no premium (it is borne by the Employees' Pension System (the Employees' Pension or the Mutual Aid Pension) in which his or her spouse has participated)</td></tr>
</table>

Figure 2.5 : Categories and Premiums for Beneficiaries
(Source: JPS, 2014)

The selection of additional benefits is undertaken by the choice of the individual citizen. The determination of the individual pension benefits are selected prior to the submission of the application to receive the retirement benefit or the premium.

The financial resources depicted in Figure 2.6 of this thesis are compressed into the following Basic Pension systems:

a. Contributions to the National Pension (Category1: Insured person pays contribution individually).
b. Contributions from insured persons to the Employees' Pension Insurance and Mutual Aid Associations (The Employees' Pension Insurance and Mutual Aid Associations contribute to the National Pension according to the number in Category 2; insured person and their spouse, and in Category 3: insured person).

c. National subsidiary (In principle, 50% of the expense comes from the Government Basic Pension System).

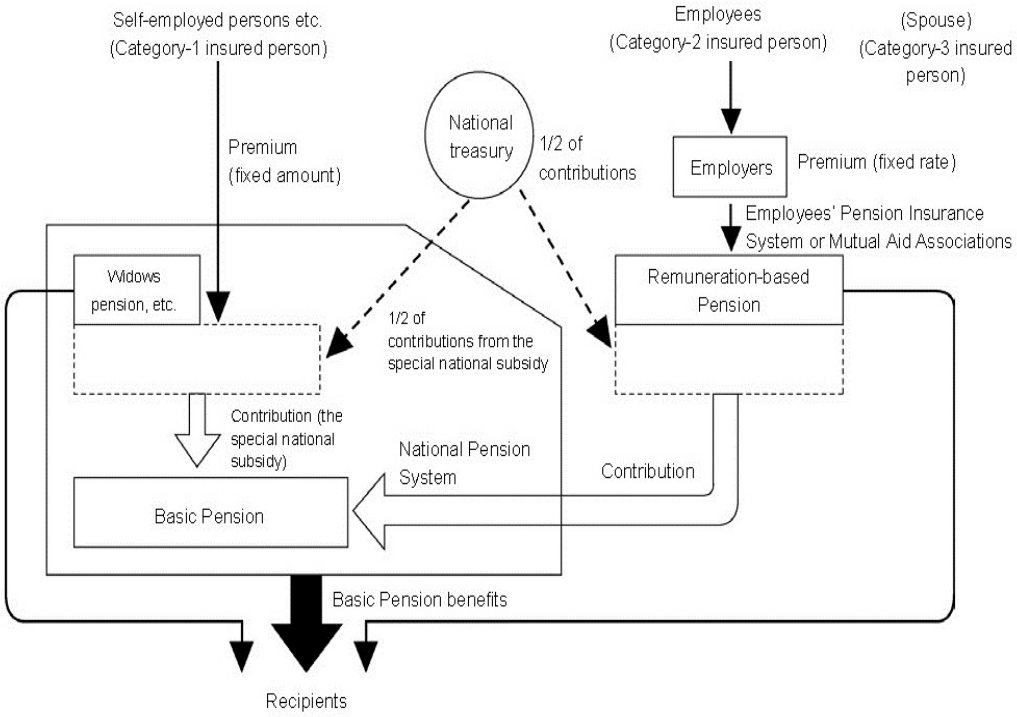

Figure 2.6 : Structure of the financial resources
(Source: JPS, 2014)

It can be seen from Figure 2.6 (the structure of the financial resources) that it is evident that the government is undertaking responsibility for the old age period of the Japanese workforce. The workforce are further enhanced by the common PAYG structure and the service sector employers and can receive additional benefits. These mechanisms automatically encourage individuals to divert towards production sector employment.

2.10.4 French Social Security System (FSSS)

Development of the French Social Security System (FSSS) was influenced by several political and economic occurrences during the past century within the neighboring countries of France, such as in Germany (Chapter 2.10.6) and the United Kingdom (Chapter 2.10.7). Currently, FSSS can be seen as a complex network that includes a variety of benefits for the entire population of France. The Industrial Revolution during the 19th century had a profound impact on FSSS, as it did in other European countries. During the past few decades, the growing

population of working class have commenced to regulate their livelihoods on remuneration based regular income. The passion for having a remuneration related income related to modern industries has increased the social risks of the responsibilities depending on the type of the occupation.

After the Wald War 2, the traditional mechanisms of communities that have supported social risk management mechanisms (Guilds, religious centers, family relatives and neighbours associations) gradually decreased mainly for the reason of the unavailability of having time for social events that is influenced by occupational pressure. Because of disconnection from social networks, people were at a greater risk of becoming vulnerable when they faced situations such as unemployment, occupational injury, sickness and old age. The applicability of the traditional law of tort was ill adapted to help during such situations that commonly occurred. Even for applicable occasions (Keeton, 1962), implementations were poor and rare since, the distribution of power had an imbalanced situation between the employers and employees.

During the first stage of the French Revolution in 1791, mutual aid societies were developed, diluting the old Guilds. In the era between the late 19th century and the early years of 20th century, a structure to support social development was commenced. During those days, a social supportive structure appeared as useful but supportiveness was limited only to a segment of society. The system was managed purely on the voluntary contributions received from the working people. There would always have been differences in the contributions since attitudes towards the contributed amount varied depending on the individual's mentality. These kinds of contributions were considered as the final option available for the underprivileged citizens. Such supportiveness was insufficient for protecting a population at large. Since then, the evolvement of new institutions capable of providing protection that was more adequate could be seen to slowly develop in society. In 1898, a law was passed by French Government relating to occupational injuries and this established the principle of absolute liability with the employer. In 1910, the first law was passed in France for a mandatory old age pension scheme benefiting the entire population of the country. The framework, which was a combination of a variety of schemes suitable for different occupational categories

(such as railway men, mineworkers, seaman and civil servants etc.) had only a small impact at its beginning.

The current French social security system is structured on a number of statutory schemes such as:

a. A compulsory general scheme which covers most employees and certain other categories (students and beneficiaries of certain benefits that have progressively come under the general scheme),
b. Various "special" schemes covering specific categories of nonagricultural workers against all or some risks (usually old age, with other risks being covered by the general scheme),
c. Compulsory basic and supplementary pension schemes, such as the health insurance scheme for nonagricultural, self employed workers,
d. An agricultural scheme which covers agricultural sector employees and non salaried workers against all risks. The agricultural scheme's provisions are similar to those applicable under the compulsory general scheme,
e. An unemployment insurance scheme covering all wage earners and managed by representatives of employers and employees.
f. The supplementary pension schemes (ARRCO *or L'Arrco - Association pour le régime de retraite complémentaire des salariés*) and (AGIRC or *L'Agirc - Association générale des institutions de retraite des cadres*), which are compulsory for all employees affiliated to the general and agricultural schemes (Cleiss, 2014).

The initial intention of the FSSS scheme was to provide benefits for all the residents of France. At the time of commencement of the universal social security coverage for all the residents of France, considerable opposition was developed from the self employed residents. A similar opposing situation was reported in Sri Lanka when GOSL began to convert the prevailing EPF system to a lifelong PR/SS tfor the textile industry employees in the Katunayake Free Trade Zone (FTZ) in Sri Lanka causing the death of one life in May 2011 (The Island, 2011).

In the recent past, the FSSS commenced has hit difficulties due to the self complexity of the system. Fiscal unsustainability for the medium term was a major

concern due to regional recession. It appears that these constraints have now been resolved in the FSSS when evaluating the last few years against the current situation. A higher level of fiscal fragmentations and dissimilarities in patronage treatment have been identified as the areas that require constant concern by the policymakers. Despite the described constraints, the FSSS can be considered as another substantial mechanism that covers the periods beyond employment responsibilities (Guardiancich, 2010). The FSSS may change their mode of operandi in the future as replacement rates are in a decreasing trend because social appropriateness usually cannot be considered as a perceived or significant political constraint.

Since the commencement of 1980s, the FSSS has been considering a restructuring based on workforce movement and the complexities relating to systemic disintegration. From that point onwards, elderly people commenced enjoying comparatively high social security advantages. It appears that social competences were considered only on an occasional level during the reform discussions because policymakers were more focused on the calculations relating to retirement benefits in basic returns, the duration of the contributions and the setting up of an individual plan for capital savings. When comparing looking at the reformed structure, it can be noticed that a substantial portion of the old system remains unchanged and constructions relating to inherent fiscal mechanisms are left unresolved. Any pension, retirement benefits or social security system that is not capable of being synchronised with a variety of other prevailing schemes of a similar nature means the persistence of an inequality among the categories of benefiters (DICOM, 2012). Employees of statutory organisations and civil servants in France required participating in ‘régimes spéciaux’, which provide better and generous conditions during retirement age; also regarding the period of qualifying and formulae advantages.

In 1959, the FSSS identified the requirement of having corresponding organisational setups in overseas countries in order to liaise with the main body and other inland institutions within France known as *(Le’ Cleiss - Centre des Liaisons Européennes et Internationales de Sécurité Sociale)* well before the European

Union was formed (Cleiss, 2014) and the FSS implemented the constitutional requirement for an establishment of such a nature.

2.10.5 German Statutory Pension (GRV)

Germany is considered the first nation in the modern world to introduce a pension, retirement benefits and a Social Security system (PR/SS) among the developed countries identified by the United Nations in 2013. The Chancellor, Otto von Bismarck in 1889 (www.ssa.gov, 2014) initiated the PR/SS mechanism in Germany as an insurance scheme called '*Gesetzliche Rentenversicherung'* (GRV) which was outlined by Germany's Emperor, William the First, through an innovative letter to the German Parliament in 1881. Therein, William pointed out that *"… those who are disabled from work by age and invalidity have a well grounded claim to care from the state"* (Nybo & Alexander, 2013, p. 24).

Over and above the insurance scheme of William the First, Bismarck pursued a broader aim towards introducing a social insurance scheme in Germany to encourage wellbeing among the workers in order to gain maximum efficiency and to avoid proposals for socialist alternatives by radical civilians.

Regardless of Bismarck's unimpeachable credentials as a rightwing leader, he nevertheless invited socialists to assist in introducing these programmes to the public, which was somewhat similar to the actions taken 70 years later by American President Roosevelt. During a parliamentary debate in 1881 on PR/SS of Germany, Bismarck replied to the opposition saying, "Call it socialism or whatever you like but it is the same to me" (Pannier, 2009, p. 10).

The PR/SS of Germany generally provides instrumental benefits and disability related assistance. The system is a tri partial arrangement based on mandatory contributions from employees, employers and the government. The system is further interlinked with the "Sickness protection" endorsed in 1883 and the "Workers' compensation benefits" introduced in 1884 (Pannier, 2009). The German PR/SS system became comprehensive in 1927 with the introduction of "Unemployment assurance".

A factor of the German PR/SS is that its standard retirement age has often been set beyond the usual level. Currently it is set at 65 years. Germans set the initial retirement age at 70 years (Bismarck was 74 years at that time) in 1889 and 27 years later (between 1916 to 1918 following the death of Bismarck) the standard retirement age was lowered to 65. This unusual age standard established by the Germans became important to many other countries. One example is that Americans, straightaway, adopted their retirement age as 65 years utilising the benchmark established by Germans.

From the commencement of PR/SS by Germany in 1889, the system has been managed a popular mechanism called the PAYG framework. Even today, pensions for the retired are paid from the current premiums of those who have not retired yet. Currant participation in the GRV system is around 85% of the gross workforce in Germany (www.ssa.gov, 2014). Around 9% receive their benefits from an independent mechanism established for civil servants and self employees are allowed to participate in the common platform of GRV if they wish to do so.

Germany's PR/SS system (called GRV) can be considered as a properly structured social security system. Whoever participates in GRV can be considered as being well protected against the bigger risks of life such as unemployment, occupation related accidents, and general illnesses when aging, since the system has 5 categories for serving its participants:

A. Pension insurance
B. Unemployment insurance
C. Health insurance
D. Care insurance
E. Companies' accident insurance

Every employee working under any kind of employment agreement in Germany or working without a documented contract (with some exceptions) in Germany becomes eligible for all of the aforementioned social security benefits.

The stated insurance systems, contributions towards a pension, unemployment cover, health and care are shared equally by the employer and employee, whereas segmental costs for accident insurances are paid by the employer in full. There are

several pre fixed ceiling limits available for pension, unemployment, health and care insurances, and monthly instalments costs are calculated for the participants. In other words, there are pre fixed limits for contributions for the benefit schemes and the earnings over and above the limit are free to be spent at the sole discretion of the employer without any liability to the GRV.

The PR/SS system operating in Germany is considered as an iconic framework that has received global respect and attention since its commencement. The endpoint practicability of the system has been considered and high attention has been given to safeguard its containment of short term costs, medium term sustainability and long term reforming capabilities. Meanwhile, the rest of the world including Central Europe, Eastern Europe, USA and the Latin American countries began to consider GRV as the exemplar framework of PR/SS (Lipset, 1996). The German system of PR/SS still receives global attention for its multi pillar framework based on continued dependability on privately financed initiatives; it is not a direct redistributive system or a public stanchion.

> *"German public pension benefits reflect employment and earnings outcomes prior to retirement"* (Haan & Prowsec, 2014).

Nowadays the PR/SS of Germany is of some concern since the system was not pre planned to face the challenges of early retirement, unemployment factors, challenging economic conditions, an increasing aging population and the combined impacts developed by various other factors (Freitas & Martins, 2014). It is not the intention of this literature review to carry out an in depth examination of the PR/SS of Germany because each system has its own complexities when looked at in depth.

2.10.6 Italian National Social Security Institute (INPS)

The PR/SS in Italy is managed by the National Social Security Institute (INPS - *Instituto Nazionale Previdenza Sociale*). The institution usually provides benefits to face difficult situations such as illnesses, unemployment or maternity leave for both organisational employees and for freelancers (Torso, et al., 1997). Providing PR/SS, providing benefits for elderly citizens and disabled employees and providing allowances for families living overseas are among the responsibilities of the institute

(Angloinfo, 2000). However, the National Health System (NHS or SIP - *Societa´Italiana di Pediatria*) is managed and administered independently as a separate entity.

The history of PR/SS in Italy commenced with issuance of the Royal Decree number 30 of 17 Mar 1898 (Costamagna, 2013) for the benefit of factory workers nationally as an Insurance Fund for Invalidity and Ageing (CNAS). The mechanism was more of an insurance scheme with voluntary features although it received funding benefits from the State Government in addition to the contributions received from the employers. Throughout the following years, after its inauguration, the PR/SS in Italy broadened its horisons gradually.

- In 1919 it became a an organisation to which it was compulsory to pay, affecting 12 million workers
- In 1933 the Agency was retitled National Institute for Social Insurance (INPS- *Instituto Nazionale Previdenza Sociale*)
- In 1939 a host of new benefits were introduced which included unemployment insurance, widows' pensions, family grants and tuberculosis benefits. The introduction of redundancy funds too occurred during this year and pension ages were lowered.
- In 1952, the pension system was reformed and minimum benchmark level for pensions were introduced.
- In 1968 to 1969, the contribution related system was replaced with a retribution related system that related more to previous wages. New measures were introduced for workers and employers with a view to facing any production crisis.
- Circa the 1980s INPS was linked to a new healthcare insurance system
- In 1989, INPS had to go through an administrative reformation exercise since 1990 was pre planned as being the year when private workers got their pension related to the yearly income of the company.
- In 1992, the financial disorders of the early 1990s brought an increase in the pension age during this year and voluntary private insurance schemes were introduced the following year.

- In 1995 further reformation came in order to reduce fragmentation between public spending and to make alignments complete through an Act introducing a flexible pension age between 57 and 65 years. These reformations rolled back to the contribution system of 1992 once again.
- In 1996, pension coverage for new flexible workers was introduced.
- Finally, in 2004, an act called ‘Maroni’ was outlined as another reformation and was introduced from 2008 by the new left orientated government that came to power in 2006.

Although the life expectancy rate of Italy has dramatically increased during the past few years, it is currently experiencing one of the lowest seen fertility rates among developed countries (Brugiavini, 1999). This predicament is partially compensated by the magnitude and frequency of immigrants to the country but even the most optimistic forecasting does not suggest an improvement in these circumstances. By 1984, the positive effects of the baby boom generation were already fading (Schieber & Shoven, 1994), and the proportion of the elderly and the underage population to the working age population has been roughly consistent since then (Brugiavini, 1999). Studies have shown that, by 2030, each individual will support 0.4 elderly individuals and that this proportion may rise to 0.56 by 2050.

The Italian welfare system is involved in providing means’ tested benefits for individuals and households in need. Its benefit areas include:

- Old age pension plans
- Early retirement plans
- Invalidity plans
- Survivors’ plans
- Sickness plans
- Unemployment plans
- Family, paternity and maternity benefit plans
- Work related injuries and occupational diseases’ plan

The Italian system of social protection is not structured according to universal terms and conditions except for its health care systems. The cause for this is that, to be

entitled to some benefits from the system, a beneficiary needs to fulfill certain requirements.

All employees working in Italy have to be compulsorily registered with the General Compulsory Insurance Scheme. Both employees and freelancers are automatically covered by the current social security system. However, some exceptions are seen for the professional or gold collar workforce including lawyers, doctors, engineers and the like (Wijewickreme, 2010, p. 14) who are registered under specific private funds managed by their specialised institution. For this reason, the gold collar workforce is entitled to establish rules of its own according to corporate governance (Lipton & Lorsch, 1992) set forth by the national law.

The Italian social security system is mainly funded by the common tax systems of the country implemented on all residents within Italian territory and through social security contributions paid by employees and employers working in Italian territory. The National Health Service (*Servizio Sanitario Nazionale*) is, in particular, funded by these means.

The contributions to the Italian social security system by each individual employee are calculated as a percentage of his/her income, the rates of which are fixed by the governing bodies based in the sector, the contractual arrangements, the professional qualifications of the employee, the number of employees and the location of the business. The employer is responsible for paying both his and his employee's contributions to the system, usually on a monthly basis.

For self employed individuals, contributions to the system are calculated by applying the income tax return for the relevant year on the declared total labour income. Particular reimbursements of contribution rates are concerning the self employee's family members who actively participate in the production activity such as farmers, sharecroppers and holders of small holdings.

With respect to the public pension scheme of Italy, employees are registered for three varying models of pension schemes based on their seniority in the industry at the time that reformations occurred in 1992, 1995 and 2011. They are namely, earnings related (retributive), superficial (pro rata) and contribution based (contributive). These schemes differ vastly in terms of the computation formula

applied to determine the benefits offered for each of these pension schemes and all three schemes are pay as you go (PAYG) funded.

The new all inclusive pension reform introduced by the Monti Government at the end of 2011 put forward some major changes in the pension schemes with an immediate aim of reducing the rate of spending for pension schemes via a significant escalation of the retirement age. The reforms established that the eligibility age of PR/SS for women who were employed in the private sector should rise from the then current 60 to 62 years in 2012 and gradually increase to up to 66 years of age by the year 2018, whereas men's retirement age would rise directly to 66 years in 2012.

The reform also introduced much stricter limits to early retirement. Since 2012, early retirement before 62 years of age is possible if one has an accumulation of 41 years of social contributions for women, or 42 years for men, but with reduced benefits. It has also been confirmed that retirement ages and the seniority record for the early retirement option is to be increased following the increase in respective life expectancy levels. When the first employees who in their life have only contributed to the *'contributive'* or Notional Defined Contribution (NDC) will retire around 2040, the effective retirement age will reach 69 years and the seniority record for early retirement will be established at 44 years for women and 45 years for men.

With regard to private pensions, it has to be stressed that, since 1993, Italian policy makers have favored the development of funded supplementary supports in order to compensate for retrenchment interventions in the public pension system. Supplementary supports were introduced on a voluntary basis; they are fully funded and provide Defined Contributions' (DC) pensions only.

The supplementary supports are organised through three different types of collective occupational pension institutions:

- Limited or Closed Pension Funds (CPF)
- Public or Open Pension Funds (OPF)
- Selective or Personal Pension Plans (*Piani Individuali Pensionistici*)

Limited funds are generally set up as not for profit institutions within the framework of collective bargaining between employer and trade unions. Open funds are promoted and managed by banks, insurance and investment companies. They can offer both personal and occupational (i.e., based on a collective enrolment) plans. Since 2000, personal pension plans can be offered additionally through the life insurance contracts of PIP.

Unemployment benefits schemes are financed by contributions from employers, providing earnings' related benefits. However, a special unemployment assistance scheme neither exists nor has been tested. There is no possibility of voluntary insurance. Freelancing and para subordinate workers are not covered by the unemployment benefit system (apart from a means' tested benefit provided to some, very small, categories of para subordinate workers).

A reform approved by the Parliament in the summer of 2012 strongly modified the unemployment benefit schemes. It abrogated the mobility allowance and changed the duration and the generosity of unemployment benefits. The ordinary unemployment benefit has been replaced by a new benefit, called ASPI (*assicurazione sociale per l'impiego*), which arranges for individuals to be insured with the National Institute for Social Security for at least two years if they have accumulated at least 52 weeks of contributions in the two years preceding the cessation of the employment. The ASPI will be paid up to 12 months (18 months for people aged over 55) and the replacement rates will be around 75% (60% from the seventh month). Compared to the current level (in 2012?), the maximum gross monthly amount of ASPI will also increase. Moreover, the reduced requirement unemployment benefit was abrogated too and it was replaced by the so called "mini ASPI" provided to all employees having worked at least 13 weeks before the firing. The mini ASPI amount is the same as that of the ASPI, but it is paid on a monthly base for a maximum of 6 months (i.e., for half of the weeks worked in the year prior to the firing).

Two schemes of redundancy payments exist (ordinary and extraordinary). The ordinary compensation is paid by the income supplement fund (*Cassa Integrazione Guadagni*) and is intended for the employees and managers of industrial enterprises in general and for the managers of industrial and design enterprises in

the construction and stone quarrying sector. This structure is somewhat similar to the Sri Lankan categorisation, whenever they get affected by a reduction or stoppage of activity for temporary difficulties that are a result of temporary market conditions.

The extraordinary redundancy pay authorised by the decree of the Ministry of Labour in Italy is intended to preserve the income of employees in industrial enterprises that have ceased operations for restructuring, reorganisation or conversion. This applies also to commercial enterprises, shipping and transport companies, and travel and tourism agencies with more than fifty employees. The condition for eligibility is that these businesses have had to have an average of 15 employees over the six months preceding the application for benefit. This allowance cannot be paid for more than 18 months for bankruptcy proceedings, 12 months for business crises and 24 months for restructuring, unless extended as provided by law. The amount of the ordinary and extraordinary redundancy pay is 80% of the total pay the worker would have been entitled to for the hours of work not worked.

As regards protection against poverty risks, it has to be pointed out that employees, pensioners and those receiving social security benefits deriving from paid employment are entitled to receive family allowances. The amount of these allowances depends on the size of the family and the income of the household.

2.10.7 United Kingdom Social Security System (UK-SSS)

The Department for Work and Pensions (www.dwp.gov.uk) states that the national social security system functioning in the United Kingdom is almost entirely funded by the contributions paid by the employers and employees towards the cost of certain national benefits. It was initially presented by the National Insurance Act in 1911 as a contributory system of insurance against sickness and redundancy and later expanded by the Labour government in 1948 to provide retirement and other benefits. The system has been subject to several amendments in the succeeding years.

The retirement benefits functioning at the commencement was initiated as a weekly benefit of 5 shillings (£0.25) for those above the age of 70 years, whose income did not exceed £31.50 per annum at that time. This welfare scheme was introduced by

the Old Age Pensions' Act in 1908 and it coincided with the Royal Commission on the Poor Laws and Relief of Distress that took place between 1905 and 1909. It was also the first step in the liberal welfare restructurings that began with the National Insurance Act of 1911 through to the completion of a social security system with unemployment and health insurance benefits.

Contributions to the social benefits' system are collected by Her Majesty's Revenue and Customs (HMRC) through the PAYE (Pay as you Earn) system, along with Income Tax and repayments of Student Loans. "National Insurance Contributions" (NICs) are paid by employees and employers mainly as a part of their earnings and some employers compensate them in the form of added benefits to their own employees. Freelancers contribute their part to the social security system as a fixed weekly or monthly payment scheme, usually based on a percentage of their net profit above a certain threshold value. In the event that individuals are unable to contribute their share to the social security system during a certain period in time, they may be able voluntarily contribute more than the allocated amount in better times to fill in their gap in the contributions' records and, therefore, protect their entitlement to the benefits of the social security system.

The social security system operating in the UK has several branches of security mainly in the case of death, retirement, unemployment, maternity and disability. The beneficiaries are provided with a weekly income or a lump sum that are determined by the claimant's contribution record and circumstances.

A reformation of the National Insurance Contributions to eliminate the high contribution rates fixed in the initial stages has caused the social security system to be redistributed countrywide. This enables employees, determined to be a certain income level, to pay a much lower rate as contributions to the system. Measures have been taken lately to further weaken the link between an individual's contribution record and the remaining contributory benefits. These recent developments in the system have contributed to 21.5% of the total government's revenue collected by HMRC.

The National Insurance Act of 1911 presented the concept of social security benefits based on the contributions paid by employers and employees. The system

at that time required the employer to record the contributions of an individual to the system, by buying special stamps from a Post Office and affixing them to their contribution cards. These cards were handed over to the employee at the end of their tenure as proof of his or her entitlement to benefits. This system of cards caused the phrase “being given your cards” to be commonly used in society to indicate the loss of one’s job. Though the card system is no longer in effect, the phrase is still used commonly today.

In the initial stages of social welfare, two separate programmes existed simultaneously. The programme that focused mainly on unemployment benefits was directly controlled by the Government, whereas the benefits programme for healthcare and pensions was managed by "approved societies" including unofficial societies and some trade unions.

A single stamp that covered all branches of social security was introduced after the Second World War when the government pressed ahead with the introduction of the Welfare State whose major component was an expanded National Insurance scheme. This process caused the new Ministry of National Insurance to be held responsible for the social security system in the UK after 1948.

The initially introduced system of stamping cards for class 1 employees was in existence until 1975. Gradually, with the evolution of the security system, that system of contributions was converted to one based on an individual’s earnings and the link between individual contributions and benefits was weakened. These contributions were collected along with Income Tax under PAYE procedures. For years after the discontinuance of the older system, Britons continue to describe making NI contributions as paying their stamp.

The National Insurance Funds are used to pay for certain types of welfare expenditure and National Insurance payments cannot be used directly to fund general government spending. However, any surplus in the funds is invested in government securities and so is effectively lent to the government at low rates of interest. National Insurance contributions are paid into the various National Insurance Funds after the deduction of monies specifically allocated to the National Health Services (NHS). However, a small percentage is transferred from the funds

to the NHS from certain of the smaller sub classes. Thus, the four NHS organisations are partially funded from NI contributions but not from the NI Fund at present.

2.10.8 Summary of the PR/SS structure in developed countries

When studying the PR/SS (pension, retirement benefits or social security) within the UN recognised developed countries in the world, it can be seen that there are a few common key values that exist as the backbone of the entire structure. Such key values can be summarised as follows:

1. Securing a supply source for families and individuals when they are in need of essential materials.
2. Providing security for elder folk (who sacrificed some part of their lives for the betterment of the society) when they face aging, disparities, illnesses etc.
3. Securing the family lives of individuals.
4. Securing and safeguarding children from unforeseen parental disappointments and displacements.

However, the retirement needs of different societies vary depending on the socioeconomic, cultural and administrative status of the individual society. Such deviations can primarily be separated into two groups, namely the 'Europe, America and Latin American framework' and the 'West, East and South Asian framework'. Further discussions on two identified clusters are provided in the next two sections.

2.10.9 Comparison of the Europe, America and Latin American frameworks

The 'Western Pathway' was originally applicable only to West European countries although it spread among other Western countries in the region later. Southern European countries such as Spain, Portugal and Italy have many similarities to the Latin American cultures (Lipset, 1996). To avoid unnecessary complexities, the United States is excluded due to its exceptional add on to the typology. Hence, the United States was blended with many characteristics of the West European nations (Wallerstein, 2004). These mechanisms further influenced the pension reform in Latin America and China as well since supporters of such systems have repeatedly pointed out other systems in the world and the dependency theories.

One of the most generous social security systems in the world is in Germany. Germany faces one of the largest aging populations as well due a lessening ratio of workers to pensioners. However, predictions were made to bring this ratio down to one to one because the current Pay As You Go social security system is under severe pressure at present. To reach this goal combinations of several feasible measures are likely to be created wherever possible. For the transition generation, it has become unavoidable that they will face having a double burden (Borsch Supan, 1997). Generally, a social security system works as a mirror of the social or political environment in which it operates. Similarly, previously in Germany has occurred influencing the protection of traditions and political motivations. Organisational administration systems have been sharpened by the workers' desire and strengthened with the predominant political structure of power (Rimlinger, 1968). Ultimately, Germans have found a way to link the systems with a proper approach that has benefited social insurance and the growth of national revenue. According to the social security system introduced by Bismarck, the social security systems are linked with social rights (Feng & Weizsacker, 2006). However, this interpretation does not move in parallel with the general situation in Germany because it was developed to act as a democratisation barrier.

The formulation of the social security system in the United States was initiated in 1935. However, collection of taxes commenced in 1937 (Cooley & Soares, 1999). In the 1930s, President Franklin Roosevelt was required to introduce a public pension system with a view of ending the Great Depression and to avoid similar circumferences in future. The initial Act was created as a fully funded system where benefits were linked to the contributions (Grafstein, 2009). However, in 1939, an amendment came converting the entire system into a Pay As You Go insurance system.

Pay As You Go (PAYG) can be considered as most widely used social security system or social insurance system within the global scenario (Grafstein, 2009). Out of 42 Latin American and Transitional Economies that are changing from a centrally planned economy to a free market economy (Sam, 2012), 22 countries have privatised their social security systems.

When reforming the old age pension systems, the aging population and other associated problems were considered. The challenge of policy reforming applicable to pensions is creating a precise framework. In Latin American and Chinese markets, such challenges are blended into the outlines of traditional and cultural values even though they are within a low income economy (Calvo & Williamson, 2008). This has to be recognised in relation with the comparatively with Latin America and China, which contrasted to the Western European nations.

When modernisation is taken into account, the existing social security systems such as PAYG and the Western pathway are applicable only to the Western European countries even though it could gradually spread among other Western countries in the region.

2.10.10 Comparison of the West, East and South Asian frameworks

China, India, Japan, Korea and Malaysia are among the major countries in Asia even though they are not among the recognised developed countries according to the country classification of the United Nations Department of Economic and Social Affairs (United Nations, 2013) (as discussed in the section on the Global Scenario of Social Security in Section 2.10 above in this thesis). However, China is the country that has largest the global population at present.

In China, social enterprise (SE) was an unimportant area to the people of China until 2004 because China had a socialist government. Thereafter, academics and practitioners developed a Chinese context of SE by providing a consensus on the definition especially by focusing on the specific socioeconomic context of the social welfare regime transformation during China's market transition (Yu, 2011). It is believed that the Grounded Theory (Glaser, 1967) could be used to formulate an empirically based definition for SEs in China.

2.11 Social security in Sri Lanka

Social security is a fundamental right according to Article 22 of the Universal Declaration of Human Rights (United Nations, 1948, p. 5).

> *'Everyone as a member of the society has a right for a social security and is entitled to realisation, through national effort and international cooperation in*

accordance with the organisation and resources of each State, of the economic, social and cultural rights indispensable for people's dignity and the free development of the personality'.

Further, the International Labour Organisation (ILO) considers social security as a universal need (Ginneken, 2003). Social security is recognised as a basic human right by ILO Conventions and United Nations charters (such as the International Covenant on Economic, Social and Cultural Rights) as well.

The objective of a pension, retirement benefits or the social security (PR/SS) system is to protect the poor and vulnerable and to ensure that they have an acceptable standard of living. Social security may also involve smoothing consumption and reducing risk or spreading income over a life cycle (Fedlstein, 1974). Often there is a redistribution of income among groups with differing needs (Ahmad, Ehtisham, 1991). A majority of the public considers social security as the most important form of household wealth but neither theoretical nor empirical analyses give due consideration or adequate attention to the existence and growth of social security.

2.11.1 Social security in Sri Lankan history

In ancient Sri Lanka, the framework for providing PR/SS or for taking care of senior citizens was focussed on their children. Even at present, such a system is highly influential and respected according to traditional, cultural and current patterns of thinking as children are, frequently, the sole investment of parents.

After 1815, the British rulers generally started offering government employment to the educated locals in the country with lifelong retirement benefits (PR/SS) in order to present them with a reasonable life after the end of their service. From the middle of the 19th century, many schools opened throughout the island replacing religious centre based educational institutions. Many parents from the agricultural production sector directed their children towards school education with a desire to receive government employment for their children in order that they would have a civilised social life and a struggle free end section of life that included service benefits. Government departments relating to the construction industry such as the Public Works Department (PWD), the Department of Highways, the Building Department,

the Irrigation Department etc. and some other organisations such as the Department of Railways (CGR: Ceylon Government Railway), the Education Department etc. had their own construction and maintenance divisions with a bottom level operational workforce who were eligible for the government pension scheme.

2.11.2 Liquidation of prevailing social security systems in Sri Lanka

A natural death for government organisations with pensionable employees began after independence in 1948 because local politicians regarded 'pension' schemes as a huge liability for the government and they introduced statutory corporations and boards with the Employees Provident Fund (EPF) and the Employees Trust Fund (ETF) and by introducing the State Engineering Corporation (SEC), the River Valleys Development Board (RVDB), the Road Development Authority etc. (Gaminiratne, 2004). These statutory corporations initially offered attractive remunerations more so than the government departments where civilians evaluated the return on the principle of 'One Rupee today is better than the same tomorrow', and had no thought for inflation that had less impact at that time since Sri Lanka had a stable economy.

With the collapse of both traditional and government social security systems between 1815 and 1948, working and earning became essential even after the normal retirement age for non pensionable employees in Sri Lanka.

2.11.3 Current ESBs and the constraints of the EPF system in Sri Lanka

The current End of Service Benefits' (ESB) model in Sri Lanka are known as EPF and ETF. They are one off settlements of 20% or 25% from the entire lifetime savings with an added interest percentage at the age of 55 years (Abeynayake, 2010). In addition, an employer is liable to pay a gratuity calculated at the rate of a half time monthly salary for each year of service of the employee (the minimum eligibility requirement is a continued service of five years under the same employer). However, workers usually spend the entire ESB within a short period of retirement due to reasons such as a lack of management skills, family burdens, under duress situations such as children's education, renovation or construction of houses, trying out trading businesses, being caught by money gamblers etc.

2.11.4 The legal system of Sri Lanka

Contractors who obtain the services of an operational workforce are liable to pay their wages, salaries, EPF, ETF etc. when it becomes due (Ministry of Employment and Labour, 2002). Default is a criminal offence. However, delaying a payment to a subcontractor is not an offence.

Therefore, many contractors have introduced alternative methods similar to the Nonstandard Employment Relations (Kalleberg, 2000) for labour recruitment such as:

- Output based subcontractors.
- Labour supply contractors etc.

Main contractors generally pass the liabilities of labour management to another party. The secondary parties, who undertake these subcontract works, assign the duties to the operational workforce on a productivity basis in several stages of a hierarchy until it reaches to groups of 5 to 10 persons.

The aforementioned mechanisms convert workers to being contractors and mislay they lose their fundamental rights to receive their wages on, or before, the tenth day of the following month. In this subcontract mechanism, certain portions of their due payments are retained further as ‘Retention’ and many workers are unaware of receiving of retention when it becomes due, because of a lack of knowledge and time.

2.12 Risks and challenges involved with global social security

According to the statistical report presented by the International Labour Organisation (ILO, 2011) it can be observed that pension, retirement benefits or social security (PR/SS) systems practiced throughout the globe are facing financial deficiency challenges on income and expenditure. Therefore, traditional data collection was practiced in order to develop a quantitative knowledge base by the ILO for the first time. This report further described social security coverages of the global challenges and the economic developments in various regions, individually as well as countrywide.

PR/SS challenges can be divided into three contexts.

A. Exposure challenges
B. Competency Challenges
C. Monetary Challenges

The aforementioned contextual challenges demand fair governance of participation and strong team capabilities for managing such challenges.

2.12.1 Exposure challenges

The world has been waiting for a long period assuming that countries with mid and low income levels would increase their social security coverage in line with their economic development. At present, it can be seen that this expectation has not been achieved (ILO, 2011). It can be observed that that there is an increasing frequency in the stagnation of work in developing countries. For this reason, a great segment of the world's population is still does not have access to proper social security treatment.

It has been possible to see some kind of development and extension to social security coverages in several parts of the world but the majority of places in the world have demonstrated idleness and shrinkages in this area. In respect to the instrumental benefits relating to the coverage levels, developments of this nature are narrowly related to the modes of recruitment, predominantly to the eminence of certain jobs and the number available under formal economic conditions. In this kind of atmosphere, governmental institutions have a significant role to play in consulting and cooperating with social partners in order to outline the nature of the groups in society that need that are to be covered. The nature of this exercise eventually requires identifying that clusters of social groups are to be kept outside the parameters of social insurance as well as executing and imposing the provisions of these policies. When launching and preserving social security schemes of a noncontributory nature, it is important to develop an assurance scheme with at least a minimal level of a social security framework for all involved in general.

In the global context, the establishment of PR/SS systems was originally applicable to several identified employment relationships that only did work for certain formal establishments with explicit contracts on a remuneration basis. The countries with

people on low and mid level incomes have not had the capacity to introduce such social formalities and laws that are totally based on government revenues. Many countries of such a nature have introduced PR/SS systems modelled on the nature of social insurance. Such insurances were not helpful to the majority of workers within an informal economy. In many scenarios, a considerable and developing number of workers have not had the opportunity to enjoy any kind of PR&&SS benefits due to uncertain, ambiguous or concealed employment relationships. The majority of the people who fall under this classification are females who work as domestic helpers. It can be seen, in several countries, that small enterprises are relieved from complying with some of the provisions of regulations relating to PR/SS. In the meantime, it has been possible to identify that several workers have been deliberately excluded from PR/SS since the applicable regulations were not at a mandatory or obligatory level. Another factor is non enforcement of applicable laws that affect the numerous workers engaged in small initiatives even though sufficient constitutional coverage has been extended to them (ILO, 2011). The workers employed even by formal nature enterprises are commonly without formal agreements or are called undeclared workers (who would commonly be categorised commonly as part of the comparatively high share of overall temporary employed employment in the developing countries).

It is common practice to provide alternative social security preparations with noncontributory schemes in some of the developing countries. Under these circumstances, it is common that insufficient provisions are allocated to obtain basic level needs such as food and sleep (Marslow, 1943) (which are required by human kind). Such kind of social security coverages are generally provided on pitiable grounds, irrespective of the formal employment relationships. For these reasons, social insurance relating to employment remain as one of the foremost stanchions of the social security systems that are practiced in numerous parts of the world. However, large numbers of social groups within the population is not covered by any kind of a PR/SS system. A comprehensive system of PR/SSs may not be a reality for the majority of the global population. In the selective areas of PR/SS divisions, a marginal group receives the benefits from a fractional method of PR/SS mechanisms.

The International Labour Organisation (ILO) is a premier organisation working for the establishment, and streamlining, of social security standards as a global protocol. The goal of setting up the ILO standards was to provide complete protection to as many individuals as possible. In the short run, it aims to provide at least a fundamental level of protection to as many individuals as possible. A Social Security (Minimum Standards) Convention held in 1952 commenced by producing a framework for global social security coverage at a minimum level of benefits as guaranteed by Article 102 of the Convention Bulletin (Myers, 1952). The new International Convention was a luxury for only a handful of the world's population and only a limited amount of individuals were capable of acquiring at least partial social security (i.e., only in some of the social security areas). Thus, the efforts of the ILO attempt to assure that every individual is entitled to at least a primitive level of income security on all platforms of their existence. This will, in turn, improve living conditions and give people access to essential health facilities. It was identified that only a limited number of countries in the world have the means to provide social protection to its population in all areas of security. In many others, protection was restricted to only a few areas and, even then, only a minority of the population has access to these existing arrangements. However, some level of social security for their population is offered by almost all countries in the world.

Every country in the world enables its citizens to obtain at least a basic range of healthcare facilities by making some sort of provision for social health protection from its budget. While some countries offer healthcare facilities free of charge for a number of illnesses, others may not be as liberal, offering only healthcare services to sectors of the population such as toddlers and the elderly (usually those retired from employment). Since most of these schemes are new, the number of people actually reaping their benefits is still inadequate. In the majority of the countries, officially hired employees are entitled to healthcare facilities in the case of employment injuries. However, in most cases, this coverage is not adequate or in line with the requirements of the ILO Convention held in 1952.

Paid sick leave and maternity leave has been facilitated in most countries for at least some of the labour sectors by means of the labour code or through other organisations legally. Though this sort of coverage exists, the actual circumstances

where assistance is given from the security system are infrequent. Comprehensive PR/SS is still restricted to the recognised developed countries although many countries have made countless steps towards the establishment of a comprehensive constitutional coverage for PR/SS. One sector of the countries in the world generally cover seven to eight areas of the ILO requirements and other countries only provide limited statutory protection at an elementary level. At least one legislative lineup is widely available almost everywhere to provide short time welfare for events such as work related injuries, temporary sicknesses, temporary unemployment, disaster survivors (Abeykoon, et al., 2013); such welfare includes family allowances and maternity.

According to the ILO surveys, 28% of the global population have comprehensive PR/SS systems covering all the recognised divisions of the ILO. However, the greater number of these identified classifications and protections are limited to the persons in a formal occupation such as salaried or remunerated workers. Such formally occupied employees constitute less than 50% of the economically active people in the global scenario spread over 70% of the countries with widely spread PR/SS systems. Approximately, 20% of the working age population in the global scenario (including their families) fall into the economically inactive classification.

2.12.2 Worthiness challenges

Since significant social security coverage can only be provided if the benefits thus provided are sufficient, the challenges of providing PR/SS for individuals are closely related to providing suitable benefits. The suitability of a PR/SS system is decided by taking into account its economic and public aspects in addition to the benefits granted. PR/SS systems may be concluded to be adequate if they are successfully capable of meeting the requirements of a people who have to cope with life's enforced and unfortunate risks. Then the compensation received as security is deemed to be termed as 'fair' in terms of social suitability if it is in line with the contributions or taxes paid during the individual's working life and if it is up to the standards as stated (ILO, 2014). To achieve these goals, it is important to work in collaboration with employment laws, monetary laws and the other economic policies governing the country and to ensure that they do not result in undesirable economic consequences.

A commonly discussed topic in national and global policy platforms is the suitability level of PR/SS benefits. Benefits are deemed too high if the security returns are unacceptable to the public or the scheme itself and cause expenditure levels and behaviour detrimental to the common good of the beneficiary. On the other hand, benefits are deemed too low if the amount received by the beneficiary is inadequate to meet the needs of the mishap that has occurred which is covered by the system itself or if the amount is too low with respect to the former contributions by the beneficiary. Therefore, when constructing a social security system it is crucial to determine that the returns are neither too low nor too high for the realisation of the programme.

Evaluating the sufficiency of benefits provided by the national health protection systems of a country is a complicated task since the suitability level changes from individual to individual and the quality of the service too varies according to the availability of medical supplies and the services within each country. A generalised level of fitness is determined by the availability of the necessary vital services and the absence of financial barriers to access them.

The unit of measuring the suitability level of a social protection programme clearly relies on the type of commenced programme, the current living standards of the citizens in that country and its economic capabilities. The concept of worthiness may vary depending on the application or usage. The benefits of PR/SS can to be monetarily strengthened through the contributions received, through the rise of acquired rights and the returns to the beneficiaries. Depending on the impacts of elementary, widespread or communally available supporting schemes, these too can provide lateral supports, principally through taxation or subscriber sources. Therefore, different variables may be used as a reference when deciding the suitability of the benefits provided and these can depend on the objectives of the policies that are introduced to the public. Variables of this nature generally incorporate poverty demarcations, remunerations or the comprehensive income levels of individuals on average.

Since finding the appropriate suitability levels of PR/SS are always a challenge (when required to provide guidance in this aspect), the ILO Social Security Convention has set a minimum standard for PR/SS in different divisions. The same

Convention further states the minimum suitability standards for social security benefits are as follows:

- The marginal level of returns to be paid on the occurrence of each of the likelihoods
- The circumstances and phases of such a privilege are to be approved.

2.12.3 Monetary challenges

Currently the global community has come to see social security as an investment in social cohesion and economic growth rather than expenditure. This has caused low and middle level income countries to focus their attention on how to increase their expenses in social security and where the fiscal resources necessary are to be acquired (whereas for a long time most industrialized countries concentrated their efforts on minimising social security expenditure). Therefore, at present, more emphasis is focused on the “how?” than on the “how much?”

This section of the thesis investigates on the sum of resources that are allocated for the social security worldwide and how the PR/SS mechanism is financed as a single entity. It has been shown that an average value of 20 to 30 percent of the gross domestic product (GDP) of a nation is reserved for providing social security for its citizens within the developed countries. It should be noted that this is an average value calculated by taking all national incomes to be equal. However, though this value may be true for countries with higher incomes, only a fraction of this value is allocated for social security purposes in less fortunate undeveloped countries. Therefore, this average value does not reveal the circumstances for the majority of the world’s population. Alternatively, when this value was calculated by the ILO in 2011 as a mean of the proportions of the GDP allotted for social security purposes in different countries, it was revealed that developing and undeveloped countries allocate less than 12 percent of their individual GDP for providing social security. When calculating the average value of resources allocated for social security with regard to the population of a country, it has been found that an ‘average’ citizen will be contributing 8 percent of the country’s GDP as social security benefits in the form of reimbursements according to the official website of ILO (www.ilo.org, 2014). The percentage of GDP invested in providing PR/SS vary

greatly between the regions and countries of the world, mostly depending on the national income levels. While European countries can afford to devote 20 to 30 percent of the GDP into social security investment, most African countries only devote 4 to 6 percent in this area and, of this; a major portion is spent on the more pressing matters of healthcare rather than on salary replacements to provide an income security.

As illustrated by (www.ilo.org, 2014), it can be seen that low income countries are spending on average less than 4 per cent of their GDP on health whereas countries in the intermediate levels of the income scales spend 7 to 10 percent on the said issues that pertains to more than twice of what a low income country would fund with regard to social security. On the other hand, countries at the higher end of the income scales spend about 20 percent of their GDP on social security benefits that amounts to about five times higher than that of a low income country. Therefore, in conclusion, a higher income country has the means to allocate a greater percentage of its GDP on social security than a low income country. It should be noted that this analysis is based on data collected in 2000, as they are the most recent data available on the topic. The data are based on a slightly smaller number of countries than would have been preferred and conditions have improved in most countries within the last 14 years, the majority of improvements being in the middle and higher income countries. Therefore, caution needs to be exercised when drawing conclusions from the data quantified herein.

When considering the percentage of resources allocated to providing a social security system, most countries reserve a larger quota for health securities and pensions. In low income countries (as opposed to countries with higher incomes where the major percentage is spent on pensions for senior citizens) the major quota is spent on healthcare facilities. Only the countries on the highest end of the development scale can afford security in areas such as employee benefits and family benefits.

Countries at the lower end of the income scales (where poverty and fluctuating economies are commonly prevalent) require a strong social security system, even more so than the more developed countries. Studies have made it clear that social

security in these developing countries is conductive to the development of the nation.

Though there exists a link between income levels and the resources allocated to social security, this does not conclude that social security is a ‘luxury’, though contrasts exist between how the service is financed and delivered and which branches of the many areas of social security require more priority than the others do.

Though the levels of social security offered to the citizens of a country are in a close relation to the size of the country’s overall government expenditure, each country has some level of independence when deciding their expenditure on social security for their citizens irrespective of the income level of the country. This is the reason as to why countries whose per capita GDP are on parallel levels may have vastly diverse levels of resources allocated to different areas of social security, as depicted in Figure 2.7.

As stated, different countries allocate different percentages of the national resources towards social security (even if they possess the same levels of government spending) based on historical and political influences. Therefore, the percentage spent on social security from a country’s budget (i.e., the amount of financial resources available to finance such programmes) is decided by the government, the taxpayers and the body of voters.

Thus, the organizing and financing of a social security system in a country is a mammoth task and its success greatly depends on the arrangement of the labour market (i.e., the percentage of labour employed under formal salaries in total employment and the amount of the informal labour forces). Therefore, it is important to decide to what extent these social security programmes are initiated as contributory programmes that benefit a selected sector of the community and to what extent they are initiated as noncontributory programs that may benefit all the residents of the country.

Only a limited amount of data are available on the topic of pension schemes (i.e., old age benefits). It should be noted that many governments also provide irregular non continuous funding for some schemes that may not be recorded. The available

data show that the percentages of social security privileges that are distributed amongst workers, employers and the government have vast regional variations.

Coverage, fitness and the financial challenges of social security (as identified earlier) are the key global challenges in providing a lifelong social security system. Provision for a social security system, both in terms of fiscal and policy space regulations, are critically influenced by the governing parties of a country. When a country's government is interested in the welfare of its citizens security schemes can be initiated, funded and suitability levels can be established accordingly. This nature of These Socioeconomic policies would have to be focused towards the objectives of a production based employment structure and a decent work environment supported by good industrial governance.

2.13 Social security theories, models and frameworks in practice

Carrying out the literature syntheses was an essential requirement in order to understand the currently available social security theories, models and frameworks that are in practice prior to introducing a new framework. During the literature review, it was identified that there are 166 countries in the world that practices some kind of a PR/SS at the commencement of the Millennium in 2000 (Holzmann, 2013). These pension, retirement benefits or social security (PR/SS) systems were provided by lifelong social security frameworks which functioned under the respective governments or were provided by insurance companies or by any other fund management systems or by multiple combinations of several mechanisms (Mulligan & Martin, 2002).

As a developing country with a developing economy, finding funds for such an operation will definitely be a challenging aspiration when it comes to the Sri Lankan context.

In this chapter, some of the internationally and historically common features of social security programmes (including explicit and implicit taxes on labour supply, PAYG features, intergenerational redistribution, and benefits that are increasing functions of lifetime earnings) were discussed (Holzmann, 2013). The rest of the discussion in this chapter will be on the various positive theories on social security

and comparing each of them with the empirical regularities uncovered and discussed earlier.

During the literature review, it was identified that partition theories (Mulligan & Martin, 2002) can be further divided into three groups based on the PR/SS globalisation guidelines of the International Labour Organisation (ILO, 2011). These three groups are presented below.

Political theories:

- The elderly as the leaders of a winning coalition
- The time intensive framework of the political competition taxpayers' protection framework

Efficiency theories:

- SS as welfare for the elderly
- Retirement increases productivity to optimally manage human capital externalities
- Optimal retirement insurance
- Labour market congestion
- Prodigal father problem
- Misguided demand for finical needs
- Optimal longevity insurance
- The government economising transaction costs
- Return on human capital investment

Narrative theories:

- Chain letter theory
- Monopoly capitalism theory
- Sub but Nearly Optimal policy response to private pension theory

However, micro discussions of these listed headings and sub headings were not carried further since such details are out of the remit of this research.

Political and efficiency explanations will be compared with international and historical facts and will be used to derive implications for replacing the typical PAYG

system with a forced savings' plan (Mulligan & Martin, 2002). Most of the explanations suggest that forced savings do not increase welfare. In fact, it generally decreases welfare for the elderly.

2.14 Dilemmas in the PR/SS frameworks and suggested myths

The World Bank expressed their concerns in 1994 and advised rethinking on reforming the Pay As You Go pension or social security system. Accordingly, ten microeconomic, efficiency and political myths were put forward to overcome the problem (Orszag & Stiglitz, 1999). Examined myths included the following:

A. Microeconomic:

1. Individual accounts raise national saving
2. Rates of return are higher on individual accounts
3. Declining rates of return on Pay As You Go systems reflect fundamental problems
4. Investment of public trust funds in equities has no macroeconomic effects

B. Efficiency:

1. Labour market incentives are better under individual accounts
2. Defined benefit plans necessarily provide more of an incentive to retire early
3. Competition ensures low administrative costs under individual accounts

C. Political:

1. Corrupt and inefficient governments provide a rationale for individual accounts
2. Bailout politics are worse under publicly defined benefit plans
3. The investment of public trust funds is always squandered and mismanaged

In 2003, it was further predicted that the current social security system in the USA would face unembellished financial difficulties in approximately 15 years because of cash deficits that could be generated due to insufficient tax revenues and payroll collections (Cogan & Mitchell, 2003). Furthermore, it was anticipated that the system would become insolvent in 2041, because the programme will legally become unable to pay the programmed reimbursements.

2.15 Current recruiting model for the operational workforce

Various systems have been employed over time for obtaining supplies of labour and transporting it to where it is required, including enslavement, indenture and recruitment. The last may be informal or may involve recruiting organisations of varying scale and complexity. Demands for labour to meet employment needs have been met throughout history in a variety of ways. In some instances, the labour has been available at the point of demand and has been organised through economic prospects or by some measure of pressure, coercion or control, and a balance has been sought between supply and demand. Often local supplies of labour either have not been available or have been unsuitable and it has been necessary to look further afield for sources of supplies (Prothero, 1990). According to the latter, systems have been developed which involve the movement of labour which have been influenced in their forms by the demands which they have to meet and the time when these demands were made.

Due to the increased global economic competition among firms, uncertainty has developed regarding the future of the human resources when they have been recruited. This scenario has placed an additional pressure on firms to seek for greater returns for the investors. For this reason, flexible terms of recruitment have been required by the contracting organisations with regard to their employees in order to respond to the investor needs (Kalleberg, 2000). The result, at present, has been the development of nonstandard employment relations which can be called ‘hire and fire’ in simple terms wherein the entire pressure has drained down to land on the shoulders of the operational workforce.

Considerations relating to culturally based variations in the paths of employees’ relationships with employers have become the requirement of the current generation. Sometimes it is not possible to express all the terms and relationships between the employees and the employer. Someone should study these relationships in depth and fill in the gaps (Thomas, et al., 2003). A psychological contract could be a platform of choice for understanding this relationship.

Various *‘modus operandi’s* are being used in global scenario in order to procure labour. This process generally includes establishing a recruiting framework,

choosing the required labour, moving them to the work site, providing logistics and returning them to the place of recruitment. This process may be formal or informal depending upon the formality requirements, the culture and law of the land regarding recruitment organisations that may have varying scales and complexities. However, employment needs have been met in a variety of ways throughout history. In certain cases, labour has been available at the point of demand. However, similar situations are not applicable in each case (Prothero, 1990). Somehow, these processes have to come to an equilibrium point between demand and supply (Tantawi, et al., 2009). In the case of supply, if it is scarce or does not serve the purpose, then it becomes a necessity to look further for a suitable source of supply.

2.16 Modified hierarchy of human needs

As the world is changing daily, human requirements too require change on a daily basis. There is no fixed formula exists that can insert all human related data into one framework or matrix and answers can be found. A system that works for today may not work for tomorrow as well. A successful approach for human resources' management that applies in one location may not be applicable in another factory, industry, culture, city or country in the same way due to the natural differences of human actualities.

However, as a solution to the common constraints of human resources management, Abraham Thomas Maslow introduced a theory that generalised human needs. This was 'A Theory of Human Motivation' (Maslow, 1943) that initially categorises human needs into five groups as depicted below.

1. Physiological Needs : Air; Water; Food; Sleep
2. Safety Needs : Living in a Safe Area; Medical Insurance; Job Security; Financial Needs
3. Social Needs : Friendship; Belonging to a Group; Giving & Receiving Love
4. Esteem Needs : Recognition; Attention; Social Status; Accomplishment; Self Respect
5. Self Actualisation : Truth; Justice; Wisdom; Meaning

When Maslow was introducing his Theory of Human Motivation in 1943, pension, retirement benefits or social security (PR/SS) was not listed as a need therein. The reason for this would have been that, at the time when Maslow was introducing his motivational theory, the USA had an active PR/SS structure that was introduced in 1935 (US-SSA, 2013). However, job security was identified therein as a level two requirement.

Since it is said that no theory in human resources can apply to a different industry, location or culture as a unique formula, there is an essential need to revisit the suitability of the theory introduced by Maslow. The Sri Lankan construction industry needs a mechanism to attract the youth and to retain them in the industry. In current context of Sri Lanka, it has been identified that most important factor in attraction and retention would be 'Retirement Benefits' in Sri Lanka. Accordingly, another tier is added to the bottom of Maslow's Pyramid named 'Retirement Benefits' in order to create the 'Modified Theory of Human Needs' as depicted in Figure 2.8. However, Maslow's Theory can be utilized to work inside an organisation in order to retain people once a person has entered into an industry (Wijewickreme, 2010).

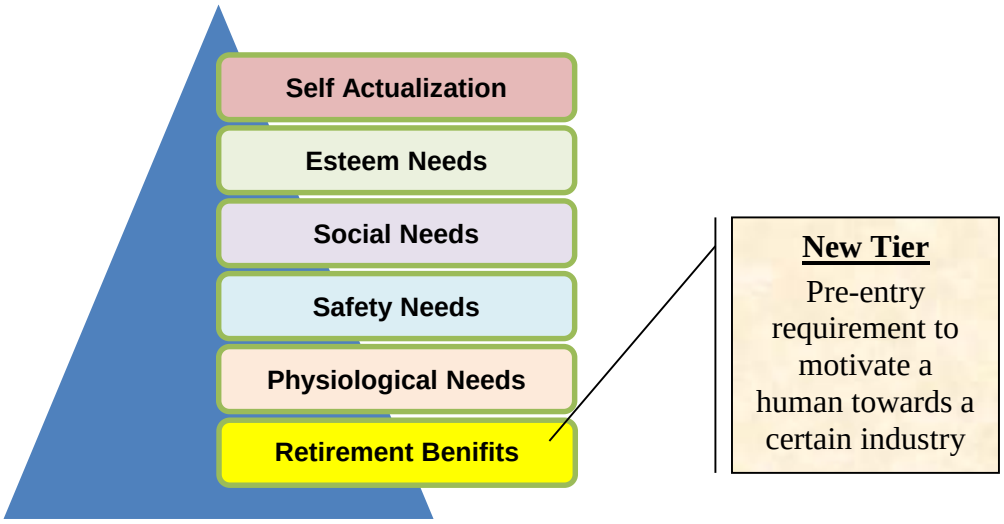

Figure 2.7 : Modified Hierarchy of Human Needs
(Source: Wijewickreme, 2010)

The above discussions indicate that human behaviour and human needs keep changing. It appears that the time has arrived to reconsider the facts explained in some motivational theories. Nowadays human capital has to be considered as a partner in any industry (Campbell, et al., 2012). As partners in the construction

industry, people will become eligible to share profits. The best profit that they are looking for at present is the ‘Retirement Benefit’ (Wijewickreme, 2010). If the retirement benefits are fair and reasonable in any organisation, industry or country, then there will be less short supply in any category of human resources’ requirement.

There can be several mechanisms to bring about retirement benefits. These include, but are not limited to the following:

i. The prevailing military pension scheme of Sri Lanka.
ii. Prevailing government servants pension scheme of Sri Lanka.
iii. PAYG schemes that are popular among the developed countries of Europe and upon the American continents,
iv. The insurance supported PR/SS scheme in Japan.

In order to provide a ‘typical pension’ or ‘social security system’ or any other tailor made PR/SS system that may work it must correspond with the religious, social and economic patterns of the country. All the identified difficulties experienced by the operational workforce that are described in Section 2.9.2, in addition to the key factor ‘Retirement Benefits’, also have considerable impacts which need to be addressed when developing a suitable framework.

2.17 Conceptual framework

When there is a desire to build by a client, the requirement is initially transferred to a trusted individual, namely an architect, an engineer or a project management consultant who initially will become a member of the pre contract team. Depending on the size, complexity and the nature of the building, development or project, this pre construction team will keep on expanding until the appointment of the construction procuring team. There are varieties of construction procurement strategies, as discussed by Murdoch & Hughes (2008), which include, but are not limited to the following:

- Traditional: Hotels, Individually designed houses
- Design and build: Factories, Hospitals

- Partnering: Oil and gas
- Turnkey: Pre designed housing units
- Project management: Commercial completions
- Construction management: Mixed used developments
- Built, Operate and Transfer (BOT): Power stations
- Built, Operate, Own and Transfer (BOOT): Railway lines
- Built, Operate and Own (BOO): Leisure projects

Irrespective of the construction procurement strategy, the major responsibilities of the pre contract team can be summarised as follows:

- Specifying the time, cost, quality, design and performance requirements of the client
- Proper documenting of client's needs for communicating to the construction team
- Providing guidelines for the selection and evaluation of the construction team

Once the pre construction stage is completed, then the project is ready to transfer to the construction team. Nevertheless, the continued cooperation of the pre construction team is essential for monitoring and evaluation during the construction stage in order to ensure the smooth transfer of the desires of the clients, the architectural and engineering concepts, the performance and maintenance parameters etc. The essential duties of the pre construction team can be outlined as follows:

1. Viability analysis: to determine the client's desire with a view to identifying whether his/her intentions can be optimally achieved through the suggested approach.
2. Financial analysis: to determine the project scope against anticipated expenditure and to seek the availability of alternative fund raising mechanisms.
3. Project procurement analysis: to determine the viability of the approaching strategy and to check that it can ensure the specific objectives of the client.

4. Evaluation of service providers: to identify the state of the art products and the services available in the industry in order to avoid utilising an outdated product.
5. Transition Management: during the documentation of the project to avoid gaps between the two stages of design and construction.
6. Evaluation of the procurement strategy: to assess construction organisations to deliver better value for money for the client.

A major constraint within human resources' management relating to the operational workforce in the Sri Lankan construction industry is the unavailability of a mechanism that can address the previously mentioned basic needs described in Items 1 to 5 of Section 2.16 (or which are called Maslow's hierarchy of human needs).

Another major myth that needs exploring are the differences between factory oriented [e.g. textiles, automobiles and the like] or location oriented industries [e.g. farming, fishing and the like]. Factory or location based production lines can be primarily categorised as routing industries that are required to produce several units of a single design or product with several pre determined varieties. This is where the difference of the construction industry starts which makes it unique from other industries. Therefore, construction can be considered as a mission oriented industry. Construction is a unique industry (Murdoch & Hughes, 2008, p. 1).

Therefore, the proposed framework is required to address the hierarchy of human needs at the same time adjusting it to also suit the requirements of mission oriented operational structure. Since there are many similarities between the armed forces and the construction industry when it comes to the operational or implementation stage (Wijewickreme, 2010, p. 63), this research's suggestion is to adopt the Armed Forces of Sri Lanka (AFSL)'s mechanism into the construction industry alongside the required modifications that are needed to suit the construction operational environment; this will be called the Building Forces of Sri Lanka (BFSL).

The operational mechanism of AFSL is naturally suited to open environment mission oriented operations. There are 24 different military regiments in Sri Lanka (www.globalsecurity.org, 2012) that can take care of the entire requirements with

regard to the country's security related activities from inception to completion. In AFSL, several regiments are allocated only to provide the entire supportive services to the fighting units by organising weapon supplies, logistics supplies, engineering services, intelligence services, medical services, and volunteer services. These are used to assist with emergencies as well. In addition, AFSL maintains a media unit and military police to maintain internal discipline, public relations etc.

Similarly, the construction industry too requires various disciplines that are to be simulated for the smooth achievement of the primary objective of construction or for improving the quality of people's life. Thereby, several models have been developed to understand the essential supporting structures in the construction industry such as the 'Five Ms' of Construction' (Clough, et al., 2000 and Dudgikar, et al., 2012). The 'Five Ms' are Machinery, Management, Manpower, Materials and Monetary. The researcher considered another 2Ms, namely Methodology and Measurement that are important for construction. However, "Measurement" is in doubt as a resource because it can equally be considered as a quality requirement rather than a resource, which can be, included under .Managing the Manpower. Therefore, the following six major resources can be listed (in alphabetical order):

1. Machinery
2. Management
3. Manpower
4. Materials
5. Methodology
6. Monetary

After demarcating the key construction resources, Figure 2.8 (The Construction Six M Wheel) in this thesis, was developed by applying the following lateral forces into the identified key resources. Therein, PR/SS will act as a lubricant to improve the easy manoeuvering of the entire mechanism because it is anticipated to disperse the temporary nature of occupational behaviours.

1. Desires of the clients
2. Requirements of the procurement team
3. The construction monitoring team

The researcher's idea of introducing a Building Force to overcome the identified behavioural constraints of the existing operational workforce to operate somewhat similarly to the Armed Forces of Sri Lanka may not become a reality if no suitable financial benefits are provided by the respective governing authorities of the country. Through the findings of this research, the financial possibility is justified in the mathematical demonstrations depicted in Tables 5.1 and 5.2 of this thesis. Once financial successability is proved, the next step is to implement the suggested BFSL through strong intervention from the statutory authorities; that will facilitate the financial structure itself. The requirement of such a mechanism to avoid stakeholder dissatisfaction is discussed in the Section 1.3 (the research problem) of this thesis.

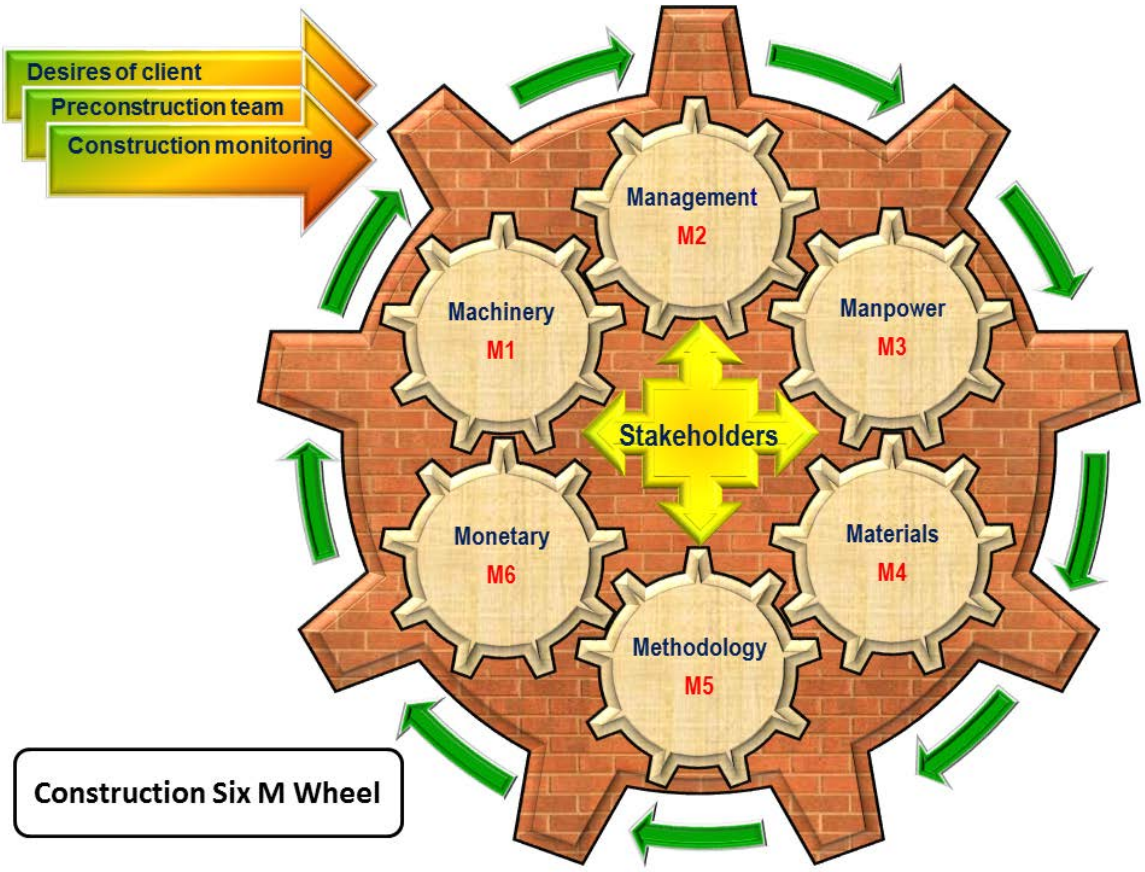

Figure 2.8 : The Construction Six M Wheel

How these salvaged finances are possible to reinvest on construction operatives in a systematically developed construction management structure will discussed further in Chapter 5 (The Proposed Framework) of this thesis. Therein, operational mechanism, which is outlined in Figure 5.1 (Proposed BFSL Framework for Construction Operatives), demonstrates the merging mechanism of master

cogwheel of BFSL titled as “The Construction Six M Wheel” (Figure 2.8) into the overall framework reinforced with a lifelong PR/SS for construction operatives in Sri Lanka. Further particulars of the current constraints or the disorganised pattern of Sri Lankan construction sector is depicted in Figure 5.2 (Imbalanced Construction Six M Wheel) of this thesis as well.

Through this new BFSL framework or the organised ‘Construction Six M Wheel’, the operational workforce will become an effective cogwheel with an equal contribution to the bearing of responsibilities and thus for sharing profits in return, via a lifelong social security system. The modus operandi of this philosophy will be disused in Chapter 5 of this thesis.

It is said that:

> *“Many firms are willing to train internal employees for other positions. Since they find no use in workers with experience from other places, they prefer to promote young workers and train them on the job. Firms want to maintain the investment afterwards; therefore, they offer the employees job security and structured promotions. Due to the importance of on the job training, the promotion is often given by seniority. In addition, this way of promotion encourages on the job training, since the eldest worker is not afraid that the young one replaces him. Employers benefit from this more stable relationship because they reduce the cost of training.”*
>
> (Autor, et al., 2006, p. 6).

Based on the findings and observations within literature syntheses chapter, this conceptual framework was developed with a view to preparing the research questionnaire and to recognising the requirements for the secondary data to be collected.

2.18 Chapter summary

When looking into the history of social security systems within the global scenario of developed countries (United Nations, 1948), more than 50 years have passed since the introduction of the PR/SS system into their nation (Germany 1889, Italy 1898, UK 1908, France 1932, USA 1935, Japan 1942 and Canada 1965).

Therefore, it appears that providing a social security system did play a major role in securing their status as a developed country. These developed countries are among the popular destinations for legal and illegal migrants who were brought up in the undeveloped countries.

Despite the current universal constraints of an aging population and failures within the Pay As You Go (PAYG) systems, still social security can be considered as the backbone to the social anatomy of these developed countries. Major impediments to the PAYG are its inherent pyramidal financial structure and its inability to face the inflation structure. This situation was foreseen by Thomas Jefferson (1743 - 1826), first State Secretary and the third President of the USA who stated:

> *'I believe that banking institutions are more dangerous to our liberties than standing armies. If the American people ever allow private banks to control the issue of their currency, first by inflation, then by deflation, the banks and corporations that will grow up around (the banks) will deprive the people of all property until their children wakeup homeless on the continent their fathers conquered. The issuing power should be taken from the banks and restored to the people, to whom it properly belongs.'*
>
> (Jefferson, 1778, p. 20)

From the literature that was reviewed, it was learnt that the proposed framework should be developed with an anatomy that is capable of avoiding the inherent difficulties that the current systems have in common (such as inflation, deflation, an aging population and pyramidal dependency in general).

The next chapter on "Research Methodology" was developed with a view to finding the pathways for gathering essential data on the current constraints, in an analysable manner, which were identified during the literature review.

Chapter : 3 Research methodology and data collection

3.1 Introduction

This research methodology chapter commences initially by defining the meaning of research. Thereafter, a brief documental review is carried out to understand the history of research and the background thereto. After discussing research paradigms and approaches through positivism, interpretivism (Antipositivism) and strategies of inquiry, then, the development of research approaches is discussed. Thereafter, paradigms and mixed research approaches are discussed.

Research means different things to different people (Amaratunga, et al., 2002). Many professionals accept research as an advantageous way of undertaking critical examination and a mode of thinking that guides principles and procedures (Kumar, 2011). The process, that travels through various activities for combining and exploring ranges of approaches, strategies, techniques and procedures to achieve the desired aim and objectives of the researcher too can be considered as a research as well. Abiding by the ethical concerns of the supporting organisation (a university or any sponsors, as the case may be) and conducting research in accordance with the law of the land (Vazquez, 2008) are among the important procedural requirements for any research of an academic nature. Selecting a suitable methodology from the available recognised methods or developing an own blended version of an existing model or creating a new concept for carrying out the research to be done by a researcher at the early stage of the research project is an essential requirement.

Some studies such as those of Bell (2005), Mahmood (2011) and Kumar (2011) argue that the word ‘research’ is derived from two syllables “re” and “search” which are put together to form a noun meaning “to look at again”. The Oxford Dictionary (Oxford, 2012) indicates that the word ‘research’ originated in the late 16th century. Further, it states that the word began as a merging of two words “re” and “search”. However, according to Webster’s New International Dictionary research means “careful or critical inquiry or examinations in seeking facts or principles, diligent investigation in order to ascertain something”. The American Heritage Dictionary

states that research is "…an investigation undertaken in order to discover new facts..."

Scholarly studies on the history of research methodology have frequently been accompanied by a sense of anonymous, but possibly never further than 1652, etching by Rembrandt (May, 1985). The term research is defined by (Walliman, 2001, p. 6) as *"…collecting masses of information, delving into esoteric theories, and producing new wonderful new products"*. Information and data cannot be merely collected and assembled for moving facts themselves from one situation to another. Research is further described as *"...any form of disciplined inquiry that aims to contribute to a body of knowledge or theory"* (Fellows & Liu, 1948). For this reason, it is generally expected that research, as a combined process of inquiry and investigation, should develop an independent methodology supported by a systematic mechanism to increase knowledge. Methodological assumptions are required to focus on the best means of acquiring knowledge about the natural world. The process of research should be described clearly and should fulfil the research aim and objectives.

Saunders and others (2012) explained the detailed procedures of research methodology using the process 'Onion' as depicted in Figure 3.1.

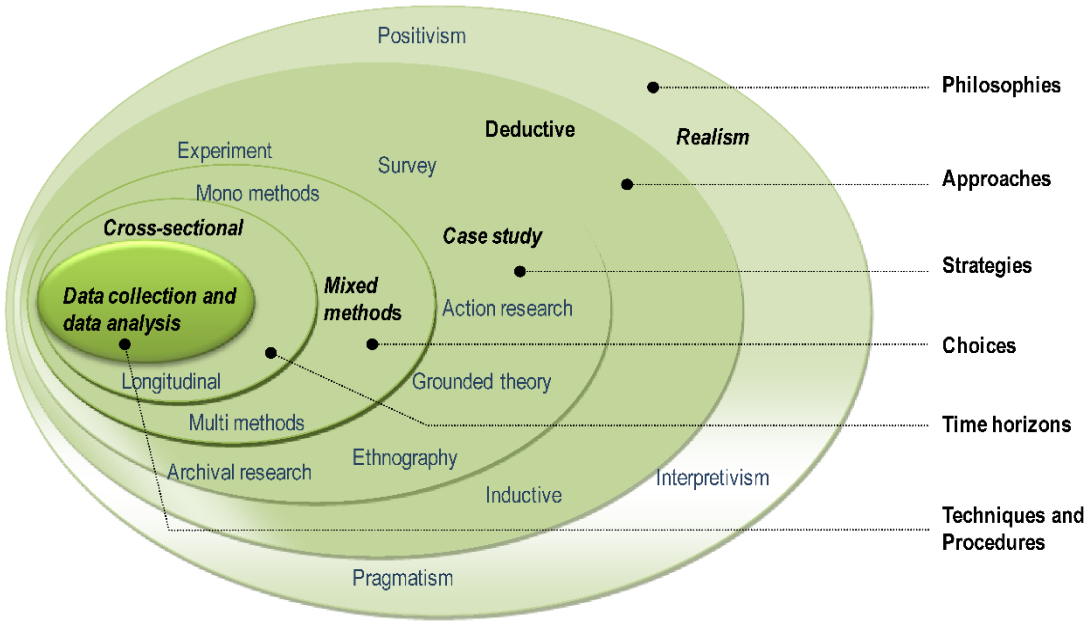

Figure 3.1 : The Systematic Research Process 'Onion'
(Source: Saunders, et al., 2012)

The six layers of the research onion do not clearly position the branches of research philosophies such as ontology, epistemology and axiology. The philosophical domains of the research onion have a mixed nature of implicit branches of various natures in the first layer such as ontology (e.g., realism) and epistemology (e.g., positivism, realism, pragmatism, and interpretivism). The other layers are perceptible as axiology that can help researchers to understand the role of values and meanings, purposes and the specific domains of the intended research.

The following sections will discuss the research methodology adopted for this research and will justify the primary aspects of the research process (e.g., the research philosophy, the research strategy, the research design, the research methods, and the research techniques and procedures).

3.2 Research philosophy

The research philosophy depicted in Figure 3.2 contains important assumptions about the researcher's views of the world (Saunders, et al., 2012). These assumptions helped the researcher to choose a research strategy and to outline the design with a view to determining the research methods, techniques and procedures.

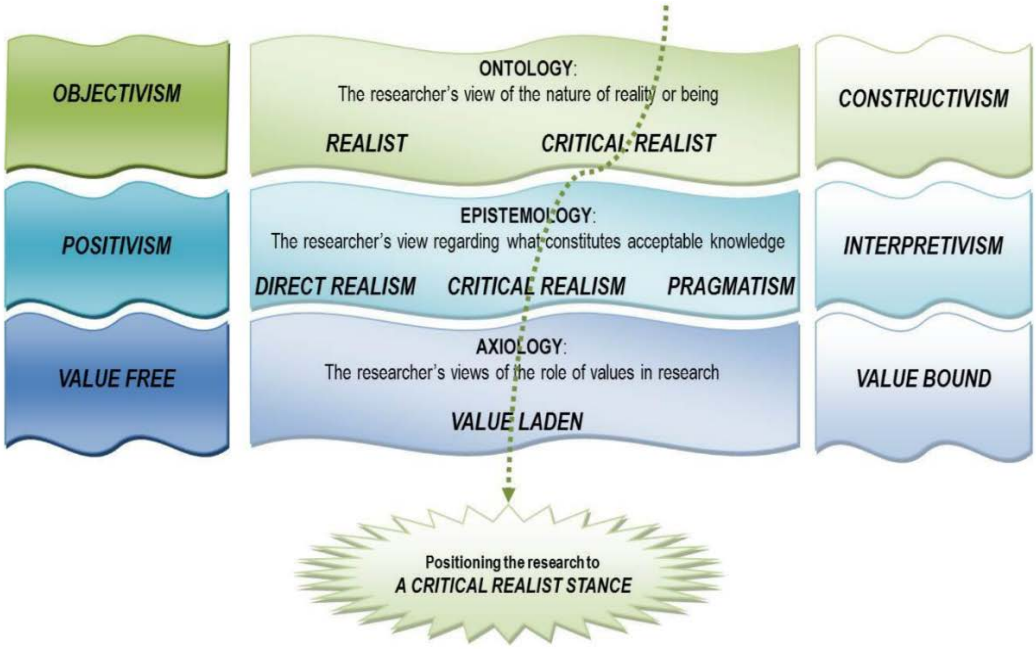

Figure 3.2 : Philosophical Positioning of the Research
(Source: Saunders, et al., 2012)

There are three major domains within research philosophy, namely ontology, epistemology and axiology, according Saunders and others as discussed in the next few sections.

3.2.1 Ontology

Ontology concerns the researcher's own view of the nature of authenticity (Saunders, et al., 2012). From this point onwards, the researcher becomes free to inquire about and analyse the nature of the world and everything within the universe. There are two extremes called objectivism and constructivism, as depicted in Figure 3.1. Accordingly, the objective of the research stance considers the nature of realities in the world looking towards the external parameters of the researcher's own mind. The constructive stance argues that reality is socially constructed and that reality is only understood by examining the perception of human actors (Saunders, et al., 2012). The research 'Onion' depicted in Figure 3.1, as presented by Saunders and others, has not explicitly shown the position of the ontological stance. The ontological stance considers 'what knowledge is and assumptions about reality'.

The aim of this research is to develop "A Framework for Providing a Lifelong Social Security System for the Operational Workforce within the Construction Industry in Sri Lanka" where the prevailing pension, retirement benefits or social security (PR/SS) systems are in an obsolescent stage as discussed in Section 2.11.4 of this thesis. The focus of the proposed framework will be centered on the salvaged finances that can be generated by removing the behavioural constraints that affect construction activities in the Sri Lankan construction industry.

When looked at from the ontological extremist point of view, the traditional PR/SS system and the current subcontractor management approaches would seem to be considered through the objectivism assumption. In the traditional system within Sri Lanka, taking care of the senior citizens came under the responsibilities of their children. This provision has collapsed greatly due social modernisation due to urbanisation and other socioeconomic changes. This reality exists independently of human factors in that the standard Employers Provident Fund (EPF) and the Employers Trust Fund (ETF) systems are usually followed in the long term in factory oriented production industries (Wijewickreme, 2010). Because of the projectised

environment of the construction industry, and its temporary and seasonal nature (PMBOK, 2008), these systems which are commonly implemented could not successfully be applied to the construction industry due to its inherent feature of short term employment.

The other ontological extreme that was considered was the view of the objectivist aspects of the insolvency of traditional PR/SS against the global scenarios of PR/SS in UN recognised developed countries. The reason for this was generated during the literature synthesising. Many countries are experiencing management constraints that have developed due to the aging population. This situation is further impacted upon by currency fluctuations and changes in the basic needs of people. The For example, the requirement to have modern electronic gadgets relating to communication and media have now become more important than the basic needs such as air and water identified by (Maslow, 1943). Therefore, a streamlined financial accounting system that is somewhat different to the contemporary systems may require developing. Financial management strategies are very important in business and the management of them may have 'neither a fixed start nor certain end' (Cole, 1996, p. 83). This is a constraining exercise when it comes to limiting the strategies that may only be understood through the constructive perception of human creators. For this reason, the research studies relating to developing contemporary PR/SS strategies can be considered through a socially constructed reality such as constructivism. However, this research considers PR/SS for the construction operatives cannot be positioned to both ontological in either of ontology's extreme sides (i.e., objectivism or constructivism).

The research falls between the two ontological extremes because it has relations with the development of a Framework for PR/SS and the removal of the behavioural constraints that are being experienced by the stakeholders within the construction industry. For this reason, outlining the framework and its key tools and techniques has to be considered as an independent reality of the researcher's inherent efficiencies. This phenomenon exists independently because the researcher is not involved with or contributing directly to, the failure or success of the framework when it comes to implementation. The researcher's judgements and awareness can only be utilised for understanding and interpreting the meaning of project documents and

the perception of human actors during the research period. The researcher's view on this phenomenon can clearly be considered as that of the outsider who has no control on the reality.

3.2.2 Epistemology

The second step of philosophy is epistemology that expresses the researcher's view about an original creation and the dissemination of what constitutes acceptable knowledge in a particular area of research (Saunders, et al., 2012). It involves the examination of relationships between the researcher and what is being researched. Epistemological research philosophies can be categorised into four perspectives, as depicted in Figure 3.1 of this thesis. They are called positivism, realism, pragmatism and interpretivism.

According to the positivism arguments, credible data or facts can only be provided by observable phenomena. Positivism focuses on causality and law like generalisations. Realism considers two perspectives namely:

1. Direct realism considers whether observable phenomena provide insufficient data, then represent inaccuracies in sensations, and alternatively,
2. Critical realism considers that phenomena create sensations that are open to misinterpretation.

These two realism perspectives focus on explaining phenomena within contextual arenas. Pragmatism seems to believe that either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research questions. This focuses on practical applied research and integrating different perspectives in order to help interpret the data. Interpretivism believes that social phenomena and subjective meanings focus upon the details of a situation, on a reality behind these details (Saunders, et al., 2012). Such discussions highlight that there could be philosophical overlaps between the two phenomena.

In considering the epistemological philosophy, this research deals with the observable phenomena of the behavioural constraints of the operational workforce, stakeholder dissatisfaction and providing a lifelong PR/SS for the operatives

therein. These facts are acceptable as knowledge and create sensations that are biased and interpreted through several research activities, such as:

1. The identification of the behavioural problems experienced by construction organisations and their impact on stakeholder dissatisfaction.
2. Analysis of the importance of PR/SS for the operational workforce within the construction industry in Sri Lanka.
3. Outlining a Framework to improve stakeholder satisfaction.
4. Investigating and underpinning the fundamentals of the PR/SS system in the Sri Lankan construction industry at present.

Therefore, the epistemological philosophy indicates that this research can be considered through a critical realism stance as depicted in Figure 3.2. The proposed PR/SS Framework is suggested to be implemented as a supportive structure within the human resource management of construction projects in Sri Lanka.

3.2.3 Axiology

The third philosophical stance is axiology that relates to a researcher's view towards the concerned parameters of the overall values in the research. This outlines whether a researcher's own values play a role in the stages of the research process (Saunders, et al., 2012). Axiology considers the role of the researcher's values in extreme continuums such as value free and value bound. A value free approach believes that the researcher is independently related to the data and the approach becomes objective. A value bound approach is considered when the researcher cannot be separated from what is being researched; it will become subjective. A pragmatist approach considers both aspects, objective and subjective. However, a realist assumption may consider a value laden approach in that worldviews, cultural experiences and upbringing will have an influence on the research (Saunders, et al., 2012).

Researchers have their own knowledge and experience even though these values may not exist explicitly. Such knowledge would help researchers to determine and recognise the facts, sensation, and interpretations that are generated from the reality (Collis & Hussey, 2009). The relationship between phenomena, the researcher's values and knowledge are not explicitly defined by (Saunders, et al.,

2012). However, this axiological philosophy could bring this research to a consideration of the role of values and meaning which have been understood by the researcher.

The direction of this research lies between value free and value bound but the research tilts more towards a value laden approach (Saunders, et al., 2012) as the research is likely to be mostly influenced by professional views, expertise, experience, knowledge, and upbringing.

3.3 Paradigms and approaches

Understanding that traditional paradigms are in obsolescence, Alvesson & Skoldberg (2009) pointed out that the positivism, social constructivism and critical realism have started being used less during the recent past. This is in parallel with the point of view of Leech & Onwuegbuzie (2007) which states that the mix method concepts or paradigms are still in their adolescent age and that findings are relatively unidentified. Therefore, it can be seen that these arguments may lead towards mystifying many researchers, Kumar (2011) has additionally, simultaneously, come up with exploring several other varieties of research approaches and frameworks as outlined in Figure 3.3 below.

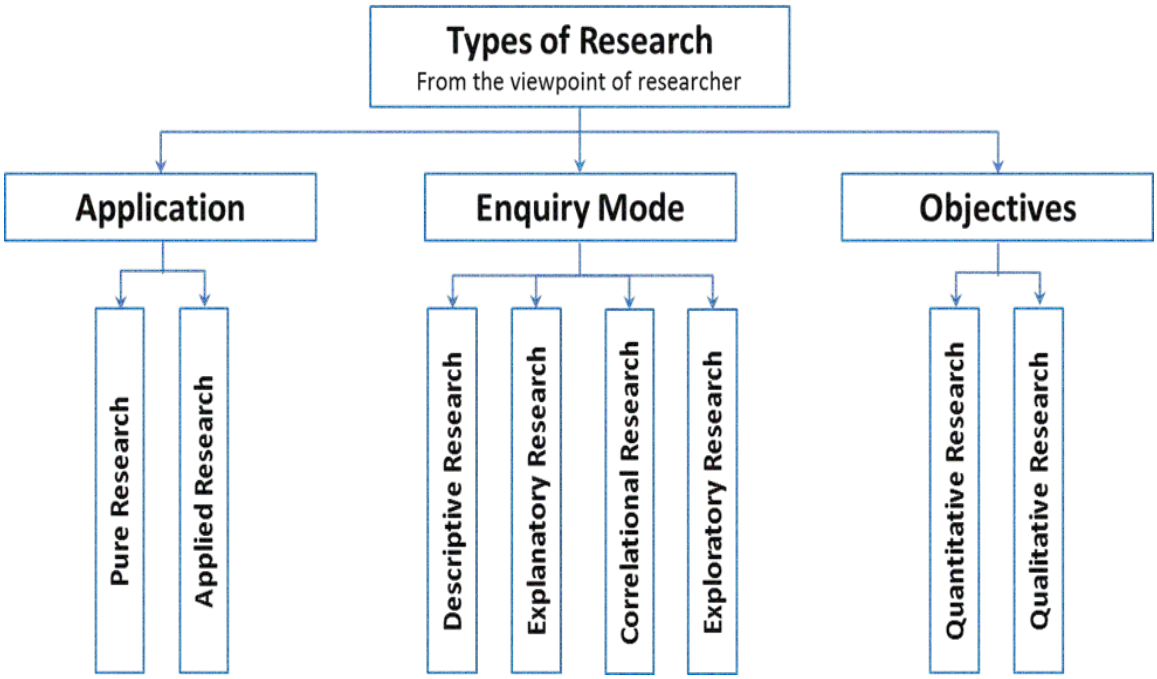

Figure 3.3 : Types of Research
(Source: Kumar, 2011)

Alternatively, there are several other combined paradigms that have been brought forward by Leech & Onwuegbuzie (2007) which support Small's (1995) empowerment research and the Delphi method for military research by Alzheimer (2009).

Research commences from two types of approaches called deductive and inductive. When using the deductive approach, the researcher narrow downs a broad picture (more general) of an object towards a more specific focal point. Sometimes this is informally termed as the "top down" approach. Inductive research is the opposite of deductive approach. This moves from specific observations to broader generalisations and theories. Some books refer to a third method called abductive approach as well (Saunders, et al., 2012, p. 128 and 144) which is used to generate testable conclusions. This research is primarily based on the deductive approach; i.e. it will commence from theories and then flow through hypotheses and observations either to reach whatever the outcomes put forward or to reject them as depicted in Figure 3.4. However, this research will have some influences to the research form of adductive since it was originally had a plan to validate this framework.

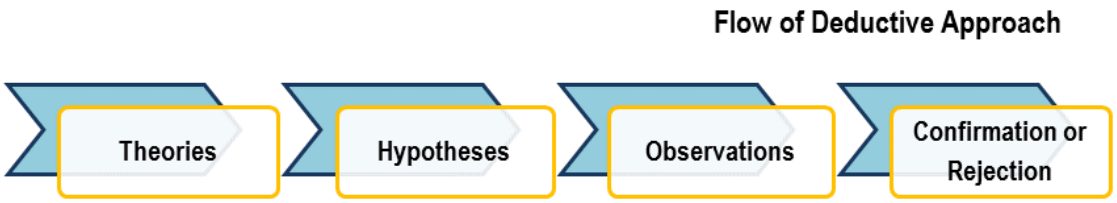

Figure 3.4 : Flow of the deductive approach

This research is focused on developing a multi paradigm approach together with qualitative and qualitative data collection strategies.

3.3.1 Positivism and interpretivism (antipositivism)

To conduct research, it is important to select one of the two primary different enquiry paradigms called positivism and interpretivism. In positivism, research enquiries will generally include statistical surveys and experiments whereas interpretivist enquiries are frequently related to conversational fieldwork and cultural phenomena supported by open ended questions in interviews etc. Generally, interpretivism is associated with qualitative research and positivist research is frequently related to the quantitative approach.

3.3.2 Strategies of inquiry

Making a decision regarding selecting a suitable research methodology depends on the nature of the research problem. Qualitative research methodologies that are popular for organisational and sociological research were dominated by abstracted empiricism methods during the 1960s and 1970s. After 1970, once again qualitative research began to improve with the triangular combination of ontology, human nature, epistemology, and methodology (Morgan & Smircich, 1980). However, some recent research have argued against Morgan and Smircich's philosophy stating that three knowledge areas called inter subjectivism, subjectivism and objectivism (Cunliffe, 2010) are missing from the fundamentals of qualitative research.

As described in Section 1.5 of this thesis, the aim and objectives of this research are to develop a framework to provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka. Therefore, it is necessary to identify funding sources via quantitative methods and sociological impacts through qualitative methods. The factors that require consideration when selecting a research approach (Galt, 2008) are depicted in Table 3.1 of this thesis.

Table 3.1 : Strategies of Inquiry
(Source: Galt, 2008)

Quantitative	Qualitative	Mixed Method
Experimental	Grounded Theory	Action Research
Between Group	Systematic	Practical
Designs	Emerging	Participatory
Within Group	Constructivist	Community based
Designs	Ethnographic	Mixed Designs
Quasi Experimental	Realistic	Triangulation
Correlational	Critical	Embedded
Explanatory	Case Study	Sequential
Prediction	Narrative Research	Explanatory
Survey	Biography	Exploratory
Cross Sectional	Phenomenology	
Longitudinal	Case Study	

In this research, the questionnaire was prepared via the combined approach because some of the questions related to interpretivism when enquiring about the behavioural problems of the operational workforce. Questions relating to measuring the impact of the operational workforce related to positivism. Since the proposed framework plans to use some information utilised in military structures, it requires using a Delphi method (Dalkey & Helmer, 1963) during the framework development and validating process.

3.3.3 Development of research approaches and paradigms

From the available various types of research approaches and paradigms, selecting and developing a suitable modus operandi was a challenge. Selection of a suitable research methodology depends on the nature of the research problem and questions (Naoum, 2013). As it was planned to collect sensitive secondary data from reputable and market leading construction organisations belonging to various organisational structures such as proprietorships, partnerships, private companies, public companies and cooperatives societies, assuring data confidentiality was highly important.

This research aims to develop a framework that can achieve greater stakeholder satisfaction in the construction industry. The platform of the framework will be reinforced with a lifelong social security system for the operational workforce within the construction industry in order to assist them to overcome their social security difficulties (which they are experiencing at the present time) (Kumar, 2011). Through the framework, it is anticipated that a time, cost and quality orientated operational workforce can be offered to the construction industry. When carrying out research relating to the human services' industries, it is essential to have a thorough knowledge of areas such as effectiveness, value for money and the training status of human resources in order to fulfill the following requirements efficiently.

- Controlled
- Rigorous
- Systematic
- Valid and Verifiable
- Empirical
- Critical

There are several ways of collecting and understanding information and finding the answers to any questions and research (Lee, 2001). However, it is said, “the fundamental requirement of any question is that it is understood”.

3.4 Research methods

Although the research process is defined according to the disciplined inquiries of academic and business purposes differently, the research method may refer to a research process that is currently offered in the published literature, such as through methodological research designs, through a systematic research process of inquiry and investigation in order to increase the body of knowledge (Amaratunga, et al., 2002). Research methods are influenced by the philosophical position of the research. This research presents assumptions about the nature of reality and knowledge and the observable phenomena to be critically interpreted by the social entities that are revealed through the value laden system.

Quantitative and qualitative methods are the two systematic and distinct categories that are generally used in conducting research (Saunders, et al., 2012). In order to increase the validity and reliability of the research or to consider the consistency of the results, different methods may be combined in order to triangulate the research through mixed methods’ or multi methods’ approach.

3.4.1 Quantitative methods

A quantitative research method is a numeric description derived from the study of a sample of the population to represent trends, attitudes, or the opinions of a population (Creswell, et al., 2010). This research provides computational expressions through secondary data observations and through questionnaire survey measurements gained from collecting and analysing numerical forms of data.

Direct observations can be obtained from audio and visual records, project documents, and from analysed events or activities relating to the research area and focus. Questionnaire surveys contain a degree of impact analysis and closed questions can be used to obtain more details and to avoid redundant responses (Saunders, et al., 2012). Questionnaires can be administered electronically or via printed documents in order to collect quantitative data.

3.4.2 Qualitative methods

A qualitative research method utilises word expressions from empirical inquiries and investigations through a process of interview assessments in order to understand human behaviours and their interpretation of the phenomena. Qualitative data or information can be collected by face to face interviews, by telephone, or by other electronic media such as the internet or intranet (Saunders, et al., 2012). Specific qualitative inquiries may be in the form of structured or semi structured interviews, and unstructured interviews.

However, this research does not utilise any interview methods.

3.4.3 Mixed methods

There two different versions of research contains both quantitative and qualitative methods as the research tradition could provide biases. The mixed method or the triangulation method can compensate for each single method's weaknesses through the counter balancing strength of the other (Amaratunga, et al., 2002) and it can reinforce each of the different methods by generalising a bias within any single method by serving the bias inherent in the other method (Creswell, et al., 2010). This has an implication in positioning both the research approaches in relation to the ontological and epistemological philosophies.

Scientific approaches have argued that hypotheses should be formulated and tested using precise measurement techniques (Saunders, et al., 2012). On the other hand, it must be considered whether a scientific approach is the right choice to adopt and how to include social research. It would seem to be a possibility and a desirability to combine both quantitative and qualitative versions.

Quantitative and qualitative approaches are seen from ontological and epistemological assumptions, wherein a grounded research is not compatible to combining both quantitative and qualitative approaches. According to the nature of these philosophical assumptions, the mixed method approach is not likely to be possible for grounded research (Greene, 2006). However, most researchers see these two approaches as capable of being triangulated in order to give greater validity to the data collection and the data analysis based on a technical assumption.

In fact, research can be assessed as being more methods that are reliable when different techniques for observing a phenomenon from different angles or dimensions are combined in order to obtain compelling information. Yen (2009) suggested that case studies can use multiple sources of information and case study databases and can maintain the chain between different sources of evidence in order to increase the validity (construct, internal and external) and the reliability of the research. Furthermore, construct validity can be achieved through establishing the correct operational procedures to address and utilise appropriate instruments for data collection. Internal validity considers causal relationships between facts and certain conditions in order to establish other conditions through the implementation of correct analytical strategies for data analysis, while external validity considers appropriate sampling strategies and units of analysis to establish generalisations from the research findings. Reliability considers that the replication of the operational methods of the research will provide similar results and acceptable inconsistencies across cases through a clear research methodology. The basic assumption provided for the mixed method inquiry, expressing the belief that its diversified types of data collection techniques and procedures could provide a better understanding of the research problem (Creswell, et al., 2010).

This research began by reviewing the relevant literature to identify the reasons behind the scarcity of, and the behavioural constraints of, the operational workforce in the construction industry in Sri Lanka. Then, a questionnaire survey was developed in consultation with experts to generalise the results in respect of the project's evaluation criteria. During the literature review phase, this research also investigated an underpinning philosophy relating to construction organisation in order to develop a self sustainable PR/SS Framework for minimising the scarcity of, and the behavioural impacts of, the operational workforce in the construction industry in Sri Lanka.

3.5 Positioning the research stance

This research typically follows a logical research process that starts from reviewing the literature and principles to developing the 'research model' as the proposition for enabling the conclusions to be drawn against the research aim and objectives. According to (Alvesson & Skoldberg, 2009), a simple argument and general

premise should be identified and then should be narrowed down to a more specific premise to allow for the drawing of conclusions.

Stakeholder dissatisfaction within construction projects in Sri Lanka was investigated in order to develop and maintain “A Framework for Providing a Lifelong Social Security System for the Operational Workforce in the Construction Industry in Sri Lanka”. The important features of pension, retirement benefits or social security support (PR/SS) were identified and analysed in order to improve the behavioural quality of the operational workforce. The important PR/SS tools that can incorporate into effective tools and techniques of the PR/SS is self sustainability of the financing mechanism. The important PR/SS tool that can be utilised as an effective tool and technique for PR/SS is the self sustainability of the financing mechanism. However, improving the management structure of the construction industry in Sri Lanka was also one of the research objectives. This approach enables the drawing of logical conclusions.

Research philosophies (i.e., ontology, epistemology and axiology) may influence the choice of a research strategy and method to be adopted when conducting research. The researcher’s views about the nature of reality and the role of values need to be considered. In order to interpret the role of values in research, different research methods (such as quantitative, qualitative, mixed and other techniques and procedures) are triangulated to justify the results of the research as depicted in Figure 3.2. Therefore, these philosophical domains (Collis & Hussey, 2009) position the research into a critical realist stance.

Many researchers believed that ontological and epistemological philosophies underpin logical reasoning into two main strategies of the research; these are the deductive and inductive approaches. The deductive research approach usually starts from theories, moving from more general premises to more specific available facts, whereas the inductive approach moves from more specific observations (involving uncertainty) to broader generalisations on establishing theories (Bell, 2005). This research applies the deductive approach; it begins from general theories on the construction industry and moves through the behavioural problems of the operational workforce towards looking at the social security systems in the global scenario as well as particularly within Sri Lanka.

Having discussed the philosophical stance and the research approach, the next section determines the research choice through examining several criteria of research strategies.

3.6 Research strategy

The research strategy depends on the research objectives and questions. The main research questions being investigated should be given the greatest importance and they should be critically linked to the most appropriate method of data collection and analysis (Fellows & Liu, 1948). In 2009, Yin considered several research strategies such as experiment, survey, archival analysis, history and case study.

The systematic choice of a research strategy can be examined which highlights the role of three research criteria:

(1) Form of research questions
(2) Control of behavioural events
(3) Focus on contemporary events.

Firstly, via the form of the research questions, the research objectives can commence dealing with tracing operational links of evidence and occurrences. This can mainly be achieved by 'how' and 'why' type questions. As such, historical data and questionnaire survey seem to be the appropriate strategies for this research. The degree of impact as a percentage (%) and 'Yes', 'No', 'Sometimes', 'Most of the Time', 'Definitely' answers may be relevant and fewer survey methods. An analysis of archive data may be relevant in this research since the research objectives are related to the incidence or prevalence of phenomena (Yin, 2009). However, a survey and archival analysis are disqualified from the first criteria for the research on the development of the PR/SS framework to reduce the behavioural impacts and improve stakeholder satisfaction in the construction industry in Sri Lanka.

Secondly, the level of control requirements such as experiment, history and case study can be determined through assessing the differences among them according to the extent of the researcher's ability to control the phenomena. The research on the development of the PR/SS Framework does 'not require' the researcher to

control the phenomena and the historical method is selected because there is virtually ‘no access or control’ over the phenomena (Yin, 2009) while the experiment requires the researcher’s control of behaviour events. Therefore, the ‘experiment strategy cannot be implemented’ for this research with respect to the second criteria. The remaining two research strategies, historical data and questionnaire, are assessed below using the third criteria.

Finally, the focus on contemporary events (such as the development of the PR/SS framework) requires the obtaining of recently updated information on project events that are accessible to the researcher. According to the third criteria, the ‘historical strategy is not appropriate’ for this type of research since it deals what has gone (Yin, 2009) and is focused on past events.

This research considers secondary data scrutinising as an ‘empirical enquiry’ that investigates a contemporary phenomenon within its real life context. The real data research strategy (Quiroga, et al., 2008), that is alternatively referred to as real world data, real time data or actual data, are considered to satisfy all three different criteria of the research strategy and thus represents a suitable method to fulfil the research aim and objectives of this research.

The ‘Real data’ research strategy can be further explained as the process of evaluating data using analytical and logical reasoning to examine each component of the data provided. This form of analysis is just one of the many steps that must be completed when conducting a research experiment. Data from various sources is gathered, reviewed, and then analysed to form some sort of finding or conclusion. There are a variety of specific data analysis methods, some of which include data mining, text analytics, business intelligence and data visualisations (Business Dictionary, 2016).

3.7 Research design

Disciplined inquiries by academic and professional researchers will never be exactly or precisely similar between different processes. Different authors define the research process in different ways or by using different focuses. However, any research should be designed methodologically and systematically (Collis & Hussey, 2009) to collect a mass of information (Walliman, 2001) about the natural world

(Dalkey & Helmer, 1963) and thus produce an effective process of inquiry and investigation (Fellows & Liu, 1948) in order to fulfil particular research questions and objectives (Saunders, et al., 2012) that aim to increase the body of knowledge.

The foremost challenge of the research design was to develop an appropriate methodology for collecting the required data and information that can support the proposed framework in an ethical manner. Meanwhile the data and information that was collected needed to be in an analysable format. It was decided to avoid highly mathematical analyses and presentation graphics in order to receive better cooperation during the validation and implementation stages from the officials within the political background.

Initially, the research design was outlined in order to establish the following (by way of the literature review and a variety of primary and secondary data belonging to the quantitative and qualitative research methodologies):

A. Literature
    a. Literature relating to the historical development of pensions, retirement benefits or social security payments (PR/SS) in developed countries.
    b. Recognising the essential amendments that developed countries undertook to pensions, retirement benefits or social security payments in the past.
    c. Current challenges and corrective actions recommended by the developed countries.
    d. Reviewing the success stories and frameworks of PR/SS in the global scenario.
    e. The Sri Lankan scenario of social security and the moving patterns of socioeconomic development.
    f. Studying the ‘pros and cons’ of the prevailing PR/SS systems in Sri Lanka.
    g. Reviewing previous studies carried out regarding human resources’ management within the construction industry in Sri Lanka.

Further details on historical development, identified weaknesses, amendments, corrective actions, success stories, the advantages of frameworks, the development time line and previous studies that have been undertaken on PR/SS systems are described in Section 2.10 and its relevant subsections. Section 2.11 and its subsections describe the elaborated scenarios applicable to the Sri Lankan context and their relevance to the construction sector in Sri Lanka.

B. Qualitative Data
    a. Reviewing public opinion on introducing “A Framework for Providing a Lifelong Social Security System for the Operational Workforce in the Construction Industry in Sri Lanka”.
    b. Assessing the presidency level and the degree of impact on the construction industry from the recognised behavioural problems of the operational workforce.
    c. Understanding the causes and effects behind the scarcity of an operational workforce in Sri Lanka.

The requirement for obtaining qualitative data was fulfilled by incorporating considered questions in the questionnaire survey. Accordingly, public opinion (Item B.a. above) on PR/SS was obtained via question 9 of the questionnaire (see Appendix D). Similarly, responses regarding the status level and the degree of impact (Item B.b. above) relating to the behavioural problems were obtained through question numbers 6 and 7 of the questionnaire (see Appendix D). Causes and effects behind the scarcity of an operational workforce in Sri Lanka was elicited from the data acquired via question 8 of the questionnaire (see Appendix D).

C. Quantitative Data
    a. Primary Data requirements:
        i. Recruiting models of operational workforce and percentage distribution. [Q2; Appendix D]
        ii. Annual turnover in the recent past [Q4; Appendix D]
        iii. Anticipated annual turnover in the future [Q5; Appendix D]

iv. Impact values of the behavioural problems of the operational workforce relating to time, cost and quality. [Q6; Appendix D]
v. The quantitative effects of material wastage due to the behavioural problems of the operational workforce. [Q7; Appendix D]
vi. The quantitative effects of the recognised behavioural problems. [Q8; Appendix D]

b. Secondary Data requirements:
   i. ICTAD Cost Indices for past 12 years.
   ii. Other historical data for fluctuation comparison such as:
      - Fuel prices
      - Cost of living
      - Salary revisions in the public sector
      - GDP (Gross Domestic Product) variations
      - Currency fluctuations of GBP, Euro and US$
      - Steel and cement rates' fluctuations
   iii. Audited statements of the selected contractors for development appraisal.

The requirements needed for the primary data were obtained through the questionnaire survey and the applicable questionnaire references [Q2 to Q8] are provided above.

The first part of the secondary data, that is the ICTAD cost indices, were available to purchase at a nominal cost from the sales centre located in the Institute for Construction Training and Development in Sri Lanka. Hence, such data were purchased from the Institute itself. The requirement for the second part of the secondary data (or the historical data) was obtained from websites managed by reputable institutions. References to these are provided at the relevant location where the data used is discussed. The accuracy level of such data was not overly important since purpose of using them was for general comparison only. The third set of secondary data (or audited financial statements) were received as supplementary attachments from the responding participants to the questionnaire survey. The importance of the audited financial statements were expressed in the

supportive covering letter issued by the National Construction Association of Sri Lanka [NCASL] (see Appendix D) to the participants.

After outlining the data requirements, consideration was then given to developing an appropriate and practical research structure. At this point, it was considered that an in depth review of previous theses would be a suitable approach. During the investigation, it was identified that research such as that undertaken by Amaratunga (2001), Pathirage (2007) and Egbu (2013) was carried out by utilising multi phased approaches during their studies. Similarly, this research study was phased down to two stages for the purpose of ease of carrying out the data collection stage.

3.7.1 Phase 1 of the research study

In Phase 1 of the research studies, the literature review was focused on identifying previous studies on pensions, retirement benefits or the social security system (PR/SS) relating to the following five (5) study areas:

1. The historical development of pension, retirement benefits or social security (PR/SS) schemes in recognised developed countries (United Nations, 2013) in chronological order.
2. Reviewing the qualitative values received through PR/SS to reach the Developed Status.
3. Evaluating the quantitative impacts of PR/SS to maintain the Developed Status.
4. The lateral affects the current systems of PR/SS in the global scenario.
5. A comparative review of international PR/SS contrary to the Sri Lankan scenario.

Through the Phase 1, the literature review, several key areas were brought to light that can be summarised as follows:

A. In the global scenario:
    a. Most developed countries have government sponsored lifelong PR/SSs for the entire population.

b. There are several kinds of other organisations that are available to underpin the PR/SS structures supported by private sector initiatives, such as insurance schemes, cooperatives and charity funds.
c. PAYG is the common system utilised for PR/SS throughout Europe and on the American continents.
d. The aging population and institutional overheads have become a global constraint for maintaining the prevailing systems.

B. In the Sri Lankan context, the literature review mainly concentrated on the following:
   a. Identifying the reasons behind the shortage of proper, affordable and reliable lifelong PR/SSs in Sri Lanka.

      These requirements were initially identified in previous research carried out by de Silva and others (2010) such as Wijewickreme (2010), and Chandradasa and Ekanayake, (2011). During this research previously, identified constraints were quantified through the data obtained via Q8 of the questionnaire survey (see Appendix D).

   b. A lack of reliability in the systems offered by private sector initiatives in Sri Lanka.

      There are several private bankers and insurance companies that offering PR/SS schemes but they are not popular since such mechanisms are not capable of underwriting the impact of inflation or currency devaluation.

   c. The available frameworks offered through both public and the private sector have been unsatisfactory in the construction sector PR/SSs, mainly due to the five [5] year ESB framework in Sri Lanka.

      The legal system of Sri Lanka requires 5 years of continuous service in order for someone to become eligible for the current ESB framework (Abeynayake, 2010). Since the majority of the construction projects are shorter than 5 years and the utilisation of a single trade

person on projects has a few months of activity, the ESB system does not work for construction operatives.

d. Constraints generating from the unstructured employment pattern, and from a lack of recognition and career development in the construction sector in Sri Lanka.

   Once again, the temporary nature of the occupations, and the projectised environment, within the construction industry (PMBOK, 2008) provides constraints. Private organisations are not capable of investing on career development since it is difficult to submit competitive bids or tenders when overhead costs become too high for any organisation.

e. Behavioural problems of the operational workforce in the construction sector in Sri Lanka.

   The behavioural constraints that are described in Section 2.8 and 2.9 of this thesis also negatively impact on the social outlook of the construction operatives (since trustworthiness is diluted by the behaviour of the operational workforces) (Divaina, 2014 and The Island, 2014).

3.7.2 Phase 2 of the research study

Having concluded a discussion of the planned investigations for Phase 1, further explanations were established by developing the research methodology. These secondary developments of the research studies led towards providing in depth knowledge of the PR/SS systems in Sri Lanka for the operational workforce in the construction sector.

The key objectives recognised for the Phase 2 investigations were:

1. A further review of the previous investigations that were carried out during Phase 1 for the following:

   a. Confirmation of the relevancy of the findings of Phase 1 in terms of the factors under investigation during Phase 2.

b. Establishing and identifying other factors that should be taken into consideration.

c. Identifying the sample size and earmarking the potential contractors suitable for the secondary data collection and investigations.

2. To identify the prevailing PR/SS frameworks applicable to the construction sector in Sri Lanka. This was carried out by investigating the current frameworks available in the local and in the global scenario. Thereafter, it was anticipated that all the available provisions relating to PR/SS should be identified with a view to explaining how these factors could act together to produce a system with less failures; thus to find a mechanism that can give better success through the mechanisms that were identified during the Phase 1 investigations.

3. To investigate the frameworks developed based on Government and private sector initiatives for PR/SS; to recognise the advantages and disadvantages of those frameworks in streamlining the proposed framework.

4. To recognise the available paths, procedures and mechanisms for validating the proposed framework.

3.7.3 ICTAD and NCCASL

The Institute for Construction Training and Development (ICTAD) (www.ictad.lk, 2015) and the National Construction Association of Sri Lanka (NCASL - www.ncasl.lk) are the two premier organisations relating to the construction industry in Sri Lanka. The researcher identified that the aforementioned two organisations have valuable information that can be utilised as a reliable set of data relating to construction organisations, their strengths, capabilities and resources. In order to avoid repetitive work, the development of the research questionnaire through to the entire data collection process, and the “Proposed Framework” depicted in Figure 5.1 of this research thesis, were pre-tailored to fit in with the infrastructure of ICTAD and NCASL (since it is said that adjusting an existing system is much easier than introducing a brand new mechanism). An outline introduction to, and the responsibilities of, ICTAD and NCASL are given below:

- ICTAD

  'The Institute for Construction Training and Development (ICTAD) is an organisation set up by the Government of Sri Lanka to develop and promote the domestic Construction Industry, Contractors, Professionals, Work Force, etc. ICTAD has established itself as a recognized and important constituent of the Construction Industry. The Vision of the ICTAD is to create a reliable and globally competitive construction industry for Sri Lanka and its missions are expanded to ensure dynamic, professional, and reliable value added services to the nation, through regulation and facilitation of the development of construction industry resources and promotion of quality standards, to meet local and global requirements for sustainable national development' (www.ictad.lk, 2015).

- NCASL

  The 'National Construction Association of Sri Lanka (NCASL) is the apex body in the country for the development of the construction industry. It was originally formed as the Association of Construction of Sri Lanka in 1981, with the initiation of the government of Sri Lanka and the support of the World Bank. With an initial membership of forty contractors, the association has steadily grown, and now has over two thousand five hundred regular members under its umbrella scattered throughout the island' (www.ncasl.lk, 2014).

ICTAD is a statutory organisation managed through a Cabinet appointed Chairman supported by a board of directors selected from industry professionals. NCASL is a company set up by the registered construction contractors in Sri Lanka. The Chair and the Board of Directors of NCASL are selected by the registered construction contractors in Sri Lanka. The websites of ICTAD and NCASL are highly informative and are openly accessible to the public. The contractor categorisation provided in Tables 3.2 and 3.3 were extracted from the ICTAD website (Appendix C). Furthermore, the contact postal addresses (Appendix B) of registered construction contractors that were utilised for the distribution of the questionnaire were prepared from the data available on the websites of ICTAD. NCASL collaborated with this research during the data collection stage by providing individual supportive letters addressed to a selected 400 construction contractors in Sri Lanka (Appendix D).

3.7.3.1 Supporting structure for the data collection and the Framework

Currently ICTAD (the Institute for Construction Training and Development) has a contractor grading system. The grade varies from C1 to C10 depending on the capacity of individual contractors (see Table 3.2 in this thesis). All grades of category C contractors generally taking the main contractor role in the traditional type of construction procurement. In addition to category 'C' contractors there are also grading systems for specialist contractors, as shown in Table 3.3 of thesis. When evaluating a contractor's grade, their capacities and resources are valued.

Table 3.2 : Main Contractor Grading Classification
(Souece: www.ictad.lk, 2015)

ICTAD - Main Contractor Grading Classification		
Speciality Areas	Grade	Financial Limit (SLRs. Millions)
Building Construction Highways Bridges Water Supply & Drainage Irrigation & Land Drainage Dredging & Reclamation Storm Water Drainage Groynes & Revetments & Reclamation	C1	X ≥ 600
	C2	600 ≥ X > 300
	C3	300 ≥ X > 150
	C4	150 ≥ X > 50
	C5	50 ≥ X > 25
	C6	25 ≥ X > 10
	C7	10 ≥ X > 05
	C8	05 ≥ X > 02
	C9	02 ≥ X
	C10	01 ≥ X
Financial Limits (Effective from 1st June 2012)		

When looking from the viewpoint of providing a suitable PR/SS structure, one of the major weaknesses in the classification structure of the ICTAD contractor grading system is the imbalanced weightages given for the availability of in house construction operatives. Since the availability of in house human resources do not give any considerable impact for the prospective contractors in terms of achieving the desired ICTAD grade (either C1 or C10 in the current scenario), the contracting organisations do not have any valid necessity to spend funds on maintaining a permanent workforce. However, many contracting organisations permanently maintain engineers and trained technicians at a supervisory level.

Table 3.3 : Specialist Contractor Grading Classification
(Source: www.ictad.lk, 2015)

Specialist Contractor :			
Speciality	Sub Speciality	Grade	Financial Limit (SLRs. Million)
Electrical & Mechanical Services (EM)	Mechanical Ventilation and Air Conditioning (MVAC)	EM 1	X ≥ 50
	Refrigeration (RF		
	Electrical Installations (Low Tension) (EE-LT)		
	Plumbing & Drainage (PD)		
	Elevators, Escalators & Travellators (EET)		
	Generators (Gen)		
	Electrical Installation (High Tension) (EE-HT)		
	Extra Low Voltage Installations (Data, Telecommunication and Security Systems) (ELV)	EM 2	50 ≥ X > 25
	Fire Detection, Protection & Suppression (FDPS)	EM 3	25 ≥ X > 10
	Medical Gas Systems (MG)	EM 4	10 ≥ X > 02
	LP Gas Systems (LPG)	EM 5	02 ≥ X
Specialised Construction Contractors (SP-C)	Aluminum & Finishes (A&F)	SP1	X ≥ 50
	Floor, Wall & Ceiling Finishes (FW&C) (must specify the finish)		
	Carpentry & Joinery (Carp)		
	Light Metal Work (ME)		
	Soft Landscaping (LA)		
	Furniture, Fittings & Equipment (FF&E)	SP2	50 ≥ X > 25
	Water Proofing (WP)	SP3	25 ≥ X > 10
	Swimming Pools (SP) - Industrial Domestic	SP4	10 ≥ X > 02
	Soil Nailing & Stabilisation (SN)	SP5	02 ≥ X
Piling		GP-P	X ≥ 50
		GP-B1	X ≥ 150
		GP-B2	150 ≥ X > 50
		GP-B3	50 ≥ X > 10
		GP-B4	10 ≥ X

Through this framework, it is suggested to set up human resources, providing organisations can take the burden of a single point responsibility for the physical production and desired quality of a project. In this system, there will be no risk transfer from one what to another person or a company. The researcher's aim is to calculate the impact of current risk multiplication and to search for the possibilities of implementing the proposed system without increasing (self sustainable) the prevailing construction costs.

3.7.4 The instruments of data collection

A questionnaire survey was chosen as the primary data collection instrument. In addition to the information that was planned to be gathered through the questionnaire survey, there were three varieties of other secondary data requirements as described in this section of the thesis, see below:

i. ICTAD cost indices for the past 12 years.

   ICTAD cost indices were available to be purchased from the Institute for Construction Training and Development since commencement of data preparation from September 1990 onwards.

ii. Other historical data for fluctuations' comparison.

It was realised that the comparison of fluctuations could easily be explained by comparing commonly applicable flat forms such as fuel prices, cost of living indices, salary revisions for public sector employers, GDP variations (Gross Domestic Product), currency fluctuations of commonly used currencies (GBP, Euro and US$), steel and cement price variations etc. Such data was available through easily approachable and reliable databases such as:

- The World Bank (www.data.worldbank.org)
- The Government Information Centre of Sri Lanka (www.gic.gov.lk)
- The Central Bank of Sri Lanka (www.cbsl.gov.lk)
- GDP inflation rates in Sri Lanka (www.gdpinflation.com)
- The Demographic Profile of Sri Lanka (www.indexmundi.com)
- Currency conversion site (www.oanda.com)

Information on the salaries of public sector workers and the armed forces were planned to be obtained by sending a request letter to The Department of Management Services of the General Treasury.

iii. Audited statements from selected contractors for development appraisal.

It was an essential requirement to analyse the financial performances of several contracting organisations in order to support the framework development stage. To evaluate financial performances, audited statements for past 3 to 5 years was a ‘must’ secondary data requirement. There are seven categories of companies in Sri Lanka:

1. Those companies incorporated abroad & registered in Sri Lanka
2. Joint Stock Companies
3. Private Companies
4. Public Companies
5. Guarantee Companies
6. Associations
7. Foreign Companies

Over 99% of Sri Lankan construction companies are registered under the category of ‘Private Limited’, according to the data available in the websites of The Department of the Registrar of Companies (www.drc.gov.lk, 2015) and the Institute for Construction Training and Development (www.ictad.lk, 2015). In accordance with the Act Number 7 of 2007 and Act Number 17 of 1982, companies registered under ‘Private Limited’ are not required to publish audited statements. Therefore, obtaining financial statements was considered as high risk data. To mitigate the risk of data collection via audited statements, several alternatives were pre planned.

A. The turnover data requirement was forwarded to participating companies as a data entry question in the questionnaire survey (Q4 of the questionnaire survey).
B. A request was made in the covering letter to the participating companies to attach their audited statements from the past five years.
C. An arrangement was made to issue a supporting letter from the National Construction Association of Sri Lanka (NCASL) emphasising the importance of providing their audited statements from the past five years.

D. Selecting several short listed companies and approaching the Company Directors to obtain their audited statements for the past five years by explain the requirement to the Directors in a more personalised manner.
E. Approaching the Chairman of ICTAD, convince him of the data requirement, and then obtaining the required data anonymously for analytical purposes.

The application of the options D and E was essential in the event that the combined approach of options A, B and C was not successful enough to collect the required data.

The following sections discuss the empirical research conducted through the questionnaire survey, the project case study documentation and observations, and the expert interviews.

3.8 Research techniques and procedures

Discussions in this section elaborate upon the last inner layer of the 'research process onion' by (Saunders, et al., 2012). It includes the two important research processes of 'data collection and data analysis'. Every research study investigates a different line of inquiry and requires different characteristics of data and information (Fellows & Liu, 1948). Even though a researcher may be experienced, data collection can be complex and difficult. If data collection is not undertaken well then the entire research process can become inconsistent. This may be avoided by utilising skills in a specific field of research (and includes factors such as protecting ethical consent and anonymous human subjects).

When there are more than one, analytical approaches used in a single research, such approaches are called a mixed approach. There is more than one definition for the combined methods' approach for research inquiries (Creswell, et al., 2010). Several commonly used definitions are (OBSSR, 2014):

a) Focusing on research questions that call for real life contextual understanding, multi tier perspectives and cultural influences.
b) Employing rigorous quantitative research that assesses the magnitude and frequency of constructs, and rigorous qualitative research exploring the meaning and understanding of constructs.
c) Utilising multiple methods (e.g., intervention trials and in depth interviews).

d) Intentionally integrating or combining various methods to draw on the strengths of each.
e) Framing the investigation within philosophical and theoretical positions.

Methods of mutual explanatory were developed to understand the evidence gathered from nature in the social world based on theoretical orientations (Weimer, 1995). Social inquiries are generally applied to the problems that infuse several tiers of society, such as when researching and validating policies, organisations, individuals and families (Greene, 2006).

Quantitative methods, which are mainly based on deductive approaches, are considered as the most suitable for pervasiveness measurements of a recognised phenomenon (Latham, 2009). Qualitative methods, based on inductive approaches, are generally applied when a process is new and the research path (Amaratunga, et al., 2002) and the range of its effects are unknown (Mertens, 2009). Amalgamated methods of researching means deliberately collecting multi tier qualitative and quantitative data (as shown in Figure 3.5) for the purpose of amalgamation in order to improve the strengths of the research process.

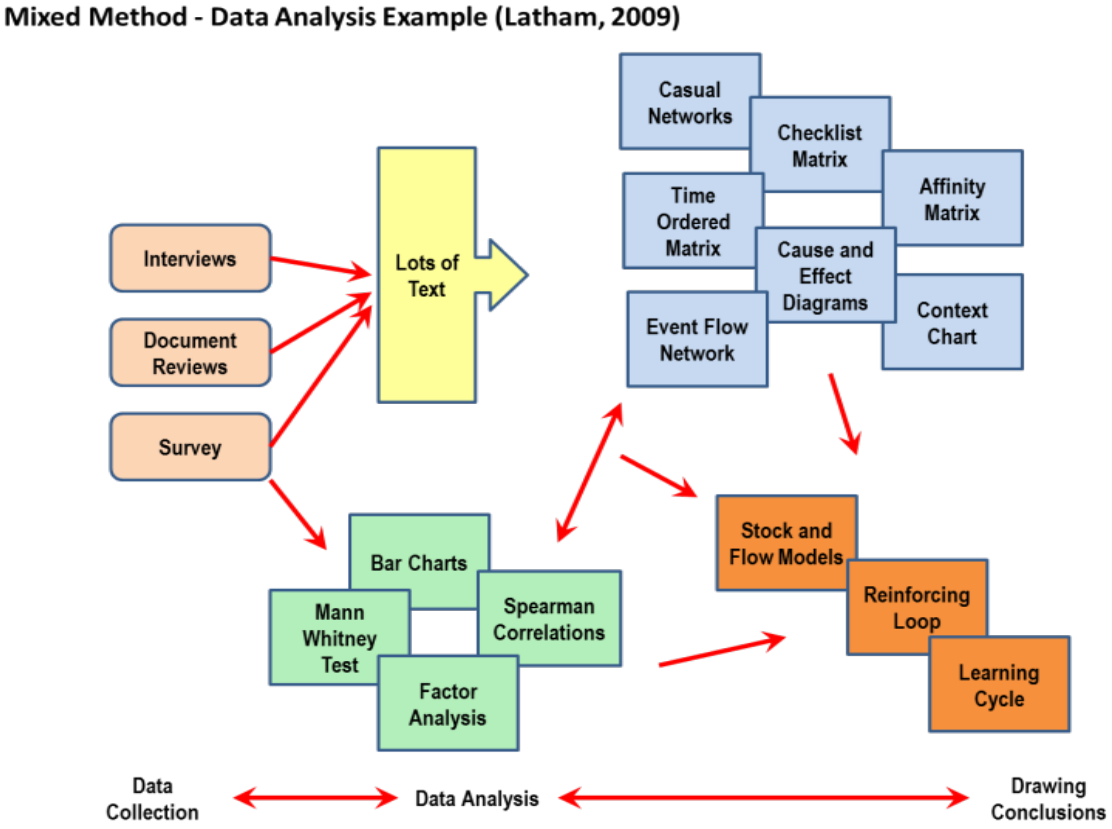

Figure 3.5 : Mixed Method - Data Analysis Example
(Source: Latham, 2009)

Furthermore, it is said that methods of a varied nature are utilised particularly for principles of management accounting (Grafton, et al., 2012) and they have gained popular acceptance in the recent past. Based on the reviews, a multi paradigm approach was considered for conducting the research for developing “A Lifelong Social Security System for the Operational Workforce in the Construction Industry in Sri Lanka”.

3.9 Data collection, techniques used, and research findings

During the process from the literature review through to the development of a research methodology for this research project, it was realised that data collection, analysis and drawing conclusions from the research findings should be conducted in a structured manner as they are interlinked to each other. The basic pattern was seen as a multi fibrous rope rather than as a chain. A chain is less flexible and usually separates when one link is broken. The image of a rope demonstrates better characteristics regarding flexibility and it incorporated strands are bound together with each other by the frictional properties of the individual fibers. The failure of a single fiber does not cause any sudden separation between the arguments when it comes to the research process. The requirement for this pattern of reactions was foreseen when developing the Research Methods (discussed in Section 3.4 in this thesis). Therefore, it was pre planned to face any such challenges that were likely to be faced during the data collection, analysis and concluding stages of the research.

The researcher planned to carry out the data collection in the following ways:

a. Questionnaire surveys (384 in total) were distributed as described in Appendix D - Questionnaire distribution summary.
b. Discussions with senior managers and company directors.
c. The use of published archived records such as audited statements.
d. The examination of pre tender records to understand the allowances that are inserted at the tender stage for risk management
e. The examination of pre tender records to understand the targeted profit margin at a tender stage.

f. The examination of post tender records to understand the actual profit generating centres (labour, equipment, machinery, subcontracts and the like)

The questionnaire was aimed at the top management of contracting organisations such as managing directors, chief operations officers and the general managers of government companies. The research questionnaire was initially prepared after hearing the concerns gathered from senior industry professionals and top management officials who the researcher used to meet during continuing professional development sessions, tender meetings and other industry related events.

Prior to obtaining ethical approval from the University of Salford, the questionnaire was initially distributed to the researcher's email group of MSc course colleagues at the University of Moratuwa as a pilot survey. 8 course colleagues out of 46 responded with comments.

3.9.1 Finalisation of the questionnaire and survey

The finalisation of the questionnaire was carried out with the support of the local supervisor and three other MSc course colleagues from the University of Moratuwa who responded with comments to the draft questionnaire.

Since the constraint of construction operatives is common to the entire construction sector of Sri Lanka, the National Construction Association (NCASL) agreed to provide support during the data collection stage. Hence, the entire selection of the construction organisations utilised for the questionnaire was prepared with the support of NCASL and individual letters (on the letterhead of NCASL (Appendix D)) were distributed addressed to the managing directors of the construction organisations.

There were 157 responders from the 400 questionnaires distributed and 148 respondents included the requested audited bank statements. Table 3.4 of this thesis provides further details on the questionnaire distribution and data collection.

The questionnaire was distributed via post in the middle of November 2013 and given a 3 weeks' response period. Return addressed and fully stamped envelopes were enclosed in the questionnaire distribution pack. After two weeks, a first reminder was sent with a 10 days' extension of time. A second reminder was sent as a printed note highlighting the importance of the response together with a greeting card for Christmas and New Year.

3.9.2 Data collection

The process of gathering information on variables in an established scientific method can be called data collection. The purpose of measuring and evaluating the concentration of data may enable the development of solutions or frameworks as stipulated in the research aim and objectives, the testing of hypotheses and the evaluation of the outcomes. Data collection is one of the fundamental stages for almost all research that is carried out, irrespective of the study areas (including but not limited to engineering, science, physics, social sciences, business, legal affairs and humanities). Depending on the researcher's personal preference and the type of the research that is being carried out and the data collection methodology may vary by discipline (Sapsford & Jupp, 2006). There are pre recognised mechanisms available for data collection. Researchers are always free to experiment with new ways of collecting data if the collected data can ensure accuracy and authenticity. It is always a 'must' requirement that the collected data are in line with the ethical and legal requirements of the supervising authority (Amelie, et al., 2014). The objective of data collection is to capture proper longitudinal and cross sectional evidence that can be translated into a credible answer for the identified rationale of the research in a convincing manner.

Irrespective of the research methodologies utilised (such as quantitative and qualitative and applied data collection techniques identified from existing models or newly developed models or modified models), one of the most important and essential criteria for the integrity of research is maintaining the accuracy level throughout the data collection process. The researcher was keen on the previously mentioned requirements and clearly demarcated and followed the instructions

provided by the supervising authority for the correct application to minimise the probability of inaccuracies that could occur. At the commencement stage of this research, it was realised that there was a necessity to have a structured data collection process. It is said that structured mechanisms effortlessly safeguard research, both in terms of data gathering and maintaining an adequate accuracy level in order to defend the research's arguments, findings and frameworks until their validation is completed. Decisions that were made concerning the data that was collected generally assisted in providing the initial baseline to evaluate the recommendations of the research project and to highlight the targets on what could be improved in certain situations (Sapsford & Jupp, 2006). The consequences that can occur from inadequate data collection can be divided into the following:

- Powerlessness to answer the research questions appropriately.
- An incapability to validate the model or the framework that has been developed.

Inaccurate findings in any research will effectively waste the valuable resources put into the research and will mislead other researchers in the same subject area. Therefore, each academic researcher has a social responsibility to pursue his or her investigations in a fruitful manner (Amelie, et al., 2014). As an example, when the degree of impact is evaluated from an erroneous data collection with inappropriate guidelines, then the results may differ from its reality and the fauna of examination has a greater tendency to cause disproportionate harm to the entire research project.

3.9.3 Questionnaire survey

A questionnaire survey may be used to collect quantitative data from individuals or institutions without any controls, sanctions, and structured limitations (Yin, 2009). It is an important procedure to provide the cross matching of information from construction project professionals in the specified area of research. This research is related to measure the degree of impact related to the behavioural constraints of the operational workforce in the construction industry in Sri Lanka (which is

frequently present in construction projects) and to analyse the importance of PR/SS in order to minimise such behavioural constraints.

The pros and cons of the questionnaire survey may be related to the availability of the respondents, the type of questions, and the techniques of data analysis. Respondents can be contacted through email or post (which can assist dealing with a wider geographical area or remote locations) and, without direct presentations, they can answer and return the form to researcher at a convenient time. However, it is only suitable for a specific type of respondents. Furthermore, it has to be ensured that the questions are simple and relatively short to increase the rate of responses (Ratnapala, 2012).

Questionnaires can be structured or can use open ended questions to provide wider opportunities to gain further information, while due to the absence of the researcher and using the structured format would not be able to clarify the questions which cannot be understandable by the respondents, so, it may has no chance to avoid misinterpretation answers. Statistical analyses of quantitative data collected by questionnaires are relatively easy to process with the aid of computer programmes or by using conventional spreadsheets (Ratnapala, 2012). On the other hand, questionnaires can lead to a low usable data set or response rates when respondents provided incorrect answers due to misunderstood questions, and the data analysis can become complex and distorted which leads to a misinterpretation of the results.

The construction industry grading system in Sri Lanka has 10 categories of contractors from C1 to C10, as per the statutory body called the Institute for Construction Training and Development (ICTAD) (www.ictad.lk, 2015). There are over 2000 ICTAD registered construction contractors in Sri Lanka (ICRA & IMaCS, 2011) (www.ictad.lk, 2015) at present. During pilot studies, it was identified that Grade C8 to C10 (Appendix B - ICTAD Guidelines for contractor categorisation) contractors belongs to the non monitoring category (ICTAD-ID-10, 2008) other than the financial capabilities.

To derive the sample size, the standard ‘T’ table was used (Krejcie & Morgan, 1970). Accordingly, the required sample size to represent the catchment population of contractors was concluded as being 384 participants. Out of 384 numbers of target questionnaire distribution, 80 questionnaires (or 20%) (Pareto, 1897) was distributed among the top eight contractors (which were selected based on the highest average turnover for the last 5 years). The remaining 304 or 80% of contractors was selected from each category based on the population of the contractors in each ICTAD grading from C1 to C7.

After the primary data collection, review and analysis, it was decided to conduct a further 30 structured interviews with the top management of the selected firms specifically to gather their views based on tacit knowledge and their predictions for the next 3 to 5 years. Further, it was planned to obtain audited statements for last five years to assist in the statistical data analysis of the research.

Major and specialist constructors (M&SC - www.mscsl.org) within the National Construction Association of Sri Lanka (NCASL - www.ncasl.lk) volunteered to cooperate with the researcher and to support him during the data collection stage.

An ‘Invitation Letter’ and a ‘Participant Information Sheet’ explained the presumed benefits to the industry through the proposed framework. The contributor’s acceptance was obtained with the use of a ‘Participants Consent Form’. These three documents were distributed to all the participant organisations. The researcher gathered information from the participant organisations in relation to the past and predicted turnover of the organisation, the head count of the management, technical and administration staff details, together with information on the direct, indirect and subcontracted operational level workforce (Appendix D - Sample data collection document).

Because of the present social security systems, it was necessary that the framework was equipped with a fund generating mechanism. Hence, it was essential to identifying the sources that can support this fund rising via a secondary

quantitative data review. Therefore, the researcher's strategies included carrying out an in depth investigation of the audited statements of the construction contractors from at least for last five years in order to identify the difference between allowed risk percentages and actual risk involvement. The researcher independently analysed such quantitative data by applying data analysing techniques (Yin, 2009, p. 119). Furthermore, the researcher plans collected the required data from the contributing organisations, selected through a cross section (Saunders, et al., 2012) of C1 to C7 grade construction contractors.

Based on the recommendations for sample size determination for research studies by Krejcie & Morgan (1970), the overall count called 'T' Table Requirements for the questionnaire data collection was prepared as depicted in Figure 3.5 and Table 3.6 of this research.

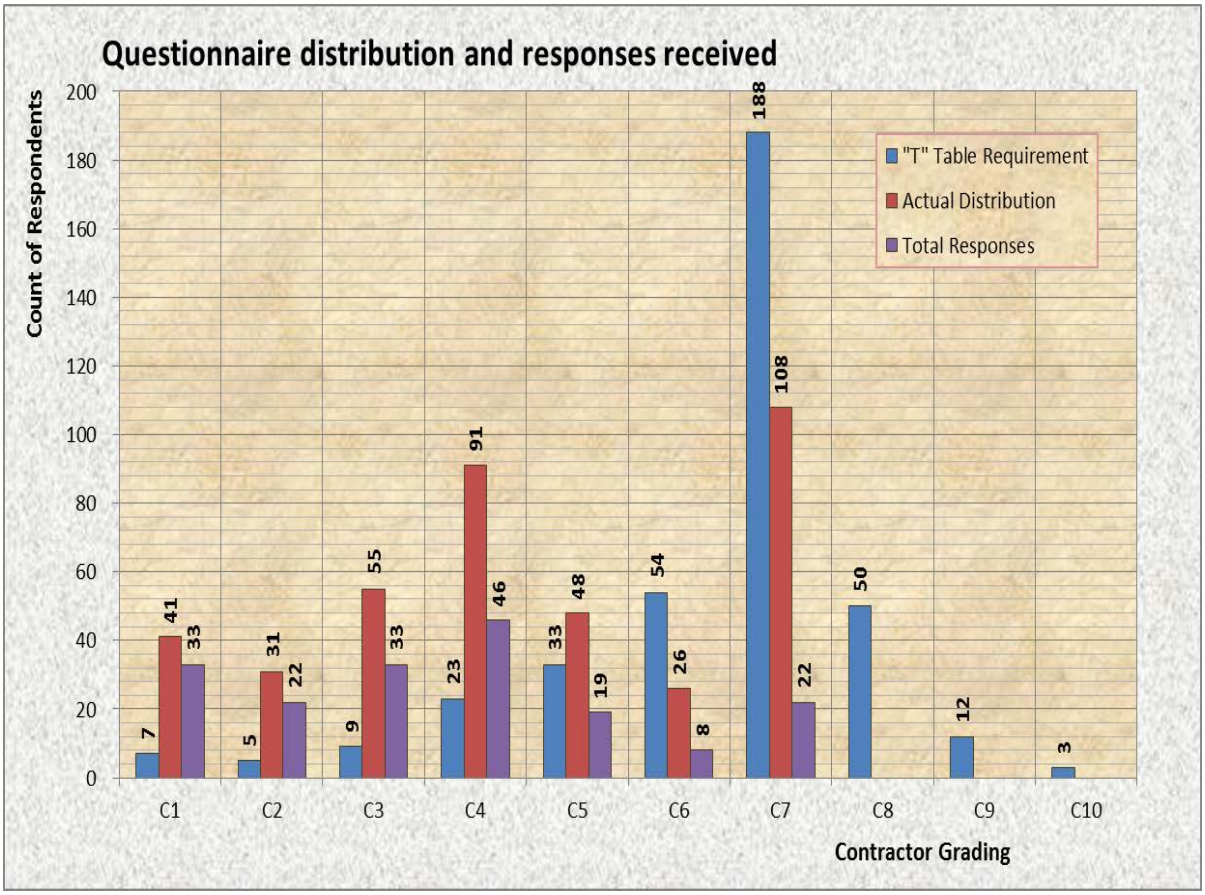

Figure 3.6 : Count of Respondents

The recommended sample size of 384 was rounded up to 400, anticipating a compensation for possible communication errors, etc. After the data collection, it was identified that the ICTAD database had 5.25% contact address errors. Other comprehensive demographic characteristics are depicted in Table 3.4 of this thesis.

Table 3.4 : Questionnaire distribution and responses received

Questionnaire distribution and response table												
A	B	C	D	E	F	G	H	I	J	K	L	M
	Distribution			Responses							Errors	
Contractor Grading	Contractor Population	"T" Table Requirement	Actual Distribution	Questionnaires only	Audited statements only	Comprehensive Responses	Total Questionnaires	Total Audited statements	Total Responses	% of Responses	Returned due to database errors	Address Errors % [Returned unopened]
C1	41	7	41	4	7	22	26	29	33	80.49%	2	4.88%
C2	32	5	31	3	1	18	21	19	22	70.97%	0	0.00%
C3	57	9	55	5	1	27	32	28	33	60.00%	4	7.27%
C4	137	23	91	8	2	36	44	38	46	50.55%	5	5.49%
C5	198	33	48	4	3	12	16	15	19	39.58%	1	2.08%
C6	325	54	26	3	2	3	6	5	8	30.77%	1	3.85%
C7	1,131	188	108	8	10	4	12	14	22	20.37%	8	7.41%
C8	300	50	0	0	0	0	0	0	0	-	Not Verified	
C9	73	12	0	0	0	0	0	0	0	-	Not Verified	
C10	18	3	0	0	0	0	0	0	0	-	Not Verified	
	2312	**384**	**400**	**35**	**26**	**122**	**157**	**148**	**183**		**21**	**5.25%**

Another adjustment made during the questionnaire stage was prioritising the C1 Grade contractors because it was understood that C8, C9 and C10 Grade contractors were registered on the listing only by the consideration of their financial capabilities. Further, the majority of the contractors were with lower grade classification were undertaking subcontracting works for the contractors with the higher classification grades.

Column A. The contractor grading acronyms given by the ICTAD are depicted therein. C1 is the highest grade that any construction organisation can achieve.

Column B. The count of the contracting organisations registered with the ICTAD for each grading acronym.

Column C. The recommended sample size as per the “T table” calculations for social research (Krejcie & Morgan, 1970).

Column D. The actual questionnaire distribution (comprehensive details are available in Appendix D).

Column E. The count of respondents who returned only the completed questionnaires without attaching the audited financial statements.

Column F. The count of respondents who returned the audited financial statements only, without completing the questionnaire.

Column G. The count of respondents who submitted both (i.e. the completed questionnaire and the audited financial statements).

Column H. The count of completed questionnaires received.

Column I. The count of the audited financial statements received.

Column J. The count of the total respondents

Column K. The percentage calculations for respondents

Column L. & Column M. Particulars of the undelivered questionnaire packs

3.9.4 The collection of the secondary data (documentary survey)

There are a number of records that are being kept on a daily basis by various government organisations, private sector organisations, universities, statutory organisations, non profit making organisations etc. during their activities. Some are merely records and are not used for further in depth analysis. Such records are called secondary data and can be used for various analyses in a useful manner if there is proper planning for their use. In general, such secondary raw data can relate to the day to day activities such as but not limited to the attendance registers, employees’ leave registers, daily visitors’ records; vehicle running charts, daily expenses, etc. Some companies keep further details such as employees’ health and safety records, rate of injuries, type of injuries etc. to be used when promotions are to be given. In practice, it is said that secondary data can be stored as being easily accessible and that it is not expensive to retrieve as and when required. Another requirement of research is the availability of basic data for a long period in order to analysis this information in an independent mode as and when need to do so and to observe the trends or the patterns of movements.

As described in Section 1.6, the aim of this research is to develop a framework which can provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka. To provide a social security system, the major fundamental need is a financial source. This research's hypothetical scenario is to utilise the funds salvaged by reducing the casacade effect, as described in Section 5.4 and Figure 5.3 of this report.

For the purpose of calculating the impacts of the cascade effects it is important to verify the contractors' audited statements. To fulfill this requirement the researcher pre planned and made a request to the contractors to provide their audited statements for past five years when returning the completed questionnaire. The researcher's initial plan was to review the audited statements of 20% of the responding organisations to be in line with the Pareto ratio (Pareto, 1897). More than the expected number of audited statements was received (since the contractors' participation was highly impressive due to the cooperation received from NCASL). Details on the respondents are described in the Chapter on Data Analysis (Chapter 4) of this thesis.

3.9.5 Publically available data

Several statutory organisations publish various reports, analyses and research publications annually and quarterly and to fulfill special requirements. The reports listed below can be directly downloaded from web portals:

1. Annual reports of the Central Bank of Sri Lanka (www.cbsl.gov.lk)
2. A Survey of Construction Industries 2011 – a special study report by the Department of Census and Statistics (www.dcsl.gov.lk)
3. A Labour Force Survey – A 2013 special study report by the Department of Census and Statistics (www.dcsl.gov.lk)

The researcher initially planned to utilise the annual reports of the Central Bank of Sri Lanka but eventually found the other reports during the literature survey and found them useful for the study. Information gathered during the questionnaire survey was blended together with the published data when outlining the proposed framework.

3.10 Management of confidentiality requirements and ethical approval

When conducting an academic piece of research it is an important requirement to maintain all due confidentially and ethical levels from the commencement through to the final thesis (for the involved parties and for the data collected through a pre organised process). Such requirements may slightly vary depending on the academic institution, country of the institution, and the catchment location of the data collection. To fulfill the ethical requirements for the collecting, storing and protecting of the personal data used in this research the following was planned.

Firstly, it was planned to follow the Code of Practice guidelines issued by the UK Research Integrity office (UKRIO, 2009)which is applicable in the UK universities. The code of ethics of the University of Salford was also followed (URL: http://www.pg.salford.ac.uk/page/codes_of_ethics).

In addition following the Sri Lankan Acts imposed by the Information and Communication Technology Agency (www.icta.lk) was essential for this research since the data catchment area was in Sri Lanka.

- Information and Communication Technology Act No.27 of 2003 (As amended by Act No.33 of 2008)
- Computer Crimes Act No. 24 of 2007
- Electronic Transactions Act No. 19 of 2006
- Intellectual Property Act No. 36 of 2003 (Sections related to Copyright)
- Evidence (Special Provisions) Act No.14 of 1995

According to the regulations, collected data are not allowed to be shared with any third parties except with the research supervisory team. Names of the participants are required to be kept anonymous. Password protected electronic data was allowed to be saved in the researcher's personal computer and in backup drivers hence accessing the data always require a password which was limited to the researcher. In addition, all field notes and filed interview transcripts were maintaining in a locked filing cabinet to ensure that the data is kept confidential. Names within the filed notes were coded to protect anonymity. Names of organisations involved (even for the purpose of acknowledgements) and the

research interviewees were kept anonymous (unless there was express written agreement is given by the interviewees to do otherwise).

During the data collection stage, a separate personal PO Box was rented instead of using the university address for receiving postal mails confidentially. These could only be opened by the researcher to avoid misplacements during the delivery.

3.11 Chapter summary

This ‘Research Methodology and Data Collection’ chapter firstly defined what is meant by ‘research’ through a brief literature review. Paradigms and the approaches of positivism and interpretivism were then discussed, following a discussion of the strategies of inquiries for implementing the mixed research approach.

The research philosophy chapter contains assumptions and hypotheses that outline the design of the research through methods, techniques and procedures identifying major territories such as ontology, epistemology and axiology. Since traditional paradigms are now obsolescent and the mix method concepts are still in their ‘adolescent’ stage, outcomes from different research methods were required to be combined in order to triangulate the research through mixed methods or multi methods in order to increase the validity and reliability of the research and to maintain its consistency. Quantitative and qualitative methods are the two systematic and distinct categories that are generally used in conducting research. This research stance typically followed a logical research process until the development of the proposed framework.

Since research strategies vary according to the research aim and objectives, the research instruments (questionnaire survey and secondary data requirements) were investigated critically as the method of data collection and analysis. Since it is said that a questionnaire survey may be used to collect quantitative data from individuals or institutions without any controls, sanctions, and structured limitations (Yin, 2009), it was an important requirement procedure to cross match the information from the construction project professionals in the specified area of research.

The data collected for the research was aimed at measuring the degree of impact relating to the behavioural constraints of the operational workforce in the construction

industry in Sri Lanka. The research instrument was prepared to apply a combined approach since several questions on the behavioural problems were related to interpretivism. Questions for measuring the value of the behavioural impacts were related to positivism. Accordingly, both qualitative and quantitative data requirements were collected through utilising the existing construction industry grading system in Sri Lanka that has over 2000 registered construction organisations distributed among 10 categories from C1 to C10 (ICTAD) (www.ictad.lk, 2015). The sample size was derived by using the standard 'T' table (Krejcie & Morgan, 1970) and 400 questionnaires were distributed. 186 or 46.50% responses for received for the questionnaire survey and 148 responses were (37.00%) for the secondary data collection (the audited statements).

The researcher has worked as an estimator in the construction industry for twenty (20) years working for national and international contractors, as well as with statutory organisations. The use of his experience, relationships, knowhow, awareness and tacit knowledge will be utilised in this research since tacit knowledge very much cantered on to the construction industry (Pathirage, 2007, p. 21). All the gathered data were utilised to develop "A Framework for Providing a Lifelong Social Security System for the Operational Workforce in the Construction Industry in Sri Lanka".

Chapter : 4 Data analysis and findings

4.1 Introduction

This chapter presents an analysis of the data collected and processed in response to the problems of the industry posed in Chapter 1 of this thesis.

Two major types of data are used in the process of obtaining information, namely primary data and secondary data. Both these two types of data have their own advantages and disadvantages specific to them.

Primary data are usually bespoke data utilised for an individual report and thus offers customised data. However, the collection of primary data is a time consuming process often involving large amounts of money and requires a long time to process into serviceable information. Secondary data, on the other hand, is widely available, inexpensive and is quite easy to manipulate the process and analyse. However, such data may have been collected to use for another purpose and the specific information required for intended research purpose needs to be carefully extracted from it.

The researcher used primary data, secondary data and both data types depending on the applicability level of the research, the scope of research, the skills, budget and other available resources. Accordingly, this research project was planned to gather data from different sources and particular analysing frameworks were, therefore, selected to suit the data sources such as shown below.

a. Qualitative data were analysed by using the Relative Importance Index.
b. Audited statements of the contracting organisations (Financial formulae and trend curves).
c. A mixture of statistical mechanisms available with spreadsheet formulas were equally used for the calculation of data and for the preparation of graphs, pie charts, tables etc.

The research questionnaire was primarily structured using a Likert Scale and it was planned to undertake analysis with the Relative Importance Index (RII) in order to weigh the importance as a percentage outcome (Enshassi, et al., 2012). The

ranking of the factors and their groups will be demonstrated according to their relevant level of importance. According to the questionnaire, survey results, the most effective factors and groups are be discussed in depth and some recommendations will be made to improve stakeholder satisfaction.

Audited statements were evaluated using standard financial formulae. The possible savings were assessed based on a method developed that is similar to ‘Surplus Calculations’ described in micro economics (Taylor, 1995, p. 81). Trend curves were prepared to understand the number of inherent risk allowances left in to cover up the risk multiplications. (BSR, 1988).

4.2 Analysis of the questionnaire survey data

Three words: “Data”, “Analysis” and “Presentation” are the key capabilities that are needed for effectively transforming data into information. These three topics are rarely treated together. Generally, books and teaching are focused on one or other, on the details of the relational databases, or on applying statistics to business problems by using various techniques. However, the requirement is approach the challenge of data analysis from a more holistic perspective and with the aim of explaining the relevant ideas both to people responsible for analysing the data and to people who want to use such information responsibly. The motivation for this approach came from a colleague, Nick Drake, who is a statistician by training (Linoff, 2008).

There are many approaches to data analysis. It is common to see it focusing on advanced algorithms and case studies usually fall under the heading “data mining.” The data analysis starts by describing the data stored in databases and continue through preparing and producing results.

When it comes to data analysis, there are several different aspects of data and several different analytical techniques. The analytical techniques range from exploratory data analysis to survival analysis, from market basket analysis to naïve Bayesian models, from simple animations to regression. The potential range of possible techniques is large and cannot be presented briefly. Such techniques have proven useful over time and are applicable in many different areas. Finally, the requirement is that somehow the collected data must be analysed in a way that the end reader can understand it, without having to read another book or follow a

course). Results must be presented to the appropriate audience in order for them to receive the anticipated value. Hence, it is always better to transform data into stories and scenarios, charts, metrics, and insights (Linoff, 2008).

Accordingly, the collected questionnaire data was analysed primarily via two mechanisms. Spreadsheet analysis and RII was extensively used to convert the collected data into an easily understandable format. Particular attention was given to avoiding complicated data analysing techniques because using them may have meant that it would have been difficult to convince the public of the efficacy of the proposed framework during the implementation phase. During a previous effort to implement a PR/SS, scheme to appeal to industry operatives in the Katunayake Free Trade Zone there was opposition against the PR/SS offer from the ruling government (The Island, 2011).

The Sri Lankan government have proposed to implement a PR/SS scheme by converting their prevailing one of EPF, ETF and gratuity earnings to a monthly paid scheme. Apparel industry feminine operatives, who are usually not schooled beyond Grade 10 or 11, were not properly educated on the proposed mechanism. They suspected that government was trying to grab their entire savings by force and opposed the suggestion. Due to political fueling, their protest was quickly converted into a civil commotion event by closing the airport access road. A worker died due to gunfire from the police when they did try to clear the airport access road.

This lesson having been learned, a less complicated mathematical mechanism is preferred within this research for ease of understanding by the public and by the operatives as well. The reason behind this is that construction industry operatives have a similar level of education as that of the apparel industry operatives.

4.2.1 Relative importance index (RII)

The Relative Importance Index (RII) was used to determine the relative ranking of the assessment methods. The scores entered in the survey were transformed to RII values using the following equation where ‘w’ is the weighting given to each factor by the respondents, ranging from 1 to 7.

$$RII = \frac{\sum \mathrm{w}}{\mathrm{AN}}$$

Equation 4.1 : Relative importance index

In the formula, ‘A’ is considered as the highest weight (i.e., 7 for this research) and ‘N’ is the total number of samples. Accordingly, RII is the relative important index, where the answers are generally in between ‘0’ and ‘1’.

4.2.1.1 Impact analysis of the behavioural problems of the workforce

Question number 6 on the questionnaire survey (see Appendix D - Sample data collection document) was presented to the participants in a table matrix enabling them to select (✓) the degree of impact.

After the pilot survey of the questionnaire had been undertaken, the weighting percentage for the Q6 matrix was found highly questionable. During the finalisation discussions on the questionnaire (Section 3.9.1) with the local supervisor, several viewpoints relating to the understanding of the matrix were taken into consideration. One question raised was how to evaluate the Relative Important Index (RII) if someone ticked (✓) “Above 20%” for all the questions. This doubt was resolved by using the medical industry rule used for feeding babies. Babies consume what they need irrespective of the volume supplied (Wijayalath, et al., 2014). Similarly, the aim of the Q6 matrix was to calculate the average impact percentages deriving from human behaviour. Accordingly, when the wastage factor for behavioural impacts were ticked (✓) as “Above 20%”, the researcher could utilise a maximum of 22.5% since it has a prefixed stopper limit.

According to the average cost indices provided by ICTAD (www.ictad.lk, 2015), the average percentages of component associated basic cost breakdowns (excluding overheads and profits) for the construction industry in Sri Lanka are as follows.

1. Materials - 60%
2. Labour - 20%
3. Equipment - 5%
4. Fuel - 5%
5. Other - 10%

Since the material component is 60%, practically it is impossible to waste fully 100% of the materials delivered to a worksite due to the behaviour of the operational workforce.

Accordingly, five options were made available to the participants such as

i. 0% to 5% - Average of 2.5%
ii. 5% to 10% - Average of 7.5%
iii. 10% to 15% - Average of 12.5%
iv. 15% to 20% - Average of 17.5%
v. Above 20% - Average of 22.5%

The highest renege on the range between 20% and 100% was left as an open ended question but the maximum value was pre determined as 22.5% when calculating the RII. The reason behind this pre determination was the purpose of this research. One hypothesis, as discussed in Section 1.2 of the research, was to utilise salvaged finances to energise the PR/SS system, as depicted in Section 5.4 and Figure 5.3. The gross value of the workforce's contribution to construction is generally 20%, as depicted in Table 5.1. Question Six of the questionnaire had three elements, namely time, cost and quality, where the maximum impact is 1/3rd of 20% or 6.67% of a single element. If the average between 20% and 100% is considered as 60%, then there was a possibility of having a 20% impact from a single item. To avoid receiving impossible values, the maximum value was pre determined as depicted in Figure 4.1, Figure 4.2 and Figure 4.3 of this thesis. Therein the maximum RII values received were 60%, 64% and 66% respectively for the statements of "poor, temporary or irregular attendance", "poor quality of workmanship" and "lack of trade knowledge and skills".

The order of the questions in Figures 4.1, Figure 4.2 and Figure 4.3 were rearranged based on the received RII values. These rearrangements illuminate the individual prominences of the behavioural factors for overall time, cost and quality of construction projects.

A. Degree of Time Impact

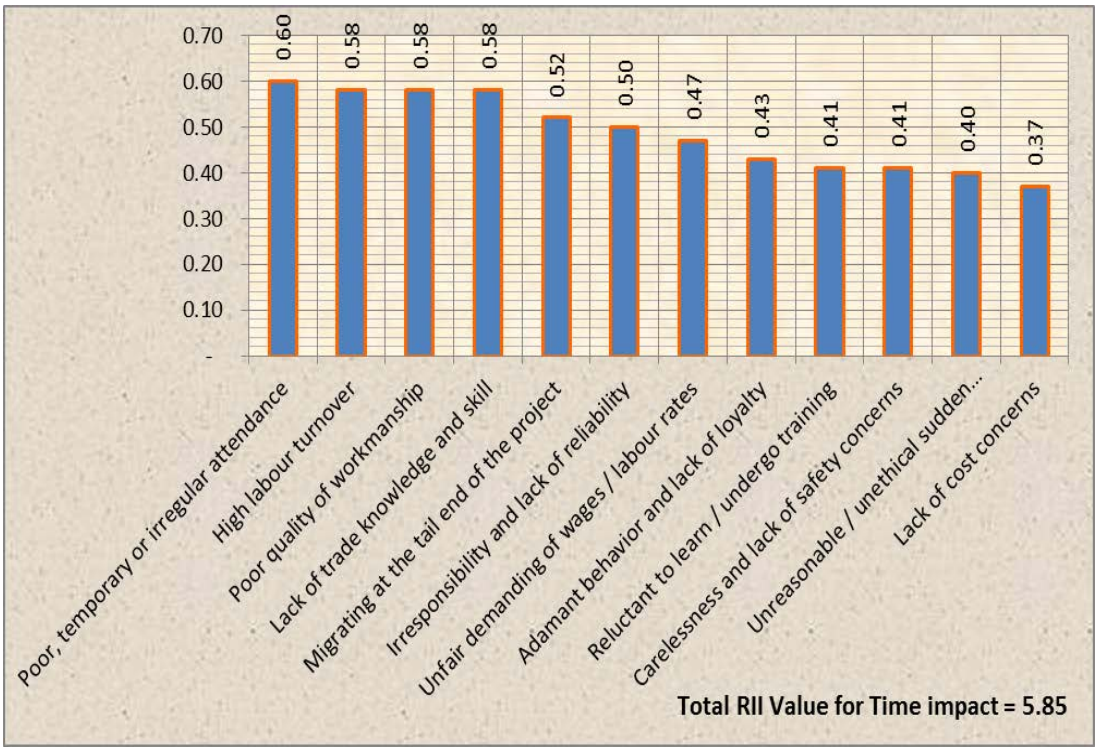

Figure 4.1: Degree of Time Impact

B. Degree of Cost Impact

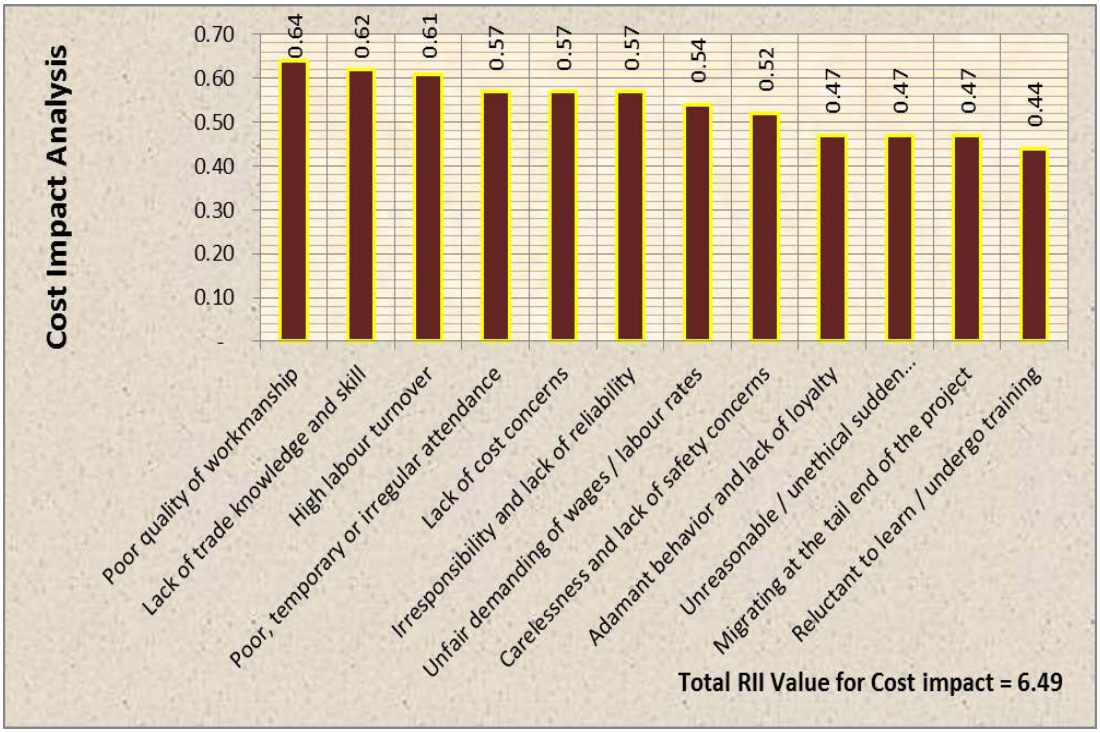

Figure 4.2 : Degree of Cost Impact

C. Degree of Quality Impact

Figure 4.3 : Degree of Quality Impact

According to the research findings, all the pre identified behavioural problems by Wijewickreme (2010) had an unanticipated waste impact of over 50% regarding the time and cost and quality elements of the construction industry.

4.2.1.2 Causes for the scarcity of an operational workforce

Via question eight, the researcher reevaluated the outcomes of a previous research undertaken by Wijewickreme (2010) to ascertain the status of previous findings by using a different cross section of the construction industry. Perhaps, the “temporary nature of occupation” scored a leading 70.6% value by pushing “poor retirement benefits” to the fifth position with a 63.39% RII value. However, 10/14 pre identified reasons for the scarcity of construction operatives crossed the 50% margin as indicated in Figure 4.4.

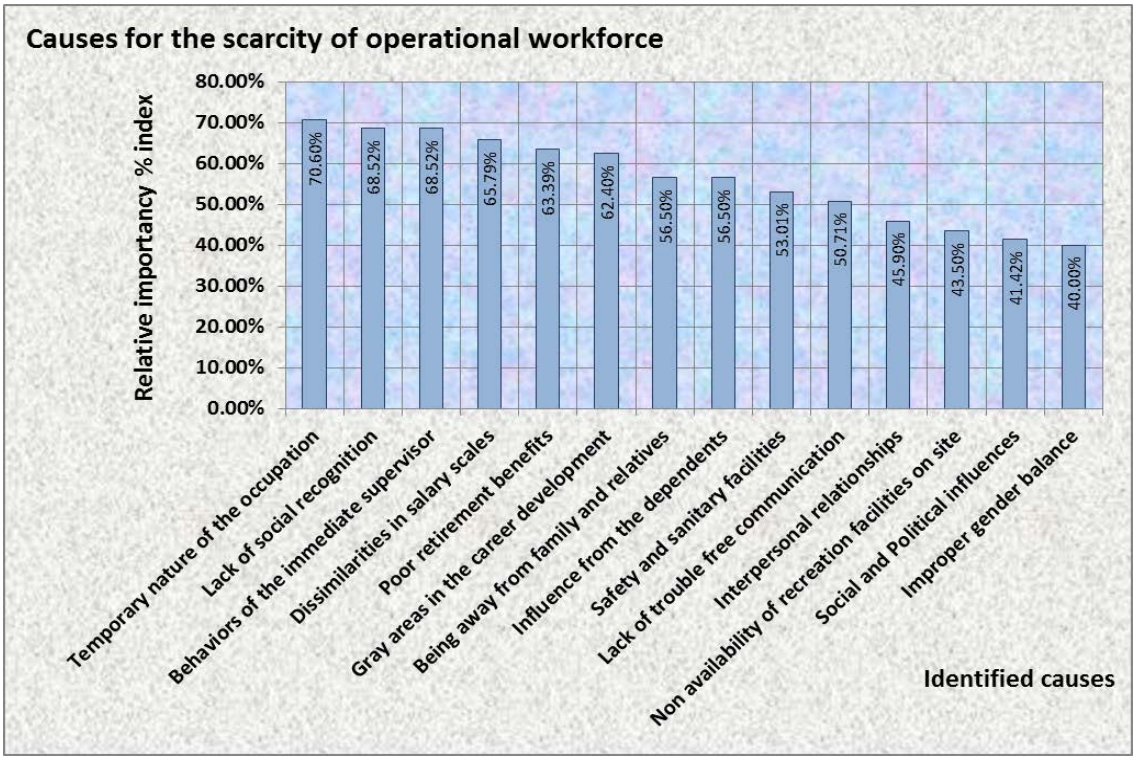

Figure 4.4 : Causes for the scarcity of an operational workforce

It can be see that, instead of one single reason, there are many other reasons for the behavioural problems of construction operatives, hence strengthening another hypothesis of the researcher. Thus this highlighted the importance of having a more structured and globalised framework through a speeded up framework for construction operatives.

4.2.2 Percentages and RII analysis by using spreadsheets

Spreadsheets are generally considered as a collaborative software programme available for grouping, analysing, storing and presenting data in a two dimensional or flat format. Spreadsheets were initially introduced as an alternative to large size paper with squares suitable for accounting and mathematical purposes. Data entered into each square or cell is generally represented as “cells of an array” which is capable of being used as text or data.

The latest software developers have introduced spreadsheets which can have several interrelating sheets and which are capable of displaying data either in numerals, texts or as graphical mode. Moreover, in addition to performing fundamental mathematic and arithmetic meanings, nowadays spreadsheets

provide several pre loaded functions suitable for statistical operations, standard financial formulae and conditional expressions.

4.2.2.1 Modes of procuring manpower for an operational workforce

Due to the constraints encountered in the staffing, monitoring and controlling of construction operatives, alternative modes of recruiting have been developed in the industry by diverting the operatives towards a nominal position of a labour contractor or an output based operative. Due to this mechanism, eventually operatives lost the benefits of the available EPF and ETF as well as any amounts due from small and mission oriented unregistered groups or associations.

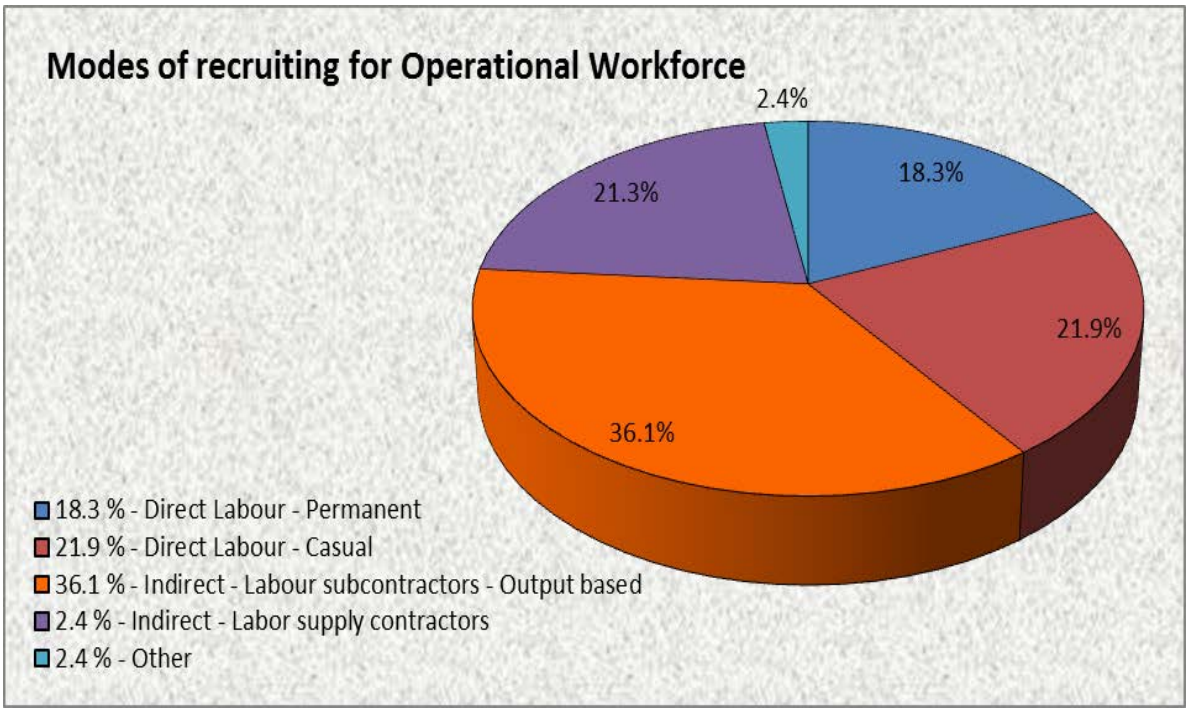

Figure 4.5 : Modes of recruiting operational workforce

Through the survey, it could be seen that 81.7% of construction employment is now being procured through alternative modes of recruiting without any eligibility for any kind of PR/SS benefits as depicted in Figure 4.5.

4.2.2.2 Monitoring statuses for current PR/SS systems (EPF /ETF)

It is an essential element for private sector employees to contribute to the prevailing EPF & ETF systems. Through the research it was identified that neither 82.6% of

the main contractors nor the government auditing authorities are giving due attention to monitoring and controlling the prevailing PR/SS systems when it comes to construction operatives. These findings of the research are depicted in Figure 4.6. According to the survey data, only 17.4% are conducting due payroll auditing for the subcontracting operatives. This is an alarming factor in the light of employees' rights. This seems almost an organised crime because it is a financial misconduct. Part of the remuneration due to construction operatives are retained by the intermediary with having any right to do so. The doubt that arises at this point is the capability level of the prevailing subcontractor mechanisms. If the construction sector requires the provision of better facilities, educational or training programmes or any other solutions to the identified causes for the scarcity of an operational workforce as described in Section 4.2.1.2 of this thesis, then the unresolvable question that is present for the private sector is which organisation is going to manage them?

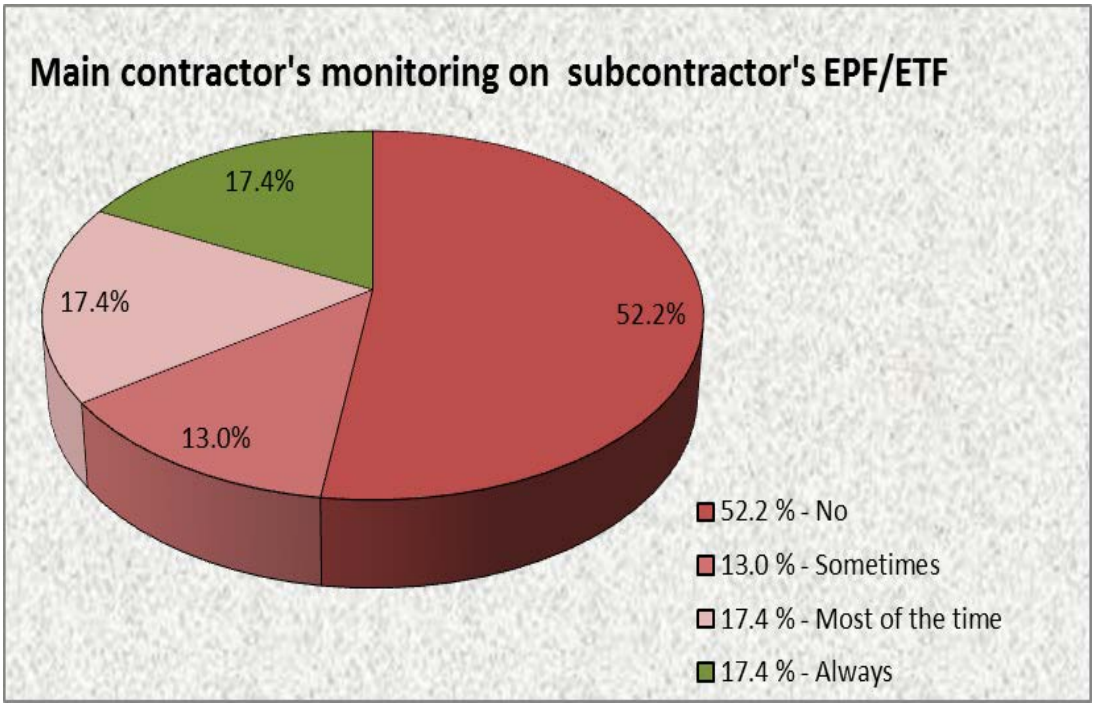

Figure 4.6 : Monitoring statuses for current PR/SS systems (EPF /ETF)

On the other hand, if construction operatives decide to arrange an organised labour strike in a middle of an ongoing shear wall concreting works that might be seen as a sabotage or politically influenced activity, which organisation is capable of putting them to complete are activity prior to seek for their civil rights. The situation is very similar to medical doctors asking a pay rise in the middle of an open heart surgery but this will never happen because ethical behaviour is an expressed obligation for the Gold Collar workforce (Wijewickreme, 2010). One example of a practical situation is the privatisation of the Sri Lanka Tire Corporation and the contrary reactions and sabotage works by employees in 1992 (Crowe & Soysa, 1996). For this reason, there is a requirement to identify a suitable recruiting framework for construction operatives in Sri Lanka as well. The reason for this is that the modus operandi for construction operatives is mission oriented rather than the day working nature of factory oriented work activity. This is due to construction's projectised working environment that has pre defined commencement and end dates (PMBOK, 2008) with a fixed monetary allocation.

4.2.2.3 Contractors' revenues for the past 5 years and the next 3 years

Construction is usually a boiling industry. Since 2009, the Sri Lankan construction industry had been on a boom but the industry participants were anticipating for a bust after 2014 (Figure 4.7) at the time of collecting data in late 2013. Uncertainty is always common in the construction industry. Can subcontractors bear the cost of standing by salaries during a recession? If not whom and is it possible to utilise the time to provide some training with some pay or deploy the workers for a maintenance activity? Which governing organisation is capable of switching the workforce from one workstation to any another in the shortest possible time? Can the workforce be utilised for disaster resilience work? If construction operatives working in private sector organisations are deployed by slam scale subcontracting cluster groups, who can guarantee the salaries and other insurance related matters when the new work station does not include any Contractor's All Risk (CAR) policies or any Workman's Compensation Policies?

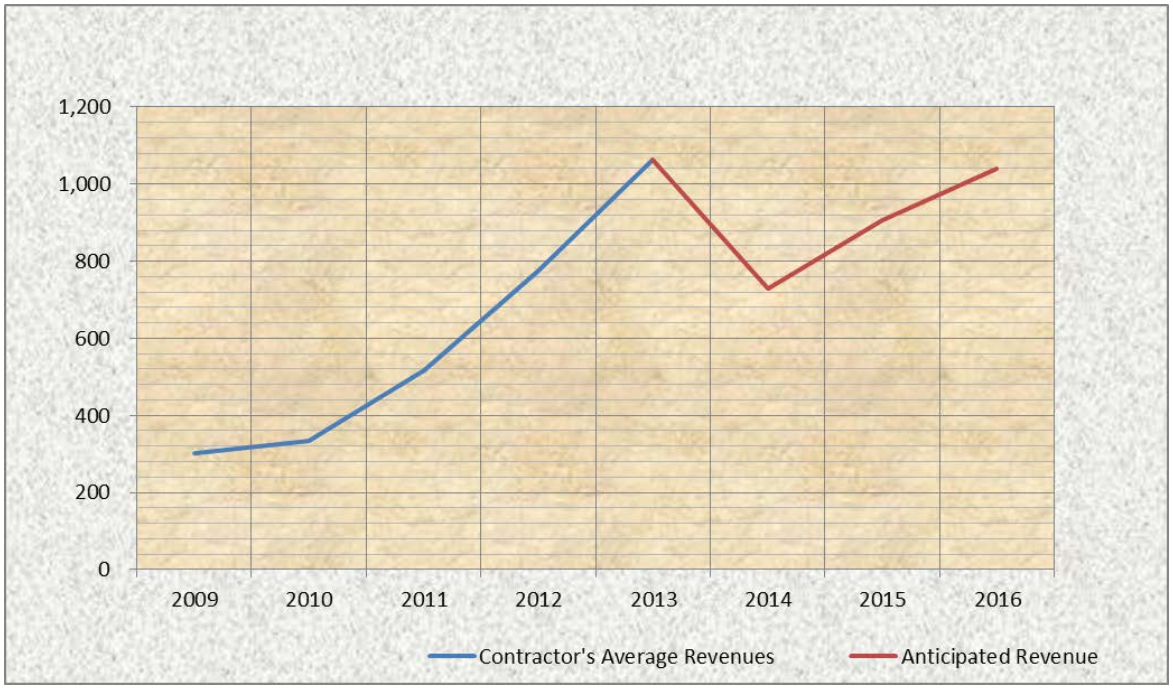

Figure 4.7 : Contractors' revenue predictions

Almost all the construction companies highlighted that there is a need for some kind of national level organization who can overcome the current constraints that are unique to the construction sector.

4.2.2.4 Cost effects of material wastage due to imperfections

Due to the behavioural imperfections of construction operatives, a large amount of materials are being wasted due to carelessness, unawareness, improper handling and as sabotage activities (Jayaweerarathna, 2010). Furthermore, Nayomi Jayaweerarathna stated that approximately 2.98% of gross construction costs could be achieved as savings if the behavioural problems of the operational workforce could be controlled.

Question 7 as shown in Appendix D (the sample data collection document of this research) asked a similar question in the questionnaire of this thesis and the findings from the responses to this question are depicted in Figure 4.8.

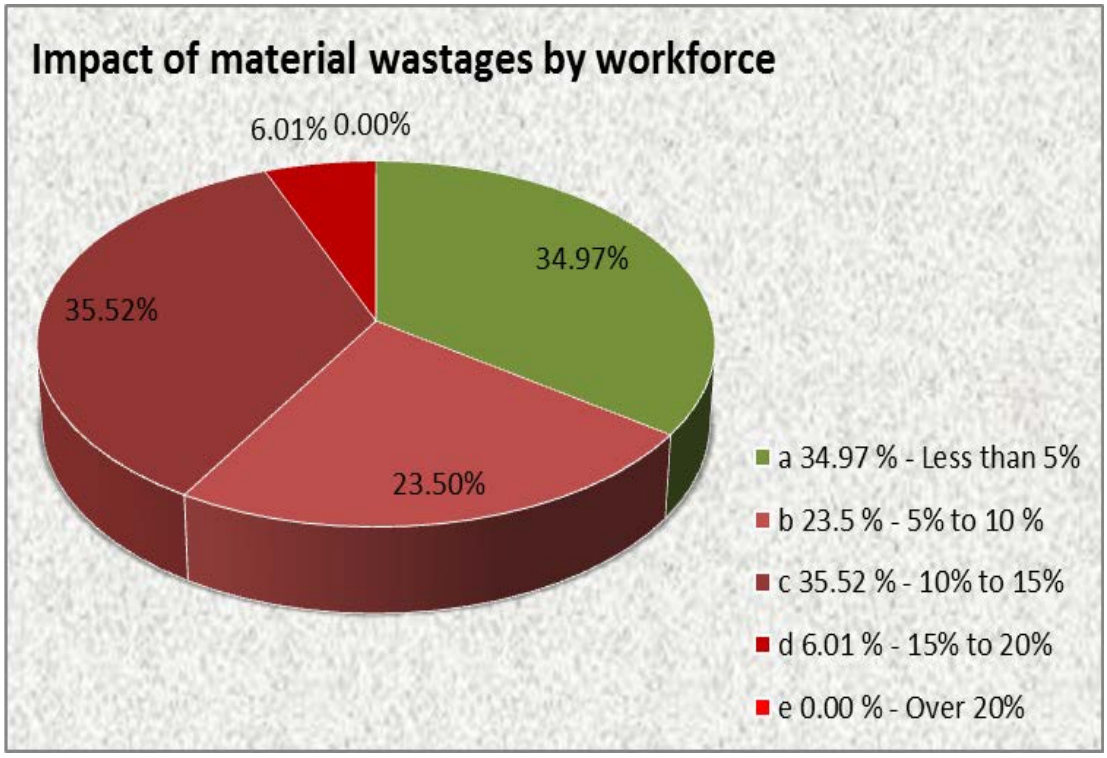

Figure 4.8 : Cost effects of material wastage

According to the general construction industry, norms in Sri Lanka (www.ictad.lk, 2015) total material components comprise 60% of the total costs and labour comprises 20%. Therein a cost overrun of 8.13% from materials' components itself of the total project cost means the allocated 20% of labour costs component is increased by 4.88% (i.e. the actual labour cost is 24.88%) approximately. If the said unreasonable cost overruns could be nullified by a proper management mechanism, then the salvaged savings could be accumulated and utilised to support the financial requirements of the proposed PR/SS Framework for Construction Operatives.

4.2.2.5 Participants' opinions on a PR/SS for the workforce

The covering letter to the questionnaire participants (Appendix D) stated that the aim of the research was to provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka. Accordingly, the final question asked, "*Do you believe that by providing a lifelong social security system [Pension Scheme] for the operational workforce, we can overcome from the aforementioned behavioral problems?*" This was asked of the participants in order to receive the industry's opinion on the successability level of the proposed PR/SS

mechanism. In response, 64.48% were neutral and 12.02% were negative. However, 17.49% expressed the belief that the proposed mechanism could resolve the behavioural constraints of the operational workforce while 6.01% also expressed a positive opinion, as depicted in Figure 4.9.

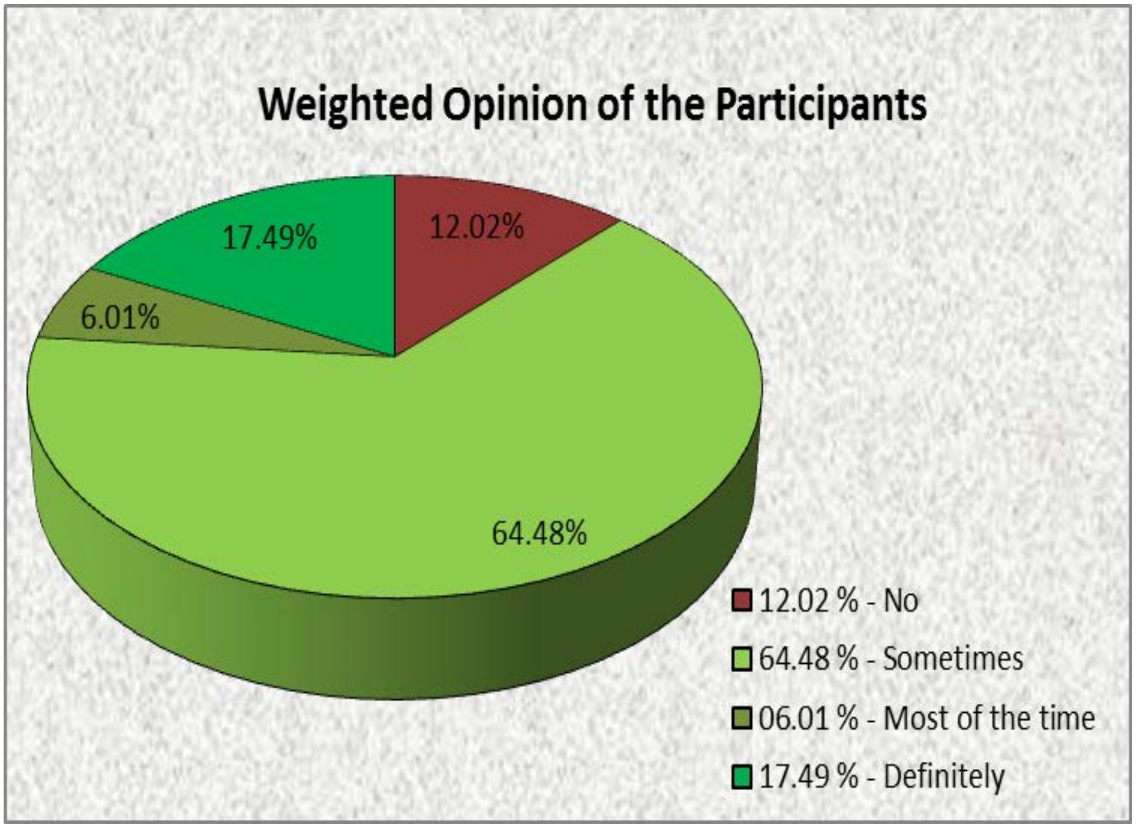

Figure 4.9 : Participants' opinions

However, the overall opinion was not very negative because 87.98% were not against the proposed mechanism. Secondly, in principle, all the participants primarily accepted that some kind of solution is required to overcome the behavioural constrictions of construction operatives generally.

4.3 Financial data review.

The content in this section was developed from the secondary data collection. However, it was necessary to incorporate several literature related references into this section in order to introduce the subject area. The basic financial data within the audited financial statements were utilised for the calculations in this section and this information falls under the areas of sensitive data within the concerned sections

of the Data Protection Acts of UK and Sri Lanka. For this reason, only the final answers received from the analysis are depicted in this thesis.

Every business organisation has to make reasonable efforts to maintain their financial data. It is a legal requirement of Sri Lanka, in accordance with the Act Number 7 of 2007 and Act Number 17 of 1982.

In the UK, three main sources of rules and regulations govern the publication of financial accounting information. These are listed below.

1. Company law
2. Statements of Standard Accounting Practice (SSAP) and Financial Reporting Standards (FRS)
3. Stock Exchange regulations for public limited companies.

Limited companies in the UK are subject to the requirements and provisions of the 1985 and 1989 Companies Acts and much of what the company and its directors may do is governed by these Acts. The Acts place particular importance on the protection of shareholders and creditors and provide stringent regulations regarding the annual financial statements. It can be seen that, during the 1980s, many changes were introduced concerned with the harmonisation of accounting within the European Union. A body called the Accounting Standards Board (ASB) in the UK has the primary aim of narrowing the areas of difference and the variations in accounting and improving the comparability between the accounts of different companies. In 1990, the ASB issued new accounting standards commonly known as the Financial Reporting Standards (FRS). Prior to August 1990, the work of the ASB was carried out by the Accounting Standards Committee (ASC), which issued Statements of Standard Accounting Practice (SSAP), some of which are still in force.

Irrespective of territory and standards, no proper management reporting can be prepared without the required financial information. Therefore, financial management is an integral part of any business because the fundamental reason

for setting up a business is to make profits. If not, it may be either a charity or a cooperative but not a business. The performance of business organisations is usually measured by way of the finances. For this reason, the finance function is primarily divided into three sections.

1. Counting
2. Recording
3. Publishing

Counting covers the physical measurement and valuation of financial transactions such as daily expenditure recording or verifying the stock balance of material issues and then converting them into financial value.

Recording instruments such as cashbooks, petty cash books, sales journals, purchase journals and sundry journals are common within any financial management department. These instruments are usually balanced regularly on a daily, weekly, monthly and annual basis for the following purposes:

1. Internal reporting
2. External reporting

Publishing covers the production of both the internal and external reports that are more commonly known as the profit and loss accounts, balance sheets and cashflow statements.

Internal and external reports are the most important means of corporate communication. Internal financial documents are usually termed as management accounts and contain information that is important to enable a business to meet its aim and objectives, such as making profits, by performing the functions of planning, organising, controlling, communicating and motivating. Management accounts, therefore, will serve a variety of purposes. For this reason, they are usually produced in formats that are tailored to suit the individual requirements of business organisations.

External reports are known as financial accounts. Since these reports are to be used by several entities, certain standards have been established by the Accounting Standard Board (ASB) with a view to setting up a common platform for common understanding. However, there are three major principles.

a. *The objective of financial statements is to provide information about the reporting entity's financial performance and financial position that is useful to a wide range of users for assessing the stewardship of the entity's management and for making economic decisions.*
b. *That objective can usually be met by focusing exclusively on the information needs of present and potential investors, the defining class of user.*
c. *Present and potential investors need information about the reporting entity's financial performance and financial position that is useful to them in evaluating the entity's ability to generate cash (including the timing and certainty of its generation) and in assessing the entity's financial adaptability.*

(Accounting Standards Board, 1999, p. 1)

Companies can be owned by their shareholders and it is compulsory to use the term 'Limited' or 'PLC' in such cases after the name of the artificial person or the given name of the company for ease of recognition by the public. Furthermore, 'PLC' indicates that the company is a public limited company and is able to have its shares held by the investing public and traded in the market (although these days the vast majority of shares are quoted on the Stock Exchange and are owned by institutional investors such as pension companies or life assurance companies). In either public or private limited companies, the liability of the owners is limited to the amount that they have invested into the business.

Companies can have various forms of share capital, but normally it is the ordinary shareholders who have the power to vote at general meetings and control the company. Ordinary shareholders are entitled to receive accounts. As a rough rule, companies are required by law to produce a set of accounts each year. These

accounts provide the shareholders with a summary of what is going on in their company.

Several important findings from the analysis of the Contractors' Financial Statements are depicted in Table 4.1 and Figure 4.10 of this thesis. The first important element is the growth of the profit percentages during the financial years from 2012 onwards. A boom in the construction industry could be one reason for this. The second reason may be that the remains of the accumulated risk factors are shown as savings during a troubled weather.

The second important element is the growth of assets. An average contractor increased fixed assets by 10 times during the period of 2011 to 2013 compared to what they had increased by in 2006.

Table 4.1 : Summarised data from the financial statements

Year	ICTAD Indices %	Contractor's Average Revenue %	Contractor's Average Profit %	Contractor's Average Assets %
2,006	100.00	100.00	100.00	100.00
2,007	111.00	106.79	125.28	114.11
2,008	126.30	86.24	115.95	87.97
2,009	126.71	121.13	165.52	77.75
2,010	129.49	109.46	226.45	97.33
2,011	138.12	158.65	303.32	178.16
2,012	157.17	238.91	432.88	276.69
2,013	164.44	420.81	1,192.00	407.24

From the summarised data extracted from the financial statements, it is apparent that contractors are applying various profit maximisation techniques. A company with an indexed profit of 100 in 2006 increased its average assets by four (4) times and by 25.6 times for its profits within 7 years in 2013. The researcher believes that

these unimaginable profits are being generated via the salvaged finances reserved for the welfare of construction operatives and the cascade effects of risk multiplication described in Section 5.4 and Figure 5.3.

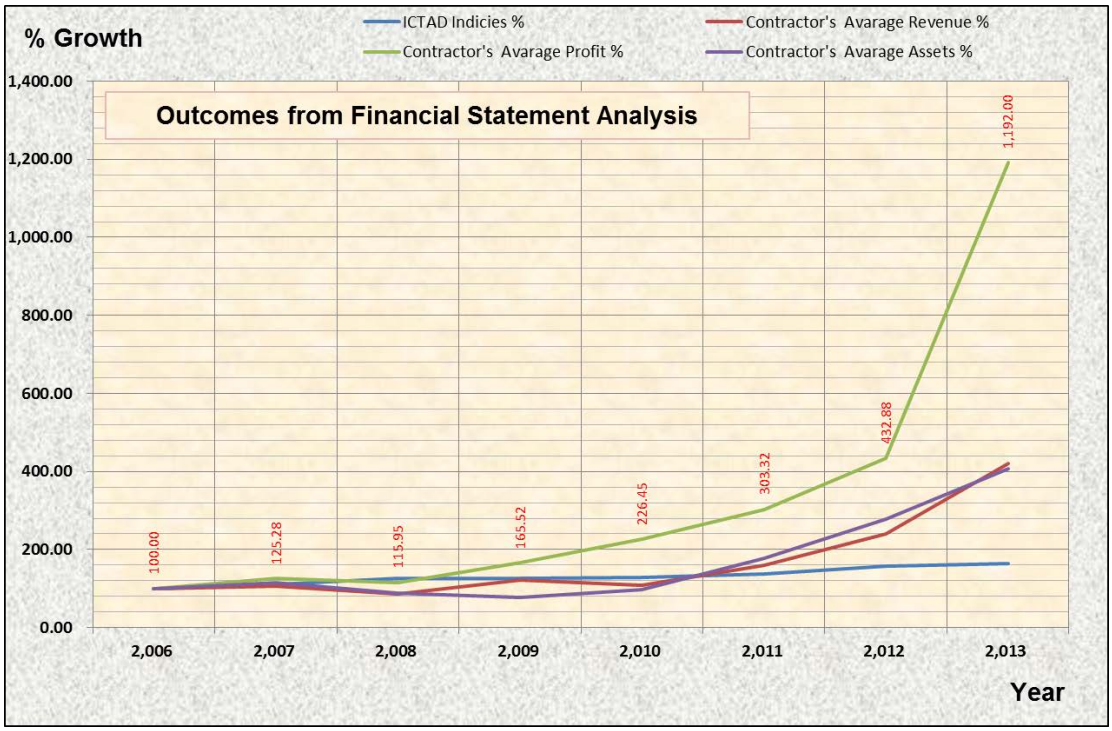

Figure 4.10 : Outcomes from the financial statement analysis

From Figure 4.10 it can be seen that there is no significant changes to the ICTAD cost indices. Despite all the factors present, contractor's average revenues, average assets and average profits have increased unpredictably due to an unknown factor. This highlights that reviewing the suitability level of usual financial formulas described in Section 4.6 of this thesis for the evaluation of Construction Organisations. Similarly, auditing mechanisms too are required to be fine tuned for the purpose of evaluating the construction organisations as well.

4.3.1 The profit and loss account

The profit and loss account shows the results of a company's trading over the last financial period, normally a year. If, for example, a company has made profits of £15 million in the first eight months and losses of £10 million in the last four months, the profit and loss account would just show the outcome, i.e., a profit of £5 million. There would be no obligation to give the shareholders an indication of the poor trading (which may be more indicative of future performance).

4.3.2 The balance sheet

The balance sheet gives a snapshot of a company's position on the last day of the financial year. Summarising everything that the company owns and owes on the balance sheet date is usually the best measure available to those outside the company of the company's financial health. However, interpretations of the balance sheet should be made with caution. The position at the last day of the year could be very different from that of a month before, or a month after, the year end, especially if the business is of a seasonal nature. The construction industry too has some seasonal features but such seasons in the construction industry are not annual and do not occur in regular intervals or cycles. From time to time, the industry moves towards either boom or bust or can appear as boiling depending on the political and socioeconomic environment.

Some companies have a trend of 'window dressing' the balance sheet by deliberately bringing forward some items and trailing others so that the balance sheet becomes untypical of the company's usual position. For example, it is required for companies to uplift the value of their assets by including a valuation of their brand names as an intangible asset. For this reason, both the law and the accountancy profession aim to standardise the treatment of assets and liabilities on the balance sheet, and income and expenditure in the profit and loss account.

4.3.3 The directors' report

Along with the annual accounts, companies are legally required to present a report from the directors. The aim of the director’s’ report is to add further information and explanation to the financial statements (Accounting Standards Board, 1999). However, in practice, the majority of directors' reports give only the bare minimum information that is required by the law and ASB recommendations.

4.3.4 The auditors' report

Annexed to each set of annual accounts, the company auditors are required to produce a report of their own. It is the auditor’s job to act on behalf of the shareholders to assess whether the financial statements present a ‘true and fair view’ of the company's profit and loss for the period and of the financial position of the company at that date. If the auditors qualify their report and state that the

accounts do not present a true and fair view, the reliability of the figures presented should be questioned by the users.

4.3.5 Format, users, timing, and content

The format of financial accounts is governed by law and is the same for all companies to the extent that all use the same wording and include items in the same order, whereas internal reports can take any format depending upon their purpose. External reports are used by many different groups of people other than the shareholders:

- Banks

  A set of audited annual accounts will obviously be important to a company's bankers, particularly if the company has an overdraft or loan facility. Broadly speaking, the bank will be looking to ensure that the company is sufficiently profitable to repay loans and interest as they fall due, that the company's performance is in line with any forecasts submitted to the bank, and that there is sufficient security in the company's assets to cover any borrowings.

- Creditors

  As with banks, firms owed money by a company and those planning to give credit to a company will be looking to the annual accounts to ensure that debts will be repaid.

- Government

  In the UK, both the Inland Revenue and HM Customs and Excise use company annual accounts. The Inland Revenue will require a reconciliation between the accounting profit and the taxable profit to ensure that the tax computation has been correctly prepared. HM Customs and Excise make occasional checks to ensure that the Value Added Tax returns are consistent with the annual accounts.

- Potential investors

  Figures from listed companies' accounts are used to calculate certain key ratios that are quoted daily in newspapers like the Financial Times. These

ratios will be carefully monitored by existing and potential investors in deciding whether to sell or buy shares.

- Employees

  Obviously, employees can utilise the annual accounts to assess their employer's overall performance. Trade Union groups will consider aspects of the accounts when preparing claims for increased wages.

External reports are prepared annually. Usually the publication occurs several months after the year end making them out of date by the time the recipients receive them. Some companies will produce abridged accounts in interim reports on the first half of their accounting year.

Financial accounts are prepared to contain the minimum disclosure required by the law and accounting standards. They are prepared on a historic cost basis, meaning that assets are recorded at what they originally cost and not what they might be worth to the business.

4.3.6 Application of financial information

Ratio analysis is the main tool used to interpret the figures in a set of published accounts (Perera, 2007). It is essential to take great care before making any firm conclusions about the state of a company from this information alone (Cole, 1996). According to Cole, particular points that should be treated carefully when using published financial information are:

- Timing

  The published accounts of a company are already well out of date by the time they reach the recipient and seasonal variations can mean large fluctuations in the balance sheet over a financial period

- Valuation

  As demonstrated, no account is made for the current value of the assets of a company. This makes it virtually impossible to value a business just by

looking at its balance sheet. This makes a true assessment is very difficult for investors, creditors and the bankers.

- Accounting policies

  Two companies trading at the same level could produce very different accounts due to their choice of accounting policies.

- Trends

  The published accounts only have to show results for the current and previous accounting period, thus making it very difficult to consider any 'trend' information that would indicate whether the company is growing or declining.

After understanding why financial statements are prepared, the next step of the research was to consider how the widest meanings can be extracted from a set of financial statements and how management might use the information obtained from the prior mentioned financial documents.

4.4 Analysis of financial performance

The figures and details contained within a set of financial statements are rich with sufficient information for interested parties to gain a deeper insight into the affairs of an organisation when certain ratios are calculated. Several ratios that can be calculated will mean little on their own and will need to be compared with other ratios to receive a more wide ranging meaning. One example is that such formulas can prove beneficial for internal comparison purposes so that the ratios for this year can be compared with the same ratios relating to previous years. For external comparison, the ratios could be compared with those of similar organisations over the same period. This analysis uses average data that is common to the construction industry, in order to obtain a global picture of the industry and its economic movements.

In the competitive world, it is desirable to find some way of comparing individual performance with another one operating in the same field. If an investor wished to compare the size and worth of a company with its previous position or with that of another company, someone might use the total assets or the net assets' figure from the balance sheet. This would be a misleading measure if a heavy engineering

company was being compared with a financial institution. The latter could be a very large concern, but this would not be reflected by counting how many machines it owned. Therefore, other measures should be used in order to obtain an accurate broader picture of the situation.

When it is required to make more complex comparisons (e.g., profitability), a straightforward comparison of single figures (e.g., net profit) will be very inadequate. A very large company may have had a bad year and only make £100,000 profit. This same figure might be the profit of a very small company employing only a few people that has had a very successful year. It would clearly be misleading to suggest that they are similarly profitable.

For this reason, figures for profit and assets are best examined in the form of ratios. Ratios are the primary means of analysing accounts for both internal and external purposes and they are useful tools to the manager in a company and as a guide to investors, creditors and other users. They provide a means of interpreting and comparing financial results, as well as of establishing performance objectives or yardsticks (Chandra, 2005).

Understanding the limitations of financial reporting statements was aimed for when presenting a true and fair view of the data collected. When taking the averages for data analysing a true and fair view of one party will not necessarily be highlighted from the others. It is said that *'Rational mechanics gives us a first approximation to the theory of the equilibrium and of the bodies'* (Pareto, 1897, p. 490). In general, the collected secondary data or the audited statements were primarily reviewed while considering the following factors.

- Accounting standards
- Traditional concepts and conventions
- Methods of valuation
- Legislation
- Personal judgement
- Facts: the events that have taken place and their impact

There are no fixed prescriptions available for a standard mixture that can analyse data for a particular problem (Cole, 1996). The combination applied by the analyser has to demonstrate the acknowledged implicit limitations of accounting information in order to suit the requirements of the end user of the report (Taylor, 1995). Where management teams have changed over a period, the particular combination applied by one management team will serve to make internal comparisons more difficult. Similarly, greater external comparisons will be distorted by the blended strategies applied by different management teams.

The collection and application of a series of ratios on a systematic basis will enhance the understanding of interested parties. This is particularly so for building a perspective based on the results and for recognising the impact of different operational areas of the same organisation upon those results. Whether comparisons are internally or externally oriented, the aggregate figures detailed in financial statements will be of differing orders of magnitude. Ratio analysis is one widely used technique that overcomes such problems and aids the interpretation and comparison of financial reports.

4.5 Ratio analysis of the contractor's averaged financial data

Ratio analysis is treated as an integrated version of the quantitative analysis that is used for evaluating the information provided in the financial statements of business organisations. The mechanism is based on line items available in the financial statements such as the balance sheet, the income statement, the cash flow statement etc. A ratio facilitates the calculation of information provided in a single line item or a combination of several line items in order to reach a dissimilar point of view on the object under investigation. Ratio analysis is commonly considered as a strong guideline for fundamental data analysis. The outcomes of the calculations within this thesis are derived from the secondary data (audited financial statements) collection as well. Since basic data utilised for these calculations fall under the areas of sensitive data that are fall under the concerned areas of the Data Protection Acts of UK and Sri Lanka.

Generally, financial statements are reviewed for the following purposes.

1. Profitability
2. Liquidity (The ability of the company to pay its debts as they fall due)
3. Gearing (A consideration of the long term financing of the company)
4. Shareholders' interests

Commonly, ratio analysis is used to understand the growth or deterioration of two or more companies via the use of data available in their published financial statements. This is usually carried out by comparing the results received through a formula analysis for two consecutive years for both the companies. For ease of understanding, a preparation of graphs showing the past 3 to 5 years is a common technique applied by financial analyses (Taylor, 1995). Similarly, measuring the performance of two departments or enterprise businesses within a large company is equally possible by the use of internal financial reports, especially where large companies are divided into several divisions for ease of monitoring and control (Chandra, 2005).

4.5.1 Profitability ratios

Profitability ratios are a cluster of financial metrics that can be utilised to evaluate the performing capability of a business organisation in order to produce greater earnings comparative to its expenditure that is incurred while performing its activities for a pre determined period. Most of these ratios have a greater value when compared to a selected competitor’s ratio or to the subsequent ratio of the previous period. It is an indicative gauge that can highlight whether the company is performing successfully. Profitability ratios are considered as the most popular set of calculations that are used during financial assessments.

4.5.1.1 Return on capital employed (ROCE)

The strategic ratio that is used by companies to calculate profitability is considered as the Return on Capital Employed (ROCE). Sometimes the same ratio is referred to as the Return on Investment (ROI) or the Accounting Rate of Return (ARR) as well.

Equation 4.2 below depicts the construction industry averages for past 5 years and how the ROCE was developed in 5 years.

$ROCE = \frac{Profit\ before\ interest\ and\ taxation\ or\ Operating\ profit}{Capital\ employed\ or\ Total\ assets\ less\ Current\ Liabilities}$ x 100
$ROCE = \frac{Operating\ profit}{Total\ assets - \ Current\ Liabilities}$ x 100
$ROCE = \frac{2.27}{20.90 - \ 9.69}$ x 100
$ROCE = \frac{2.27}{11.21}$ x 100
$\boldsymbol{ROCE = 20.25}$

Equation 4.2 : Return on capital employed (ROCE)

The capital employed is the share capital, reserves and long term loans that will be equal to the total assets less current liabilities. When looking at the profit before interest and taxation, a comparison shall not be affected by the means that the company is financed.

This ratio gives an indication of the return that the companies are earning for those who provided the finances for the company before any taxes or any interest payments or dividends are deducted. Thus, companies will require the figure to be as high as possible. Investors will relate the return to the riskiness of the industry in which the company is. When the answer is a low percentage, it indicates that the business risk is in a low risk industry and someone else may prefer to invest in a high risk industry where % indication is high since it is said that the higher the risk, the higher the profit. Monitoring the trends is equally important since investors like to see steady growth in ROCE rather than a decline or wild fluctuations. For this reason, continued caretaking of the percentage movements is important but it should be noted that past growth is not a guarantee for growth in the future.

4.5.1.2 Asset turnover

Asset turnover ratio is used to gauge the ability of a company to utilise its assets for generating revenue or sales. This ratio can be used as a mode of calculating the number of sales values or the income generated per single unit of currency of assets (e.g., per £, € or $). This gives an indication of how efficiently a company is using its assets by turning the use of them into sales. The formula for calculating the asset turnover is:

$$Asset\ turnover = \frac{\text{Revenue or Sales or Turnover}}{Capital\ employed\ or\ \text{Total assets less Current Liabilities}}$$
$$Asset\ turnover = \frac{\text{Revenue or Sales or Turnover}}{\text{Total assets less Current Liabilities}}$$
$$Asset\ turnover = \frac{20.66}{20.90 - 9.69}$$
$$Asset\ turnover = \frac{20.66}{11.21}$$
$$\boldsymbol{Asset\ turnover = 1.84}$$

Equation 4.3 : Asset turnover

Usually a higher value is preferred because it indicates that the organisation is utilising the company assets proactively to make profits for its shareholders. Vice versa, a lower value may express that the performing company is considering alternative mechanisms to take maximum advantages of its assets. Ratio variations are independent for individual industries and they can only be compared among the same business clusters.

4.5.1.3 Profit margin

Measuring the proportion of sales that has been turned into profit is called profit margin as a percentage. This ratio varies greatly from industry to industry with some

existing on very small margins that require a very large volume of sales to generate a good return.

$Profit\ margin = \frac{\text{Profit before interest and taxation or Operating Profit}}{\text{Revenue or Sales or Turnover}}$ x 100
$Profit\ margin = \frac{\text{Operating Profit}}{\text{Turnover}}$ x 100
$Profit\ margin = \frac{2.27}{20.66}$ x 100
$\boldsymbol{Profit\ margin = 10.99}$

Equation 4.4 : Profit margin

As an example, businesses such as those selling greeting cards for 'New Year 2015' are a seasonal business. The remaining cards cannot be used after 31 December. Some designs are attractive to the public and some are not. It could be that attractive designs cannot be reprinted quickly enough to cater for the new demand. For this reason, it is used to maintain high profit margins since the risk is high.

Construction too has similar market features. Some residential areas quickly become popular and some move towards being unpopular. Demand cannot be quickly supplied since construction needs time for planning, approvals and construction time, whatever the procurement method applied. Therefore, construction too is considered as a high risk industry as described in Section 2.5.

4.5.1.4 Profitability comparisons

Profitability comparisons are usually carried out in two scenarios:

1. Competitor evaluation

   If several companies have the same accounting policies, assets of the same age and are in the same industry, then it is possible to compare whether one company is more profitable than the others since it is producing better

returns on both capital employed and sales. This scenario is virtually impractical.

2. Chronological evaluation

A company might have grown in terms of fixed assets and sales but is less profitable in the second year. There could be many reasons for this but it is possible that things are not as bad as they seem. Often, when a company invests in new assets it takes some time before there is a real increase in profits and thus the drop in profitability in this example may only be temporary.

As described in Section 4.6.1.1 of this thesis, the ROCE will be high in the first year due to the low book values of fixed assets that had to be replaced. Changes in ROCE can be examined further by considering asset turnover and profit margin because:

$$ROCE = \frac{Operating\ profit}{Total\ assets - Current\ Liabilities} \text{ x } 100 \quad (4.5.1.1)$$

$$= \mathbf{20.25}$$

$$Asset\ turnover = \frac{\text{Revenue or Sales or Turnover}}{\text{Total assets less Current Liabilities}} \quad (4.5.1.2)$$

$$= \mathbf{1.84}$$

$$Profit\ margin = \frac{\text{Operating Profit}}{\text{Turnover}} \text{ x } 100 \quad (4.5.1.3)$$

$$= \mathbf{10.99}$$

Therefore;

$$ROCE = Asset\ turnover \text{ x } Profit\ margin$$

$$\mathbf{(1.84 \text{ x } 10.99 = 20.22 \text{ or } 20.22\%)}$$

Equation 4.5 : Chronological evaluation

Thus, an increase in ROCE could be due to either an increase in asset turnover or an increase in the profit margin. A company could convert the same ROCE from a high margin to a low margin by having a high rate of asset turnover. Usually this is what occurs in the construction industry.

4.5.2 Liquidity ratios

Liquidity (or solvency) measures a company's ability to pay its debts as they fall due. Many profitable companies have gone into liquidation due to a lack of funds to meet their current commitments (Cole, 1996). Liquidity ratios are a cluster of monetary formulas that can be used as determining tools for companies to identify their ability to settle their short term financial obligations. When higher output values are spotted while carrying out a liquidity ratio analysis, it indicates that a larger margin of high liquidity assets is required as a safety buffer for such companies to cover the short term debts.

Liquidity ratios in common application include the following:

1. Current ratio
2. Quick ratio
3. Stock turnover ratio
4. Operating cash flow ratios
   A : Debtors' time to pay
   B : Creditors' time to pay

4.5.2.1 Current ratio

The current ratio gives a measure of liquidity by comparing current assets to current liabilities. Therefore, the equation for the current ratio is as follows:

$Current\ ratio = Current\ assets : Current\ liabilities$
$Current\ ratio = \frac{Current\ assets}{Current\ liabilities}$
$Current\ ratio = \frac{14.98}{9.69}$
$\boldsymbol{Current\ ratio = 1.55}$ **or 1.55:1**

Equation 4.6 : Current ratio

> *"A common rule of thumb is that a "good" current ratio is 2 to 1. Of course, the adequacy of a current ratio will depend on the nature of the business and the character of the current assets and current liabilities. There is usually very little uncertainty about the amount of debts that are due, but there can be considerable doubt about the quality of accounts receivable or the cash value of inventory. That's why a safety margin is needed."*
>
> (Brigham & Houston, 2011, p. 11)

Since current ratio provides a guideline on the liquidity status and the organisation's ability to meet the demands of its shareholders, an acceptable level of the current ratios' outcomes may vary between different industries. Brigham & Houston further recommended taking care of the following points as well.

- Current ratio provides a maximum as well as a minimum. A high current ratio like 4:1 is a bad sign as it implies much money is tied up in current assets (stock and debtors) where it is not earning anything for the company.
- The 'norm' varies from industry to industry and a low ratio can be a sign of efficiency in the use of working capital (stock, debtors and creditors).
- In fact, no simple norm exists. The current ratio depends upon a number of factors such as:
  - The maturities of current liabilities
  - The nature and quality of the current assets
  - The fluctuations in working capital requirements

4.5.2.2 Quick ratio

If it is not easy to turn stock into cash quickly in order to meet current requirements, another ratio, called the 'quick ratio' or the 'acid test ratio' can also be calculated.

$Quick\ ratio = (Current\ assets - Stock) : Current\ liabilities$
$Quick\ ratio = \frac{(Current\ assets - Stock)}{Current\ liabilities}$
$Quick\ ratio = \frac{(14.98 - 1.08)}{9.69}$
$\boldsymbol{Quicl\ ratio = 1.44}$ **or 1.44:1**

Equation 4.7 : Quick Ratio

The ‘norm'' for this ratio (with the same reservations as for the ‘Current ratio’) is approximately 1:1; i.e., that the company has the same amount in debtors and cash as it owes in current liabilities.

4.5.2.3 Stock turnover

Stock turnover ratios are utilised primarily for the consideration and evaluation of the following:

a. How the various components of current assets and current liabilities are looking.
b. How quickly debts are being collected.
c. How long stock is being kept.
d. How quickly credits are paid.

Thus, these ratios may also indicate the level of management efficiency to a certain extent.

$$Stock\ turnover = \frac{Cost\ of\ sales - \ COGS}{Avarage\ stock\ held}$$

$COGS$: Cost of goods sold [Inventory from previous year + Purchases - Inventory this year]

Equation 4.8 : Stock turnover

When using the Stock turnover formula, firstly it may be required to adjust the “Cost of goods sold or COGS” because usually sales’ values are booked at market price

and buying inventories indicate the purchase costs. In construction, it is common to use average prices for seasonal materials such as sand and bricks, as well as labour rates, to overcome the impacts deriving from seasonal effects. Similar to some other previously discussed ratios, outcomes should be evaluated in line with the industry averages. A high turnover usually indicates buying inefficiencies whereas low turnovers demonstrate "… suspended work (or reduced the rate of work)…" as expressed in Clause 16.1 of FIDIC Conditions of Contract for Construction (1999, p. 49).

- Usually the meaning of low turnover means weak sales. This leads to indicating excess inventory levels. Vice versa, a high turnover shows strong sales or weaknesses in the buying team.
- High inventory levels are considered as a harmful feature in trading businesses since it indicates an investment that has nil returns. Similarly, higher figures could highlight that the company is in a difficult situation or product process is in a downtrend.

It is impractical to use this kind of formulae based financial analysis in the construction industry since it is not merely a trading business. For this reason, sometimes it is difficult to predict the success or failure of construction companies by using liquidity ratios. Even if such rations were predicted, a narrow passage is available for contractors to escape due to pre fixed prices and terms determined in the standard conditions of contracts such as FIDIC, ICE, JCT or the SBD series of Sri Lanka.

4.5.2.4 Debtors' time to pay

Debtors' time to pay can be determined as the approximate amount of time that is taken by an institution to receive their payments or receivables when they become due from customers, clients or from the employer.

$$Debtors' \ time \ to \ pay \ = \frac{Trade \ debtors \ \text{x} \ 365}{Credit \ sales}$$

Equation 4.9 : Debtors' time to pay

Usually the outputs of debtor's time to pay will depend on the type of business. Typically, low output figures which are in days indicates stock that is not necessary to be held, without running the risk of losing sales due to running out of stock. In the construction industry, there are pre fixed maximum times expressed in the conditions of contract. In an event of a default by the paying party, several remedial actions are also expressed therein.

4.5.2.5 Creditors' time to pay

Creditor days or the creditors' time to pay is a similar ratio to the debtors' time to pay. This ratio gives an understanding as to whether the business organisation is taking full advantage of the credit facilities available. Output of the ratio indicates the average time that is being taken by business organisations to settle their debts against their credit suppliers.

$$Creditors' \ time \ to \ pay \ = \frac{Trade \ debtors \ \text{x} \ 365}{Cost \ of \ Credit \ purchases}$$

Equation 4.10 : Creditors' time to pay

Maintaining good relationships with creditors are as equally important as the relationships with clients and employers for smooth and longstanding operations. When the companies' cashflow becomes tight, this nature of relationships becomes more useful. For industries such as the construction industry that requires relying on a supply chain management it will be relatively economical to agree on an extended time for payment for suppliers rather than obtaining overdraft facilities from financial institutions. When cashflow situations are relaxed, early payments could build good relationships. Such action could motivate the supplier to go the extra mile when a business is in need of a rush delivery at the tail end of a project.

The application of these ratios needs to be related to the normal terms of trade for an industry. Clearly, debtors are to be paid as quickly as possible but in the meantime, the relationship with customers should not be jeopardised.

4.5.2.6 Liquidity comparisons

Liquidity comparisons can be carried out in two scenarios.

1. Competitor evaluation

   When two anonymous companies are compared and the first company demonstrates is all the three outcomes for stock turnover, debtors' time to pay and creditor's time to pay as higher values or a greater number of days, then the initial indication may be that the first company is in a much healthier status with respect to liquidity. In the second company, the same figures appearing low may give an initial indication of having a liquidity constraint because the second company cannot turn their stocks and debtors into cash in time to pay its creditors on time, unless the financial institutions increase the overdraft facilities.

   When analysing this situation *vice versa*, then this scenario might change. This is because the second company (which indicates lower values derived from liquidity ratio analysis) seems more efficient than the first company does because it appears to be more capable of collecting debts quicker than the first company is and rotating its stocks faster while taking a longer time to pay its creditors. For this reason, the key portion of information that should be evaluated depends on the type of business.

2. Chronological evaluation

   The same conclusions are drawn here: the first company could be in a worsening liquidity position or it could be that the company is being more efficient with its liquid resources. The reduction in cash could also have something to do with the repayment of some long term loans. Once again, all the indications deriving from the ratio analysis are subject to the industry, to market patterns and to socioeconomic backgrounds.

Different kind of analyses can be carried out to evaluate the different nature of assets when calculating the liquidity level of a particular organisation. Certain analyses will produce only the amount of cash and its equivalents divided by the current liabilities since this is considered as the liquid assets. Cash can be treated

as the most probable mode of settling short term debts in case of an unexpected situation.

A company's ability to turn short term assets into cash to cover debts is of the utmost importance when creditors are seeking payment. Bankruptcy (Jardin, 2014) predictors and other mortgage establishments commonly use liquidity ratios for determining whether a particular business organisation can continue as a functioning organisation. Verifying the liquidity level of a business organisation is a necessity when analysing its performance.

4.5.3 Gearing

Gearing ratios are concerned with establishing the relationship between the proportion of capital employed that is provided by long term loans and the proportion that is provided by shareholders' funds (I.e., share capital plus any retained profits). These modes of financing are referred as borrowed funds or 'debt'' and shareholders' funds as 'equity'. The most common gearing ratios are;

$\frac{Debt}{Debt + Equity}$ x 100	= $\frac{Debt}{Capital\ employed\ or\ Total\ assets}$	(4.5.1.2)
$Interest\ cover$	= $\frac{Profit\ before\ interest\ and\ taxation}{Interest\ payable}\ x\ 100$	
$Gearing$	= $\frac{Debt}{Equity}$ x 100	
	= $\frac{Total\ liabilities\ [Non\ Current + Current]}{Total\ Equity}$ x 100	
	= $\frac{10.48}{10.42}$ x 100	
$\boldsymbol{Gearing}$	= ***100.58 or 100.58:1***	

Equation 4.11 : Gearing ratios

Gearing ratios give a measure of the financial risk of a company. Much research has been carried out on the financial statements of 'failed' companies in order to try to find a link between changing ratios and failure, with the aim being to try to predict failure before it happens according to Iturriaga & Sanz (2014), Richardson, et al. (2014) and Braun, et al. (2014). Commonly, it is said that the key ratios are the liquidity ratios, as it is the lack of funds to pay debts as they fall due that finally causes the failure. This statement is not borne out through research but, possibly, it can be argued that the reasoning is established because worsening liquidity and an increase in the efficiency of working capital management both move liquidity ratios in the same direction. Though the research is not conclusive, there is a link, however, between worsening gearing ratios and failure, perhaps reflecting a willingness of financial institutions to look at the security of their loans more than the ability to repay the interest.

4.5.3.1 Gearing comparisons

It is considered that a company with a debt to equity ratio of 100% or more is in a high financial risk category. Contrary to that, this is normal in the construction industry where construction contracts take a long time to complete and thus payments have to be made long before receipts comes in. For this reason, the debt to capital employed ratio shows the proportion of a company's long term capital that is financed by borrowings. This gives an indication of the further secured borrowing that might have to be undertaken. Interest cover gives an indication of how adequately the profits may cover the interest to be paid. A ratio of less than two or three times here would be as high as a company in general would like to see it.

4.5.4 Stakeholders' interest

Shareholders will look at financial statements with a view to considering the return that they get on their investment in the company and how that compares with potential investments in other companies or less risky investments (e.g., building societies or government stocks).

At first impression, the return to the shareholder may be seen as being the annual dividends paid by the company but, in fact, the return is more complex than this (Liu & Hub, 2013). A shareholder may accept a low dividend that may be subject to higher rates of income tax if sufficient profits are made and reinvested in the company to make the value of the shares increase. This is termed by the shareholders as 'manufacture' income by selling shares and making a 'capital gain' that may well generally be tax free (Mishra & Ratti, 2014).

4.5.4.1 Earnings per share

Because of the above reasons, the key ratio that any shareholder will look at is the "Earnings per Share" or "Divident" figure or EPS. Quoted companies in particular are aware of the need to maintain a high EPS figure and thus will use the subjectivity of financial accounting rules (Accounting Standards Board, 1999) to meet this purpose.

$$EPS = \frac{Profit\ after\ tax,\ preference\ divident\ and\ taxation}{Quantity\ of\ Shares\ is\ issue}$$

EPS : Earnings per share

Equation 4.12 : Earnings per share

4.5.4.2 Price earnings' ratio

Other ratios that are considered can focus on the return on a share in relation to its market value. The most used ratio is the Price Earnings (PE) ratio.

$$PE = \frac{Market\ Price\ Per\ Share}{Earnings\ Per\ Share\ or\ EPS}$$

PE : Price Earnings Ratio

Equation 4.13 : Price earnings ratio

The Price Earning (PE) ratio usually provides some consistency and output indicators that are similar for companies in similar industrial sectors since these companies are facing the same business risks.

4.5.4.3 Competitor evaluation

When comparing two different companies and their market values, it may not be possible to see readily available comparative data in the financial statements that can be used by the shareholders.

$$Earnings\ yield = \frac{EPS}{Market\ Price\ Per\ Share}\ \text{x}\ 100$$

Equation 4.14 : Competitor evaluation

When looking into the financial pages of reports it is possible to find the PE ratio of quoted companies in the respective industries of the two different companies. When carrying out a comparison analysis between the first company and the second company by using the data available in financial statements, this could give an indication of the value of the shares that a prospective investor would pay.

4.5.4.4 Chronological evaluation

When one considers a situation where shareholders are looking for their returns by the way of dividends, then the preference could be contrary to the competitor evaluation (as described in Section 4.6.4.3 of this thesis) some word or words missing just here will be affected because a reduction in the market value of the shares would be of great concern to the investor.

$$Dividend\ yield = \frac{Dividend}{Market\ Price}\ \text{x}\ 100$$

Equation 4.15 : Chronological evaluation

For this reason, it is common for companies to pay consistent dividends from fluctuating earnings' figures or a payment of a regular, steady dividend to reduce the risk of investing in a company. Sometimes, reduced dividends are taken out of context as a sign of weakness, when it may be that a company wishes to retain funds in one year in the hope of paying increased dividends in the future. In this instance, it would be important to release all possible helpful information to the companies' shareholders to stop the downfalls in the share market.

4.6 Other information

Before any conclusions were made, the further information in the following areas were taken into analysis as well.

- **Type of industry**

  When carrying out a competitor comparison, if the first company and the second company are in different industrial sectors, many of the comparisons will be meaningless.

- **Industry 'norms'**

  Common norms would express whether the liquidity ratios are worsening or whether the second company is being more efficient.

- **State of the economy**

  The worsening performance in the second year needs to be put in context of the economy in general.

- **Inflation**

  Inflation from one year to another and in different industrial sectors is to be reviewed prior to making any conclusions.

- **Accounting policies**

  Differences in accounting policies of individual organisations can have a significant effect on the reported figures.

- **Age of assets**

  Old assets will have low book values, but might be just as efficient as newer assets with much higher book values, giving misleading ROCE ratios, among others.

- **Historic costs**

  Income in general is in current terms but assets may be old and, therefore, they should be valued in current terms for realistic comparisons if it is identified that no attempt is made to do this in a company's' financial statements.

4.7 Knowledge acquisition and framework abstraction of PR/SS

Conceptual modelling can be considered as a process of intellectualising a framework from a physical creation when considered as a comprehensive term. During the process of conceptual frame working, certain decisions are eventually required to be made in respect of the range, level and extent of the framework. Generally, the framework outliner presents a constrained situation that is suitable for simulation. Then the expectations of the conceptual model have to be added with equipment that is essential to move parallel with the real world and remove incompatibles from the framework. These modifications are to be undertaken at every step during the detail design by addressing every aspect. When it comes to these decisions, it is important to make a pre agreement between the parties. These parties may vary from project to project. In an academic framework, such an agreement shall be made between the supervisor and the researcher. In a real world model, various parties might be involved such as designers, constructors, developers, stakeholders, end users etc. who are going to apply the framework in decision making (Kotiadis & Robinson, 2008). Introducing a range of assumptions and simplifications to connect the framework with the real world is an integral part of a successful product.

When evaluating the movement of ICTAD indices for major construction resources in comparison with each other (as depicted in Table 4.2 of this thesis) it can observed that the prices of ' Item 1 - Operational Workers' and 'Item 2 - Aluminum Installation' moved upwards rapidly. However, with the settlement of World Metal Prices (www.metalprices.com), aluminum prices have become settled since 2013 but the demand for construction operatives remains unchanged. No traceable movements could observed in the other key construction indices selected for the evaluation that are:

1. Operational Workers
2. Aluminum Installations
3. Reinforcement
4. Timber
5. Granite and Marble
6. Concrete
7. Fuel
8. Electrical Installations
9. Equipment
10. Glass

The reason for the unusual movement in the demand for construction operatives could happen because of several reasons such as, but not be limited to, the following:

A. An increasing demand for construction operatives due to maintenance activities
B. More opportunities were created due to disaster resilience activities
C. Restriction in the numbers of new incomers due to industry unpopularity and other causes as expressed in Sector 1.4 and Figure 1.2 of this thesis.

Table 4.2 : Inflation of major resources in Sri Lanka

Inflation of major resources in Sri Lanka										
	1-Operational Workers	2-Aluminum Installations	3-Reinforcement	4-Timber	5-Granite and Marble	6-Concrete	7-Fuel	8-Electrical Installation	9-Equipmemt	10-Glass
2007	10.84	(4.87)	(0.51)	2.17	0.49	3.14	4.15	3.36	(0.03)	2.47
2008	14.98	1.49	21.48	6.69	2.80	6.07	17.17	4.07	1.12	2.79
2009	19.71	11.83	10.65	8.71	6.94	6.76	5.21	4.51	3.12	2.98
2010	20.71	17.55	11.71	9.31	7.80	6.99	5.98	4.65	3.12	3.11
2011	24.60	23.33	16.51	17.00	11.04	8.26	7.98	4.88	3.12	3.35
2012	31.07	31.40	20.81	26.73	16.47	12.32	25.58	5.60	4.51	4.25
2013	37.90	36.55	21.08	32.59	19.28	14.03	29.99	6.08	4.63	5.58
2014	42.37	36.55	21.08	33.13	20.18	14.03	29.73	6.43	4.63	5.74

Source: ICTAD Cost Indicies (www.ictad.lk)

Figure 4.11 below more deliberately demonstrates how the cost of the operational workforce or the ICTAD cost indices for labour has moved upward compared to other major construction components.

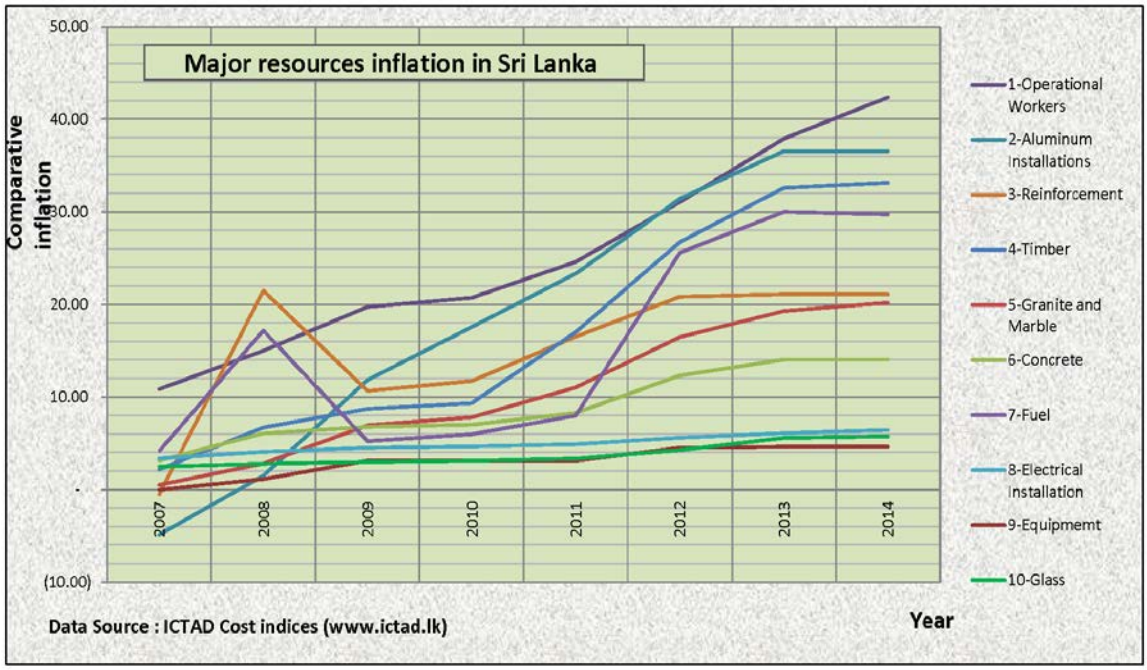

Figure 4.11 : Inflation impact on construction materials

However, the primary findings in this study demanded further investigation and detailed comparisons between the construction inflation in Sri Lanka against several non construction based elements and indicators such as:

1. Construction Cost Indices
2. Crude Oil prices
3. US$ Fluctuation (United States Dollar)
4. £ Fluctuation (Pound Sterling)
5. € Fluctuation (Euro)
6. Life Expectancy at birth
7. Cost of Living

The findings of the detailed construction fluctuation analysis is depicted in Figure 4.12 of this thesis.

Table 4.3 : Construction Inflation in Sri Lanka

Construction Inflation in Sri Lanka							
	A	B	C	D	E	F	G
	1.0-Construction Cost Indices - www.ictad.lk	2.0-Crude Oil - www.nasdaq.com	3.0-US$ Fluctuation - www.oanda.com	4.0-£ Fluctuation - www.oanda.com	5.0-€ Fluctuation - www.oanda.com	6.0-Life Expetency - www.indexmundi.com	7.0-Cost of Living - www.statistics.gov.lk
2001	203.70	23.00	86.1000	134.5470	82.1376	72.00	14.1
2002	212.10	22.81	95.3500	154.6960	101.0890	72.67	23.65
2003	226.50	27.69	96.8500	171.1320	120.8190	73.18	32.68
2004	267.20	37.41	97.2700	201.4800	142.6700	73.53	41.67
2005	304.80	50.04	99.3000	175.4800	120.7950	73.69	52.72
2006	362.80	58.30	102.6200	210.1290	141.5740	73.72	62.7
2007	402.70	64.20	108.6000	216.3040	159.4780	73.70	78.65
2008	458.20	91.48	107.7300	163.6650	159.3970	73.70	101.18
2009	459.70	53.56	115.0750	181.9500	163.7440	73.74	104.74
2010	469.80	71.21	113.9000	171.4150	146.8530	73.84	110.96
2011	501.10	87.04	110.2300	175.7810	147.2900	73.98	117.7
2012	570.20	84.46	127.8900	205.0340	167.7350	74.15	125.23
2013	596.60	89.84	126.6750	215.4670	179.8950	74.15	132.17
2014	607.40		130.6250				

Data Sources:

1.0-Construction Cost Indices - www.ictad.lk
2.0-Crude Oil - www.nasdaq.com
3.0-US$ Fluctuation - www.oanda.com
4.0-£ Fluctuation - www.oanda.com
5.0-€ Fluctuation - www.oanda.com
6.0-Life Expetency - www.indexmundi.com
7.0-Cost of Living - www.statistics.gov.lk

Figure 4.12 depicted below is more deliberately demonstrating how the construction costs were increased compared to other commonly known components.

It can be noted, firstly, when comparing the movements of 'Construction Cost Indices' and the 'Cost of Living' indices with the extended exponential curves up to year 2018, it is apparent that the projected indices are rising to extremely high end values. Secondly, the cost of living contains considerable weighting from housing

as depicted in Figure 4.12 of this thesis which means that any affect developed to construction, portion is automatically reflected to housing.

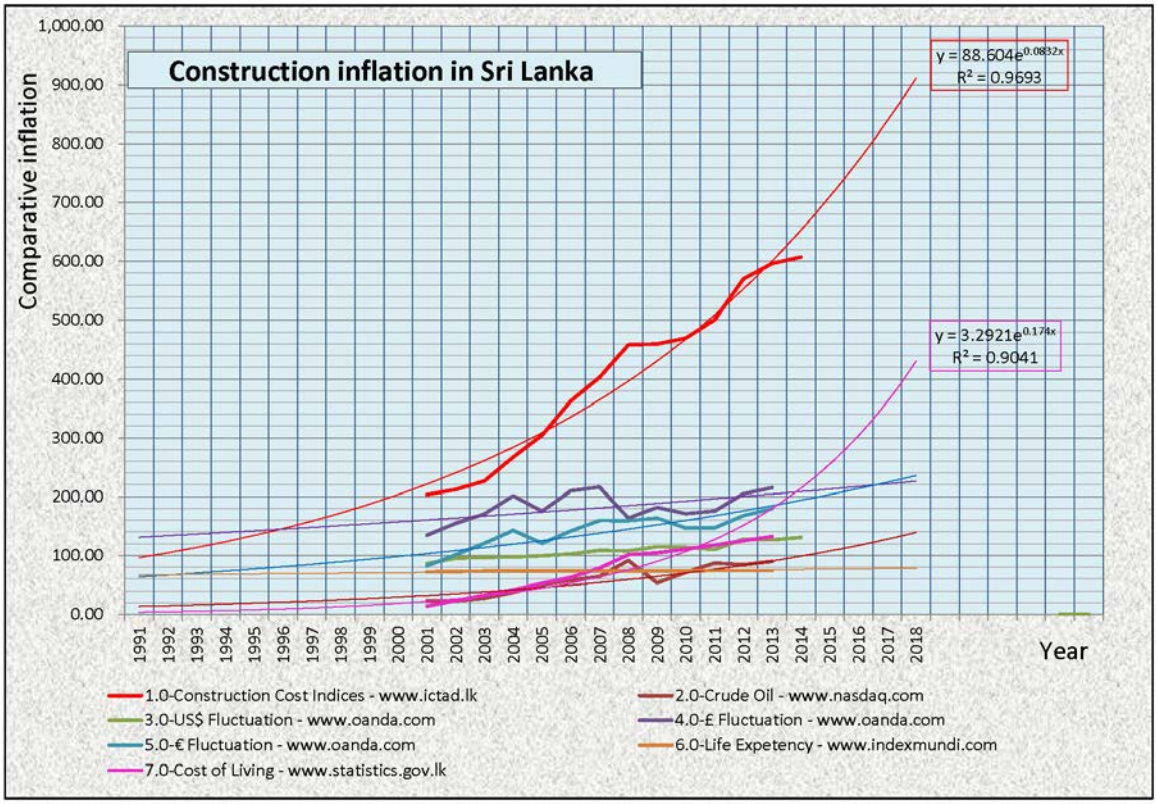

Figure 4.12 : The inflation of construction indices in Sri Lanka

When the cost of housing goes up, again, it increases the construction cost because the cost of accommodation reses similar to circular referencing or pyramidal financial structure that may eventually collapse while moving towards infinity.

4.8 Sri Lanka consumer price index (CPI)

In Sri Lanka, the Consumer Price Index or CPI measures changes in the prices paid by consumers for a basket of goods and services. There are several web based data sources that are maintained by the government and nongovernmental organisations. The Department of Census and Statistics (www.statistics.gov.lk) is a government organisation. In their web portal, several web pages provide information on the Sri Lanka Consumer Price Index (CPI), on actual values, historical data, forecasts, charts, statistics, on an economic calendar and news.

The Consumer Price Index (CPI) in Sri Lanka increased to 181.40 Index Points in June of 2014 from 179.50 Index Points in May of 2014. The Consumer Price Index

(CPI) in Sri Lanka averaged 67.16 Index Points from 1985 until 2014, reaching an all time high of 181.40 Index Points in June of 2014 and a record low of 10.80 Index Points in September of 1985. The Consumer Price Index (CPI) in Sri Lanka is reported by the Central Bank of Sri Lanka.

4.9 Sri Lanka inflation rate

The inflation rate in Sri Lanka was recorded at 2.80 percent in June of 2014. The inflation rate in Sri Lanka averaged 10.33 percent from 1986 until 2014, reaching an all time high of 28.31 percent in June of 2008 and a record low of -0.89 percent in March of 1995. The inflation rate in Sri Lanka is reported by the Department of Census and Statistics in Sri Lanka.

It was required to illustrate and establish that the construction cost indices are moving upwards unusually when compared to the other generally known components such as the Sri Lanka inflation rate etc. The required data for comparison was collected from different sources and converted into a comparable format. Such data and the obtained sources are depicted in Table 4.3 and are graphically presented in Figure 4.12 of this thesis.

4.10 Sri Lanka producer prices

A Producer Price Index (PPI) measures the average changes in prices received by domestic producers for their output. It is one of several price indices. Its importance is being undermined by the steady decline in manufactured goods as a share of spending.

The Producer Prices in Sri Lanka increased to 4867.90 Index Points in 2013 from 4457.30 Index Points in 2012. The Producer Prices in Sri Lanka averaged 1477.06 Index Points from 1975 until 2013, reaching an all time high of 4867.90 Index Points in 2013 and a record low of 103.40 Index Points in 1975. The Producer Prices in Sri Lanka are reported by the Central Bank of Sri Lanka.

Similar to the information given in Section 4.9, it was required to illustrate and establish that the construction cost indices are moving upwards unusually when compared to other generally known components such as the Sri Lanka Producer Prices etc. The required data for such a comparison was collected from different

sources and converted into a comparable format. The data and the obtained sources are depicted in Table 4.3 and the findings are graphically presented in Figure 4.12 of this thesis.

4.11 Life expectancy

Life expectancy at birth indicates the average number of years a newborn infant is expected to live. Life expectancy is a crucial factor that should be taken into account when it comes to PR/SS mechanisms because the duration of the PR/SS that shall be provided from the date of retirement to individuals are finally determined by the life expectancy factor.

Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Derived from male and female life expectances at birth from sources such as: (1) the United Nations Population Division, World Population Prospects, (2) the United Nations Statistical Division, Population and Vital Statistics Report (various years), (3) census reports and other statistical publications from national statistical offices, (4) Eurostat: demographic statistics, (5) the Secretariat of the Pacific Community: Statistics and Demography Programme, and (6) the U.S. Census Bureau: International Database.

Life expectancy reflects the overall mortality level of a population and summarises the mortality pattern that prevails across all age groups in a given year. It is calculated in a period life table that reflects a snapshot of a mortality pattern of a population at a given time. It, therefore, does not reflect actual mortality patterns that a person actually goes through during his/her life that can be calculated in a cohort life table.

High mortality in young age groups significantly lowers the life expectancy at birth. However, if a person survives an expected childhood of high mortality, he/she may live much longer. For example, in a population with a life expectancy at birth of 50, there may be few people dying at age 50. The life expectancy at birth may be low

due to the high childhood mortality so that once a child passes their childhood, then they may live much longer than 50 years.

4.12 Chapter summary

This section describes the analysis in this thesis of the data that were collected and processed in response to the problems faced by the construction industry. Two major types of data (namely primary data and secondary data) were used in the process of obtaining information for this report. Primary data are of a bespoke nature and are individually collected customised data. Secondary data are widely available but are preserved for some other purposes. In this research, primary data were collected via a questionnaire survey and the required audited statements were collected as secondary data.

The gathered information was analysed by the following methods:

a. The Relative Importance Index (Qualitative data).
b. Financial formulae and trend curves (Audited statements of contracting organisations).
c. A mixture of statistical mechanisms available with spreadsheet formulas.

Finally, by undertaking the data analysis, this research identified mechanisms available to develop and provide a sustainable model for a social security system for construction operatives which will not increase the prevailing construction costs (primarily by utilising and simulating the cascade effect or the multiplied risk allowances inherently allowed in different procurement strategies in the current scenario). Ultimately, the findings were utilised for outlining a time, cost and quality orientated PR/SS framework for the operational workforce in order to achieve greater stakeholder satisfaction.

Chapter : 5 Proposed framework for Sri Lanka

5.1 Introduction

The proposed framework will require being primarily supported by the savings gained from the minimising of risk multiplication or the cascade effect. To reduce the effect, it is inherently required to minimise the transaction layers within the supply chain management.

In the construction sector, it appears that no one would like to take on the responsibility for direct labour productivity. This may be due to the behaviour problems explained in Section 2.9 (detailed expression of behavioural problems) of this report or to any other reason thus far not identified. Whatever the reason, it increases the layers of risk transfer even though cost increases simultaneously.

The researcher's initial hypothesis was if a framework could be developed to minimise the behavioural problems within the current scenario of the operational workforce, then such recovered finances could be utilised for the betterment of the future of the operational workforce itself and, ultimately, to the Sri Lankan construction industry at large. Based on the said hypothesis of the researcher, a framework was developed that will naturally grant better stakeholder satisfaction, as depicted in Figure 5.1 (Proposed BFSL Framework for Construction Operatives).

When developing the framework, the basic need was to identify how the required finances could be obtained. The reason as to why the researcher had this understanding is that any framework without a proper financial viability seems like a man without a backbone. No sensible person would have any interest in, at the very least, overviewing the framework if it has no financial viability.

This requirement was expressed in the Section 1.4 (the research problem) of this thesis that stated, *"This task will be introduced on a platform which will not increase the prevailing construction costs"*. Proving this statement is very much similar to validating the framework itself. Table 5.1 (Count of operatives and government daily cost per head) and Table 5.2 (Calculation of possible savings from current mechanism) mathematically depicted the fulfillment of afore stated financial viability requirements from the salvaged finances.

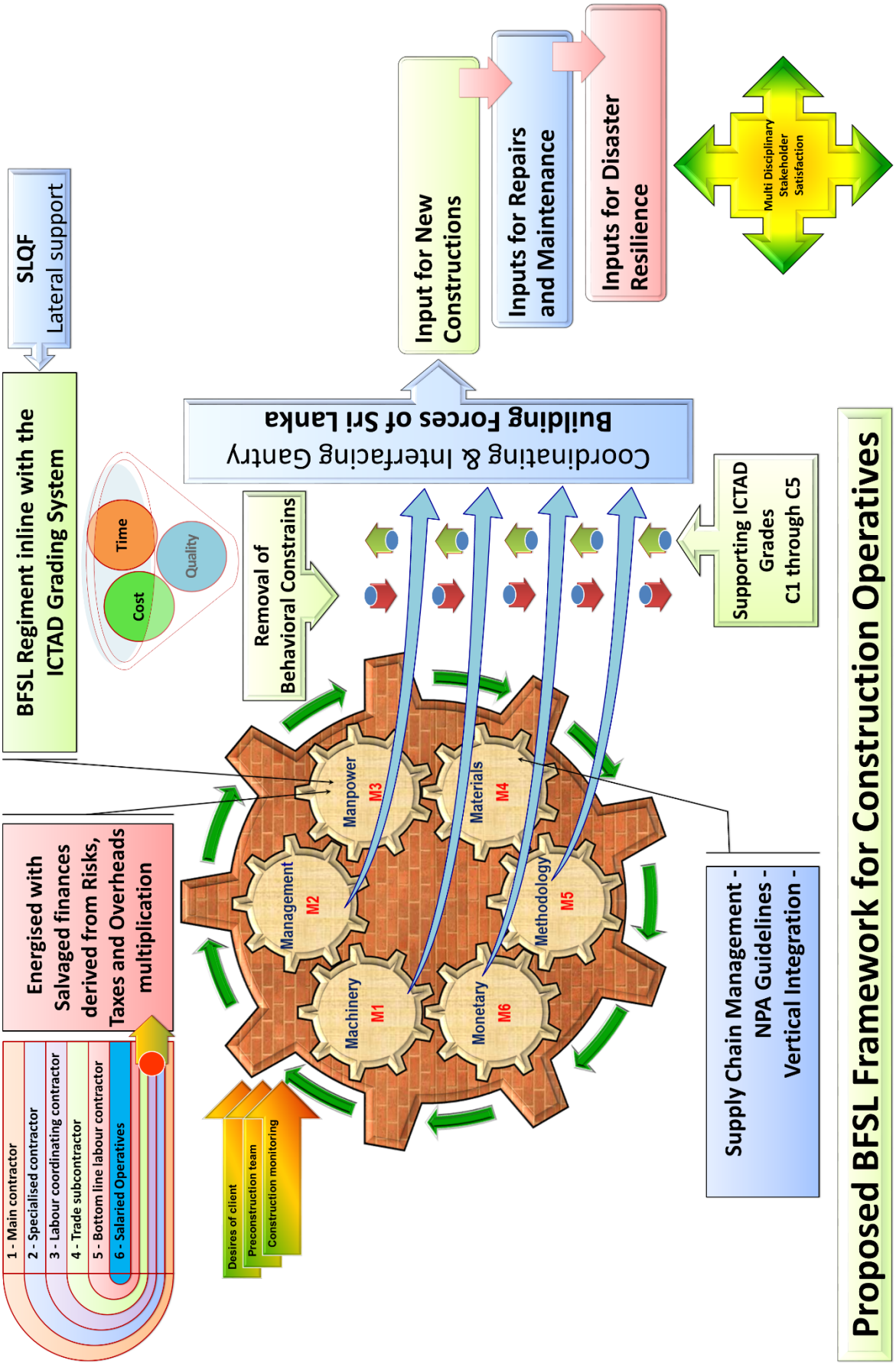

Figure 5.1 : Proposed BFSL Framework for Construction Operatives

According to the findings of this research (obtained through the questionnaire survey (Appendix D) and the analyses of the audited financial statements) depicted in Sections 4.2.1 and 4.2.2 of this thesis, it is apparent that considerable amounts of finances are being wasted by the current construction operations and risk management strategies that are being applied in the current scenario of human resources' management.

5.1.1 Projectised approach and temporary nature of occupation

Even though the projectised approach (PMBOK, 2008) is considered the best for mission oriented operations, supply routes of resources should not be treated as temporary. If continuity is not guaranteed, then components with ability will commence moving out without completing the allocated tasks if no psychological contract exists between the parties (Chandradasa & Ekanayake, 2011) similar to the movements of *"Hem and Haw"* (Johnson, 1998). Assured continuity of employment and, thereafter, taking care until one's existence is assured can be considered as key requirements within a mutual binding. All the employees in the Armed Forces are provided with such arrangements through a national budget. The construction industry too could provide a similar arrangement for its physical operatives through the allocation of a construction services' budget according to the calculations depicted in Tables 5.1 and 5.2 of this thesis.

Once financial viability is established, the existing Sri Lanka Qualification Framework (SLQF) described in Section 5.1.1 can be merged in order to develop the skills of the construction operatives.

5.1.2 Government's interventions

There are areas where the private sector cannot initiate major investments such as training and developing human culture. When it comes to areas where the private sector cannot invest, it should, naturally, become a responsibility of the public sector. People belonging to the operational workforce within the construction sector are the salient liability of the government even as they are at present. The government has to take care of people in the country whether they work or not, are good or bad, earn or not, as a fundamental responsibility.

Hence, governmental interventions are a fundamental requirement when it comes to the operational level of the proposed Framework.

5.2 Current management practice of construction operatives

One of the important reasons for the stakeholder dissatisfaction in Sri Lanka was identified as being an insufficient contribution from the operational workforce in the construction industry, according to studies by Samarakoon (2009), Gaminiratne (2004) and Pathirage (2008). Further to the findings of the survey carried out by Wijewickreme, (2010) and Wijewickreme et al., (2014), the previously mentioned identifications were further narrowed down by recognising the unavailability of a social security system as the key issue.

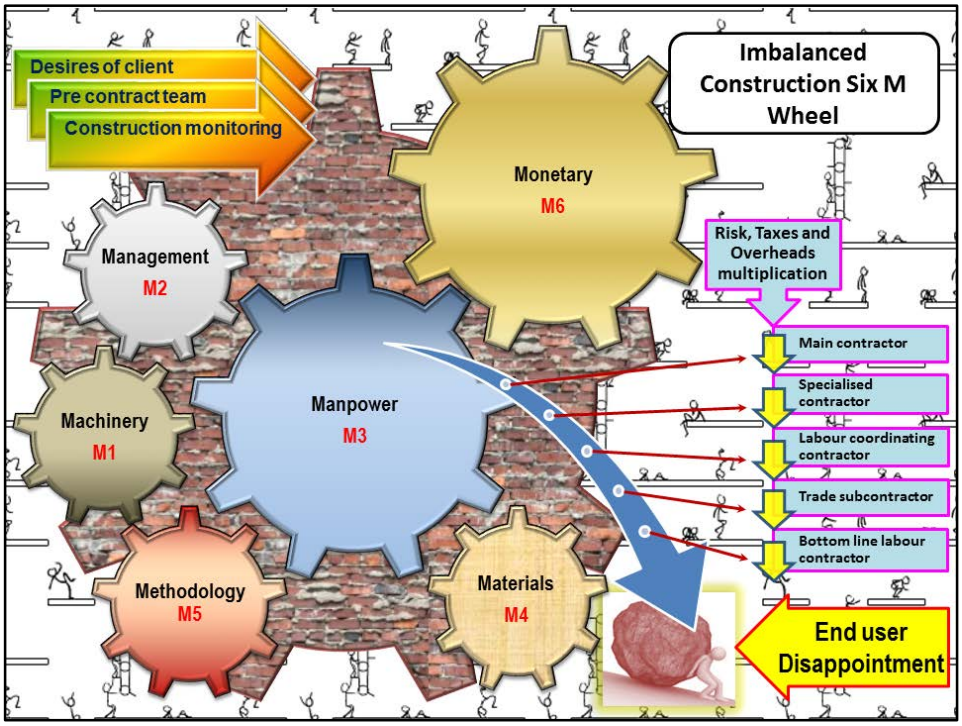

Figure 5.2 : Imbalanced Construction Six M Wheel

Even though Sri Lanka has a structured contractor and specialised subcontractor categorisation systems maintained through the ICTAD (www.ictad.lk, 2015), this structure does not provide any support for procuring human resources. As outlined in Figure 5.2 of this thesis, there is no properly coordinated, well monitored systematic approach that exists at present to care take of the technical training, HSE, welfare and PR/SS requirements of construction operatives, even though

various other monitoring systems have been introduced from time to time. Introducing a proper mechanism for ‘manpower’ management is at a critical level for the current construction industry and for several other production industries (Rasseedin, 2011a). The researcher of this thesis is also suggesting that there is a noticeable development of adamant behaviour by construction operatives to be seen in Sri Lanka during the recent past (similar to the previous opinions put forward by of Jeff Victoroff, (2005). The researcher’s belief can be further supported by the murder of an AFC journalist (The Island, 2014) as discussed in Chapter 1 of this thesis. Another organised crime, the “Meegalewa child kidnapping” by a group of construction operatives aged between 22 to 24 years seeking ten million Rupees as a ransom, was more headline news that shook Sri Lanka (Divaina, 2014). These examples emphasis the social demand for secured future income or PR/SS especially for temporarily employed operatives.

5.3 Modes of risk, taxes and overhead multiplication

As per the current practice, during the tendering stage, estimators obtain quotations from various specialised subcontractors. Labour coordinating contractors or large scale labour subcontractors playing an important role in the Sri Lankan construction industry even though the ICTAD does not recognise them under their listing of specialised subcontractors as described in Section 3.7.4 of this thesis. The website of the ICTAD (www.ictad.lk, 2015) presents further details of such categorisations of specialised subcontracting areas. This path of obtaining quotations will step down until the mechanism reaches the ‘Bottom line labour subcontractor’ in various stages. The higher the number of transactions eventually the higher the tax inundation and risk inundation by developing a cascade impact by overwhelming abundance (Taylor, 1995) within the industry, as depicted in Figure 5.3.

Similarly, taxes such as NBT (Nation Building Tax), BTT (Business Turnover Tax) present the same repercussion as the cascade effect by adding a percentage of one for each transaction between the work contractors (Murdoch & Hughes, 2008) according to the prevailing tax calculation systems in Sri Lanka.

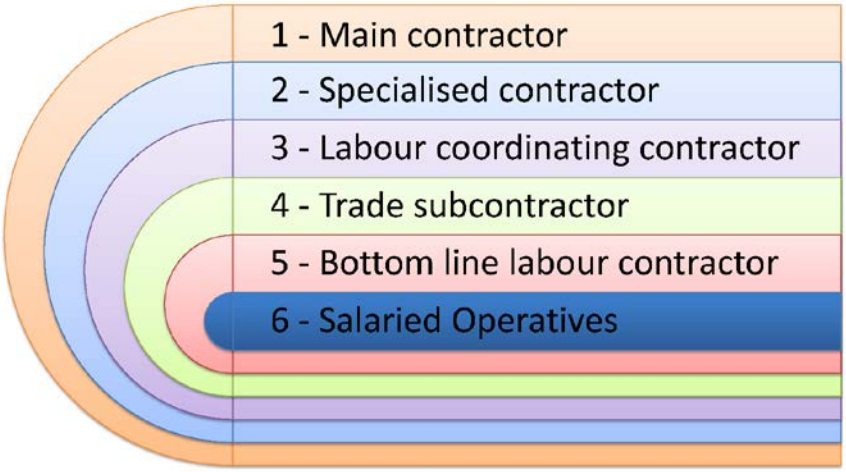

Figure 5.3 : Cascade effect of Risk Multiplication

Risk is considered as the driving force for any business. 'The higher the risk, the higher the profit' is a common motto among businesspersons and entrepreneurs. Hence, in every business transaction, a certain percentage is added as business risk (Cole, 1996). Basic project cost estimates are generally prepared based on work study records, building schedule of rates (BSR), hypothetical mechanisms etc. These estimates fundamentally have five cost headings (Brook, 2008) which includes labour, machinery and equipment, materials, specialist subcontract works and other miscellaneous costs. Risk allowances vary depending on the step ups of subcontracting or the subletting entity. These step ups generate the cascade effect of risk multiplication depending on the modus operandi for the construction procuring. Effects deriving from the reasons described in Section1.5 and Section 2.9.7 of this thesis will deliver additional impacts with regard to the risk distribution.

When looking at the rapid growths of many construction companies and insurance sector organisations and banks, it is apparent that considerable amount of profits are being generating from the savings from the cascade effect of risk multiplication or risk retaining. The researcher's hypothesis is to justify the amounts of savings that can be recovered by minimising this multiplication and utilising such recovered finances as described in Section 3.7.4, Section 4.4 and depicted in Figure 5.3.

5.4 Funding mechanisms

As described at the beginning of this chapter, financial support for the proposed framework will be provided through several sources as described below:

1. Salvaged finances derived from minimising risk, taxes and overheads' multiplication that are calculated and demonstrated in columns "L" and "M"

in Table 5.1 of this thesis. Furthermore, the same objective is expressed in the research objectives in Section 1.4.2 and Section 5.4 of this thesis as well.

2. Minimising the impact of material wastage due to mistakes and slipups by workforce as stated in Section 4.2.1 of this report thesis.
3. Reducing the impacts of the behavioural constraints of the operational workforce as stated analysed and transformed to RII values (see Section 4.2.1.1 of this thesis).

In addition, some lateral or indirect supports are possible by increasing the willpower of the operatives and reducing hypertension due to a secured retirement system and other social benefits etc.

However, during the data analysis section described below, it was identified that salvaged finances derived from minimising risk, taxes and overheads' multiplication themselves are sufficient to support the required financial anatomy in order to provide lifelong PR/SS for construction operatives in Sri Lanka.

5.4.1 Salvaged finances, construction share of GDP and workforce

Estimating the net values of salvaged finances had several options. Salvaged finances can be defined as the savings that are principally derived from the removal of the transitional layers of risk multiplication. The researcher suggests that, by introducing the model of Building Forces, the risk multiplication layers 3, 4 and 5 depicted in Figure 5.3 can be removed from current practice. These theoretical options are generally outlined in Chapter 3 (Research Methodology and Data Collection) of this thesis. The research's initial plan was to conduct several case studies to obtain an estimated value for the salvaged finances. However, during the secondary data collection it was identified that the document published after several case studies had been undertaken by the Department of Census and Statistics in Sri Lanka in 2011 (Appendix E - Survey of construction industry) could be utilised for this purpose. Accordingly, Table 5.1 of this thesis entitled 'Count of construction operatives and government daily cost per head' was developed to understand the impact of risk multiplication.

Using the information from Table 4.6 of the annual report of CBSL in 2014, the average daily remuneration per construction operative is depicted in Column 'H' of Table 5.1 below. Therein, the remuneration variance for the said 9-year duration is 68.25%.

Table 5.1 : Count of operatives and government daily cost per head

A	B	C	D	E	F	G	H	I	J	K	L	M
Count of Construction Operatives and Government Daily Cost per Head												
	GDP [SLRs]	GDP Construction % Share	ICTAD Indices for Labour	ICTAD Indices for All Construction	Labour Contribution % [1]	Construction Labour Element of GDP [SLRs]	CBSL Remuneration Per day [2] [SLRs]	Calculated Actual Workforce	DC&S Actual Remuneration Per day [3] [SLRs]	Calculated Virtual Workforce	Over Payment per Head	% Of Over Payment per Head
2005	2,423,515,800,000	6.20%	276.47	304.80	14.53%	50,850,992,470	907.00	200,325	528.00	344,205	379.00	41.80%
2006	2,900,731,273,000	6.30%	305.30	362.80	16.04%	57,059,384,852	1,001.00	203,556	542.00	376,262	460.00	45.90%
2007	3,513,221,547,000	6.40%	326.30	402.70	17.15%	61,952,206,560	1,070.00	206,787	709.00	312,255	361.00	33.78%
2008	4,386,226,950,000	6.50%	350.30	458.20	18.41%	67,548,113,664	1,149.00	210,018	834.00	289,321	315.00	27.41%
2009	4,840,975,100,000	6.60%	355.33	459.70	18.67%	69,572,168,956	1,165.00	213,249	849.00	292,547	316.00	27.11%
2010	5,645,730,867,000	6.70%	375.10	469.80	19.71%	74,555,828,110	1,230.00	216,480	863.00	308,565	367.00	29.84%
2011	6,523,793,136,000	7.10%	407.93	501.10	21.44%	85,921,871,033	1,338.00	229,405	882.00	348,056	456.00	34.09%
2012	7,596,008,342,000	8.10%	442.57	570.20	23.26%	106,347,362,120	1,451.00	261,715	898.00	423,044	553.00	38.14%
2013	8,510,279,850,000	8.70%	465.23	596.60	24.45%	120,073,369,025	1,526.00	281,101	914.00	469,202	612.00	40.09%

Note:

1 Labour contribution % for Gross construction costs

2 Average all inclusive Daily Remuneration of a Construction Operative for respective year

3 Actual Average all inclusive Daily Remuneration of a Construction Operative for respective year [Based on Survey of Construction industries 2011 by DC&S]

According to the CBSL figures, the calculated count of the workforce would have been between 200,325 persons in 2005 and 281,101 in 2013. The percentage variance therein for the same duration is 40.32%. However, when the CBCL figures were compared against the independent research outcomes of the Department of Census and Statistics of Sri Lanka in 2011, it was apparent that the cost of remunerations that actually occurred in the industry is sufficient to pay a lifelong PR/SS for the construction operatives, as depicted in Table 5.1 of this thesis.

5.4.2 Construction share between government and private sector

The Sri Lankan construction industry primarily depends on government funded projects. According to the Department of Census and Statistics of Sri Lanka in 2010, it was apparent that 66.00% of the projects were government funded.

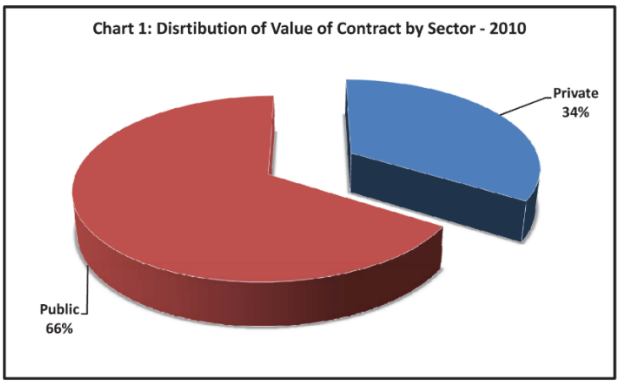

Figure 5.4 : Distribution of Value of Contract by Sector
(Source: DCSL, 2010)

Since the main channels of construction revenue are generated through national budget means, public sector finances are transferring to the private sector through the government sector. As depicted in Figure 4.10 and Table 4.1 of this thesis, it is apparent that growth of contractors' fixed assets and profit percentages are at an extreme level when compared to other sectors. Since contractors are not capable of making any arrangements for long term planning due to uncertainty it becomes the government's responsibility to ensure a certain work percentage to the contractors on a 'Quota Basis' instead of competitive tendering.

The Japanese construction industry (www.mhlw.go.jp) maintains such a quota system in order to avoid disparate bidding between contractors. An ensured quota system insures the continuity of organisations and it can be seen that some of the oldest construction companies are still surviving comfortably in Japan.

5.4.3 Calculation of possible savings from the current mechanism

A comparison of the general remuneration packages for schoolteachers (Columns C & D) and military officials (Columns E & F) are depicted in Table 5.2 of this thesis.

Other columns (Columns G to L) show how a lifelong PR/SS can be provided to the construction operatives' only by utilising salvaged finances.

Table 5.2 : Calculation of possible savings from current mechanism

A	B	C	D	E	F	G	H	I	J	K	L
Calculation of possible savings from the current mechanism											
Year	US$ Value/SLRs	School Teacher		Military Officer		Construction Operative			Monthly Saving from Risk Multiplication	From Current EPF & ETF	For 40 Y Working and 15 Y PR&SS
		Monthly Remuneration	PR&SS per month	Monthly Remuneration	PR&SS per month	Daly Salary	Monthly Remuneration	PR&SS Requirement			
2000	73.600	13,830.00	10,511.00	31,519.00	12,608.00	404.00	10,508.00	7,986.00	3,714.00	446.00	11,094.00
2001	86.100	14,241.00	10,823.00	32,455.00	12,982.00	416.00	10,820.00	8,223.00	3,825.00	459.00	11,423.00
2002	95.350	14,458.00	10,989.00	32,951.00	13,180.00	422.00	10,985.00	8,349.00	3,883.00	466.00	11,598.00
2003	96.850	14,658.00	11,141.00	33,407.00	13,363.00	428.00	11,137.00	8,464.00	3,937.00	472.00	11,758.00
2004	97.272	15,928.00	12,106.00	36,301.00	14,520.00	465.00	12,102.00	9,197.00	4,278.00	513.00	12,777.00
2005	99.300	18,056.00	13,723.00	41,150.00	16,460.00	528.00	13,718.00	10,426.00	4,849.00	582.00	14,484.00
2006	102.619	18,534.00	14,086.00	42,240.00	16,896.00	542.00	14,082.00	10,702.00	4,978.00	597.00	14,867.00
2007	108.597	24,248.00	18,429.00	55,263.00	22,105.00	709.00	18,423.00	14,002.00	6,513.00	782.00	19,451.00
2008	107.730	28,534.00	21,687.00	65,031.00	26,012.00	834.00	21,679.00	16,477.00	7,664.00	920.00	22,889.00
2009	115.075	29,065.00	22,090.00	66,241.00	26,496.00	849.00	22,083.00	16,783.00	7,806.00	937.00	23,315.00
2010	113.901	29,531.00	22,444.00	67,301.00	26,920.00	863.00	22,436.00	17,052.00	7,931.00	952.00	23,688.00
2011	110.229	30,171.00	22,931.00	68,761.00	27,504.00	882.00	22,923.00	17,422.00	8,103.00	972.00	24,202.00
2012	127.894	30,724.00	23,351.00	70,021.00	28,008.00	898.00	23,343.00	17,741.00	8,252.00	990.00	24,645.00
2013	126.675	31,277.00	23,771.00	71,281.00	28,512.00	914.00	23,763.00	18,060.00	8,400.00	1,008.00	25,089.00

According to the row for the year 2000, for a construction operative receiving a salary of SLRs 404 per day, the government is indirectly paying sufficient finance to pay a PR/SS equivalent for a schoolteacher. However, this allotment is retained by the contractors during various stages of the risk transferring mechanisms. Benefits that can be received through minimising the current behavioural impacts of the construction operatives will definitely provide a benefit for the construction industry and the country at large.

By reducing the risk, managing layers in the construction industry the government can easily convert this to a full PR/SS. An outline of a proposal is given in Section 5.5 of this thesis but the system may not be able to implement without strong intervention and support from the government.

5.5 Concept of Building Forces for Sri Lanka (BFSL)

Identified stakeholder requirements such as time, cost, quality, aesthetics, flexibility, confidentiality, transparency, accountability and individual requirements are always subject to variation.

The introduction of a completely different phenomenon always leads to an assortment of arguments, discussions and debates among the various people. As explained in Section 2.2 of this thesis the theme of the construction industry is to is provide a secure, long lasting and trouble free set up to enable relaxation when in need.

Based on the findings of the surveys and discussions, it was recognised that the proposed solution should contain the following primary features:

- The suggested social security system shall be lifelong (until death of the concerned person or his wife or until the children become adults).
- Construction careers shall comply with the ‘Hierarchy of human needs’ (Maslow, 1943).
- The strong intervention of the government is essential since a country’s law and order, safety, and a healthy economy in order to assist its citizens are among the responsibilities of any government.

- A sustainable mechanism needs to be developed which can serve the purpose without an extra burden on the government and on stakeholders.
- The provision of a merging arrangement with the Sri Lanka Qualifications' Framework (SLQF) for structured vocational educational development.

Thus, informal and unstructured preliminary surveys (Section 3.9) such as discussions with various, and prominent industry related, personnel was carried out. When the root causes were identified, it helped towards developing a comprehensive, reliable and sustainable framework as the solution.

5.5.1 Merging the BFSL with SLQF

The migration of learners and academics across states and nations has increased considerably during the recent past convincing the national higher education systems that they should broaden their scopes regarding higher education. The Sri Lanka Qualifications Framework (SLQF National Committee, 2015) (Appendix F - Sri Lanka Qualification Framework) has come forward as an important element in supporting and accommodating these changes, offering a clear cut accessible path for students to optimally continue their learning experience throughout the various stages of their lives. The SLQF has made broad changes in teaching and learning processes to achieve this goal. This change has enabled students associated with the various programmes to have a productive education at home as well as developing bridging arrangements with higher educational institutions abroad.

The SLQF generally acts as a broad base for the entire national higher education intuitions (HEIs) belonging to both the public and private sector. Furthermore, SLQF will have monitoring authority over all the higher education qualifications offered in Sri Lanka in the near future. The syllabuses of these HEIs and the learning outcomes that should be achieved for each qualification will be carefully monitored by the SLQF. The SLQF comprises twelve tiers where each tier will comprehensively defined and will enumerate the number of credits that should be earned by students for each qualification.

Furthermore, the SLQF required mediate on the name of a qualification and the abbreviations used for it as well in order to maintain proper categorisation between designators, the qualifiers of each qualification, the purposes of qualification, scope

limitations and the attributes expected for the award of each qualification. Additionally, outlining the minimum admission requirements (along with possible progression opportunities in order to maintain proper homogeneity in higher educational programmes) will naturally become the responsibility of SLQF within the global educational arena.

The requirement of integrating the National Vocational Qualifications Framework (NVQF) (established by the Tertiary and Vocational Education Commission) and the importance of maintaining the lateral interconnects between the vocational education sector and the higher education sector within the SLQF have been identified. The SLQF aims to establish a framework for accrediting previous learning and granting a value for tacit knowledge (Pathirage, 2007) in order to recognise and facilitate the existing vertical integration of the conventional higher education system in Sri Lanka.

The rapid globalisation of higher education has caused national qualification regimes to be established in most countries. This has proved helpful in maintaining the standard of worldwide educational programmes, in facilitating the appropriate international interpretation of national qualification levels and has aided in evaluating them as well. One objective of SLQF is to contribute to the evaluation process of existing qualifications obtained from overseas HEIs. Then SLQF has to establish reasonable levels within this framework based on the learning outcomes gained by the holders of respective qualifications.

One of the key objectives of SLQF is to assist students in identifying their level of qualification and to facilitate potential employers in evaluating and recognising the qualifications offered by Sri Lankan HEIs that are within the scope of their employees.

The SLQF aims to promote the quality of the higher education qualifications offered by universities and other HEIs in Sri Lanka. The said aim will be achieved by supervising the design of the courses by designating the minimum level of learning outcomes required for each qualification (indicated by the minimum number of credits that should be earned by a qualification holder) both in the state sector and

the non state sector. The SLQF further aims to differentiate the honorary doctorates from academic doctoral degrees.

It should be noted that the SLQF will not be involved in designing or monitoring of the learning outcomes of short term courses (usually completed over a span of few months) offered by any HEI in Sri Lanka. A certificate is awarded on completion of these short term courses and these certificates will not be standardised by the SLQF.

5.6 Chapter summary

From the research findings, it was apparent that because of behavioural problems and the current structure for deploying the operational workforce a considerable amount of finance is being drained out of the industry due to:

- Material wastages
- The cascade effects of risk and tax multiplication
- Poor quality of workmanship
- Time related constraints

According to new the framework, the operational workforce is planned to be absorbed into the industry as collaborators, sharing the responsibility with the whole project team. This mechanism should, hopefully, automatically cause to become respectable and responsible as their fears about a lack financial support in retirement can be removed. Through the BFSL framework, it is anticipated that material wastages can be minimised, that time goals can be proactively achieved, desired quality standards can be maintained and building interpersonal relationships can take place, etc. In order to reduce the cascading effect, it is, essentially, necessary to reduce the transaction layers in the production line.

This employment of a self responsible operational workforce can reduce the supervision overheads within construction projects as well. One of the main disadvantages of working in a projectised environment is the temporary nature of employment. By developing a national level structure, the risks of employing an operational workforce are absorbed by a central organisation who will direct the workforce to career development programmes during the transition period between

two projects. This will minimise operational worker turnover within the current scenario of the operational workforce and will naturally deliver a better stakeholder satisfaction as a result.

Chapter : 6 Conclusions

6.1 Introduction

This chapter summarises the main findings from the literature review and its emulsion gathered through the field researches such as the questionnaire survey, secondary data collections, observations, justification of the hypothetical arguments and the like.

The construction industry contributes a significant part of the world's Gross Domestic Product (GDP) for the economic development regardless of the current economic downturns that appear from time to time. Construction projects are generally considered as having high expenditure fixed assets and are complex in nature. Construction project operations may deal with fragmented project packages and diversified construction activities and usually involve many participants and a wide range of inter related industries that finally deliver the outcome (a procedure similar to the supply chain management process). These construction projects require a great deal of involvement by human resources' management relating to their physical production that is combined with advanced technologies. These unique scenarios within construction usually increase the construction costs and risks considerably. In Sri Lanka, the risk of managing the operational workforce is sublet in difference layers as discussed in Chapter 4 and depicted in Figure 5.3 (Cascade effect of Risk Multiplication) in this report.

Traditionally available pensions, retirement benefits or social security (PR/SS) systems such as the Employees Provident Fund (EPF), the Employees Trust Fund (ETF) and 5 years' service gratuity approaches are unable to satisfy the requirements demanded by the temporarily employed operational workforce in the construction industry. Since existing PR/SS, systems became unpopular in the construction sector, establishing a new viable system that can address the foundation layer of the construction industry has become essential.

To serve the purpose of providing a PR/SS system for the operational workforce, the research's myth was to collect the salvaged finances that can be salvaged by

minimising the pre observed risk multiplication areas depicted in Figure 5.1. Project risks and cost multiplication areas with cascade effects relating to construction projects were identified and investigated via this research with a view to utilising them for the proposed concept of Building Forces for Sri Lanka (BFSL). During the application stage, the proposed PR/SS system was anticipated to work as a lubrication to reduce the friction between the wheels as described in Section 2.17 and depicted in Figure 2.8 (the Construction Six M Wheel) of this thesis.

The management of time, cost and quality in construction through managing a properly trained operational workforce was incorporated in the proposed framework of Building Forces. The BFSL framework depicted in Figure 5.1 of this thesis is anticipated to incorporate effective tools and techniques for the planning, programming, staffing, motivating and controlling of the iron triangle depicted in Figure 1.1 (the Three Dimensional Iron Triangle) of this thesis, with a view to improving stakeholder satisfaction. The BFSL framework is intended to help address the current industry issues by motivating school leavers towards construction industry and from there onwards providing training and a structured career development for them. The proposed framework is primarily addressing the contexts and principles of controlling human resources' practices that includes fulfilling the hierarchies of human needs through a sustainable framework of social security.

This research identified the mechanisms available to provide and develop a sustainable framework of social security, which will not increase the prevailing construction costs, primarily by utilising and simulating the cascade effect or multiplied risk allowances inherently allowed for in various construction projects in different procurement strategies within the current construction industry. See pink highlight below. Finally, the research findings were utilised for outlining a time , cost and quality orientated PR/SS framework for the operational workforce in the construction industry in Sri Lanka to provide greater stakeholder satisfaction, to be documented for reference as a contribution to knowledge (academic milieu), and to

provide guidance for maintaining future construction projects (project practice and organisational advantages).

6.2 Overview of the research aim and objectives

The construction industry can primarily be introduced as the means of setting up a built environment and the maintenance of the same. Each aspect of construction is unique and specialised. A construction project may be presented to a client as a complete single object after the performance of a range of coordinated activities by the execution team.

Sri Lanka is suffering from a shortage of required human resources for its physical operations. Despite all the other resources, the management of the operational workforce appears to determine the success or failure of construction projects.

Even though contractors are facing difficulties in satisfying their stakeholders due to the unavailability of a dependable operational work force in the construction industry, 4.7% of the male population of Sri Lanka, who are suitably educated, are among the unemployed category. From previous studies, it has been identified that the behavioural impositions of the operational workforce have reached to a level where the industry needs to pay higher attention to resolve the issues relating to human behaviour that have developed due to the unavailability of a proper pension, retirement benefits or a social security (PR/SS) system for construction operatives.

Finally, the research findings were utilised to assist in outlining a time, cost and quality orientated PR/SS framework for the operational workforce in the construction industry in Sri Lanka in order to provide greater stakeholder satisfaction. Therefore, it can be considered that the research findings and results have been satisfactorily matched against the research aim and objectives as described below.

6.2.1 Aim of the research

The aim of the research was to develop a framework that can provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka, based on the observations of the research problem described in the Section 1.6.1 of this research thesis. Accordingly, the BFSL provides a suitable

concept of a PR/SS system that can be blended with the Sri Lanka Qualifications Framework for the operational workforce, alongside a proper bridging arrangement for continued career development.

Through a sustainable framework of BFSL, it is anticipated to offer a time, cost and quality orientated operational workforce to the construction industry. Eventually, the BFSL will need to attain greater stakeholder satisfaction with a view to developing a dependable operational workforce that can fix the 'loose corners' within the construction industry in Sri Lanka.

6.2.2 Objectives of the research

Initially, five objectives were set up as described in Section 1.6.2 of this research thesis and the aforementioned aim (Section 1.6.1) of the research was to be achieved by fulfilling the following five objectives. How those objectives were achieved is described below.

6.2.2.1 First Objective

Identifying the behavioural factors of the operational workforce in the construction industry that affects the time, cost and quality of the construction outputs.

The first objective was initially achieved during the initial stage of this research. Further implications of the behavioural problems were then identified during the literature review of this study. As stated, the behavioural impositions of the operational workforce have developed to a level where the industry needs to pay higher attention in order to resolve the issues relating to human behaviour. According to the questionnaire survey administered during August to December 2009 among the operational workers, their immediate supervisors, project managers and company directors, poor retirement benefits were identified as the major reason that caused the current operational workforce to think of a different industry (rather than construction) as the future sector for their career.

According to the survey's findings, 6.25% of the operational workforce in the construction industry are above retirement age but are still working due to the absence of an effective and lifelong social security system. These 6.25% above

retirement age workers in the operational workforce in the construction industry should be on the level of the 'Self Actualisation level'.

6.2.2.2 Second Objective

Exploring the currently applicable social security systems available to the operational workforce in the construction industry.

At the commencement of this research, a study on the social security systems that are currently applicable to the operational workforce in the construction industry was carried out. The current EPF and ETF systems supported by ESB or the gratuity structure do not appear to be applicable to the construction operatives due to temporary nature of their employment. Neither the employees nor employers had any interest in adhering to this mechanism. Through the research it was identified that neither 82.6% of the main contractors nor the government's auditing authorities are giving due attention to the monitoring and controlling of the prevailing PR/SS systems when it comes to construction operatives. The findings of the research are depicted in Figure 4.6. According to the data obtained from the survey, only 17.4% are conducting due payroll auditing for the subcontracting operatives. For this reason, there is a requirement to identify a suitable recruiting framework for construction operatives because their modus operandi is mission oriented rather than the routing work.

6.2.2.3 Third Objective

Carrying out investigations to discover the causes for the unavailability of a proper, sustainable and lifelong social security system for the operational workforce in the construction industry.

During the questionnaire survey, a separate matrix (Question 6: How does your organisation weigh the following behavioural problems of the workforce against time, cost and quality impacts for construction projects?) was incorporated into the research instrument to analyse the impacts. Such analyses are described in Section 4.2 (analysis of the questionnaire survey data) of this thesis. Therein, the highest renege on the range between 20% and 100% was left as an open ended question but the maximum value was pre determined as 22.5% when calculating the RII. To

find the reason behind this predetermination was the purpose of this research. One hypothesis of the research is the utilisation of salvaged finances to energise the PR/SS system as depicted in Section 5.4 and Figure 5.3. The gross value of the workforce contribution within construction is generally 20% as depicted in Table 5.1. Question Six of the questionnaire had three elements (namely time, cost and quality) where the maximum impact is 1/3rd of 20% or 6.67% of a single element. If the average between 20% and 100% is considered as 60%, then there was a possibility of having a 20% impact from a single item. To avoid receiving intolerable values, the maximum value was pre determined as depicted in Figure 4.1, Figure 4.2 and Figure 4.3 of this thesis. Therein, the maximum RII values received were 60%, 64% and 66% respectively for the statements of “poor, temporary or irregular attendance”, “poor quality of workmanship” and “lack of trade knowledge and skills”.

During the literature syntheses, stage there was a great deal of study undertaken on the reasons why a proper PR/SS is unavailable, what the effects of PR/SS are, and the impact that the lack of a proper PR/SS has. Details on this were incorporated in Section 2.7 (the operational workforce of the construction industry), Section 2.8 (behavioural problems of the operational workforce) and Section 2.9 (social security and the associated risks in Sri Lanka) of this thesis.

6.2.2.4 Fourth Objective

Critically evaluating the current construction management process in order to identify the risk multiplications’ areas to use as a fund raising mechanism.

Estimating the net value of salvaged finances had several options. These theoretical options are generally outlined in Chapter 3 (Research Methodology and Data Collection) of this thesis. Accordingly, Table 5.1 of this thesis (entitled ‘Count of construction operatives and government daily cost per head’) was developed to understand the impact of risk multiplication. As described in Chapter 1 of this thesis, financial support for the proposed framework will be provided through several sources such as salvaged finances derived from minimising risk, taxes and overheads multiplication as expressed in the research objectives in Section 1.4.2 and Section 5.4 of this thesis.

Risk is considered as the driving force in any business. Basic project cost estimates are generally prepared based on work study records, the building schedule of rates (BSR), hypothetical mechanisms, etc. These estimates fundamentally have five cost headings (Brook, 2008), namely labour, machinery and equipment, materials, specialist subcontract works and other miscellaneous costs. Risk allowances are various depending on the step ups of the subcontracting or subletting entity. These step ups generates a cascade effect of risk multiplication depending on the modus operandi for construction procuring. The effects deriving from the reasons described in Section 1.5 and Section 2.9.7 of this thesis will deliver additional impacts on the risk distribution.

When looking into the rapid growth of many construction companies and insurance sector organisations and banks, it is apparent that a considerable amount of profits is being generated from the savings of the cascade effect of risk multiplication or risk retaining. The researcher's hypothesis is to justify the amounts of savings that can be recovered by minimising the multiplication and utilising such recovered finances as described in Section 3.7.4, Section 4.4 and as depicted in Figure 5.3 of this thesis. From the summarised data extracted from the financial statements, it is clear that contractors are applying various profit maximisation techniques. A company with an indexed profit of 100 in 2006 increased its average assets by four [4] times and by 25.6 times for its profits within 7 years. The researcher believes these unimaginable profits are generated via salvaged finances that should be reserved for the welfare of construction operatives and the cascade effects of risk multiplication described in Section 5.4 and Figure 5.3 of this thesis.

However, during the data analysis described below, it was identified that salvaged finances derived from minimising risk, taxes and overheads multiplication are themselves sufficient to support the required financial anatomy to provide lifelong PR/SS for construction operatives in Sri Lanka.

6.2.2.5 Fifth Objective

Developing a Framework for a sustainable lifelong social security system for the operational workforce in the construction industry in order to deliver greater stakeholder satisfaction.

Since the main channels of construction revenue are generated through national budget means, public sector finances are transferring to the private sector through the government sector. As depicted in Figure 4.10 and Table 4.1 of this thesis, it is apparent that growth of contractors' fixed assets and profit percentages are at an extreme level when compared to other sectors. Since contractors are not capable of making any arrangements for long term planning due to uncertainty it becomes the government's responsibility to ensure a certain work percentage to the contractors on a 'Quota Basis' instead of competitive tendering

Through this framework, it is suggested that human resource providing organisations should be set up which can take on the burden of having single point responsibility for the physical production and the desired quality of a project. In this system, there will be no risk transfer from one to another. The researcher's aim was to calculate the impact of current risk multiplication and to search for the possibilities of implementing the proposed system without increasing (self sustainable) the prevailing construction costs. By reducing the risk and managing the layers in the construction industry, the government can easily convert this to a full PR/SS. An outlined proposal is given in Section 5.5 of this thesis but the system cannot be implemented without strong intervention and support from the government.

6.3 Methodology Adopted

The research methodology commenced with a brief literature review and moved through paradigms, approaches to positivism and interpretivism and to the strategies of inquiries utilised for implementing the mixed research approach.

Since, research strategies vary according to the research aim and objectives, the research instruments (a questionnaire survey and secondary data requirements) for this research were investigated critically to the method of data collection and analysis. Since it is said that a questionnaire survey may be used to collect

quantitative data from individuals or institutions without any controls, sanctions, and structured limitations, it was an important requirement procedure to cross match information from construction project professionals in the specified area of research.

The data collected for the research aimed at measuring the degree of impact relating to the behavioural constraints of the operational workforce in the construction industry in Sri Lanka. The research instrument was prepared to apply a combined approach since several questions on the behavioural problems were related to interpretivism. Questions for measuring the value of the behavioural impacts were related to positivism. Accordingly, both qualitative and quantitative data requirements were structured in order to collect data through utilising the existing construction industry grading system in Sri Lanka that has over 2000 registered construction organisations. The sample size was derived by using a standard 'T' table and 400 questionnaires were distributed.

The researcher has worked as an estimator in the construction industry for twenty (20) years with national and international contractors, as well as with the statutory organisations. The utilisation of his experiences, relationships, knowhow, awareness and tacit knowledge added to this research since tacit knowledge is very much centred upon, and used, in the construction industry (Pathirage, 2007, p. 21).

6.4 Contribution to knowledge

Regardless of Bismarck's unimpeachable credentials as a rightwing leader, he invited socialists to assist in introducing pensions, retirement and social security programmes to the public, which was somewhat similar to the actions taken some 70 years later by American President Roosevelt. During a parliamentary debate in 1881 on pensions, retirement benefits and the social security system (PR/SS) of Germany, Bismarck replied to the opposition saying, "Call it socialism or whatever you like but it is the same to me".

Since then, the concept of a PR/SS system has spread throughout the world. Almost all the Latin American countries have one single structure that is called the Pay As You Go (PAYG) system. However, this concept has commenced facing major constraints as the aging population of the world has gradually increased and

the system has come under pressure due to the pressure placed upon it as consequences of the baby boom era (i.e., 1946 to 1964) impacts. As of 2015, no steady solution has been developed to deal with the continuity of the current PR/SSs' functionality against the aging population. However, the Japanese PR/SS system (which is strengthened by an insurance backbone and blended with the Buddhist cultural traditions of respecting and supporting elderly people as voluntarily arrangements) does not demonstrate any severe impacts.

The underpinning philosophy of the Building Forces of Sri Lanka (BFSL) will primarily be a Government Intervention Structure that has several similarities to the current military services set up. The proposed framework will primarily be supported by the savings gained from the minimising of risk multiplication or the cascade effect. To reduce the effect, it is inherently required to minimise the transaction layers between the supply chain management. In the construction sector, it appears that no one would like to take on the responsibility of the direct labour productivity. This may be due to the behaviour problems explained in the Section 4.3 of this report or for some another reason so far not identified. Whatever the reason, utilisation of multilayer risk transferring mechanism for human based physical production will increase the cost simultaneously. If a framework be could developed to minimise the current behavioural problems of the operational workforce, such recovered savings could be utilised for the betterment of the future of the operational workforce in the construction industry which will, in turn, gain better stakeholder satisfaction as an end result.

The concept and definition of the BFSL can be interpreted as a system that provides the relevant features of reliable PR/SS management, multiple career development channels, recreation facilities, social respect, job security etc. in order to develop a responsible and more disciplined operational workforce. These important aspects and relevant features were used to develop the BFSL framework in order to improve stakeholder satisfaction in the construction industry in Sri Lanka.

6.4.1 Contribution to academia

The majority of the construction projects in Sri Lanka are financed by the government. According to the survey conducted by the Department of Census and Statistics, 66.00% of the construction projects in Sri Lanka are funded by the

government and 34.00 % belong to the private sector. Since the government is the key employer for the industry, it is recommendable for it to deploy its own supportive operational level human structure that can take on full responsibility for production and maintenance.

The BFSL can regimented to fit in with the ICTAD classification structure that has the categories C1 to C7. In the current government PR/SS for military forces, all members become eligible to receive their PR/SS benefits on the completion of 22 years of continuous service. As a solution for the aging population, the minimum period of service can be reviewed depending on the respective life expectancy relating to the year of birth. If a group of young school leavers joined BFSL at the age of 20, then they will become eligible for the minimum PR/SS at the age of 42 years and would still be in working age. At this point, every individual would have the option to continue with the BFSL or to leave and join the private sector. Since the outgoing team is well trained, both behaviourally and technically, they may have the option of fulfilling the stakeholder requirements depending on the market situation. As at present, the military forces offer those who have served the 22 years the possibility of rejoining option in officer grade, within one year out of service.

6.4.2 Contribution to the industry

In the current system of operational workforce management, contracting organisations are not capable of providing any required training to the operatives. The main reason is that if they invest in training, their return is not guaranteed. Even if an agreement is signed between the parties prior to sending operatives for training and educational programmes, enforcing such an agreement involves lengthy procedures and high overheads. When such a burden is absorbed by the statutory organisations, operatives will be responsible to return back as agreed in order to maintain their PR/SS eligibility. Therefore, such a training arrangement will act as natural binding agreement or psychological contract as the case may be.

When it comes to critical Disaster Management situations, BFSL can immediately be deployed to the identified locations since the governing authority is the same. In this way, emergencies can easily be managed by providing essential requirements from the nearest current workstation and, when resources arrive in remote disaster locations; immediate deployments can be released on a stage basis to recover the

loss time impact. In the meantime, members under training and members working on routine maintenance can also be utilised temporarily to mitigate the delay impacts of ongoing construction.

6.5 Recommendations

How the aim of this research was achieved and concluded by means of five preset objectives is described in Chapter 6.2 of this thesis. Therein was expressed the major triangulation relationships between the PR/SS, BFSL and SLQF (i.e., pensions, retirement benefits or social security; Building Forces of Sri Lanka; the Sri Lanka Qualification Framework). The identification of stakeholder dissatisfaction areas was discussed in Section 1.5 (Rationale) of this thesis. During Chapter 2 (Literature Syntheses), it was highlighted that the due participation from the operational workforce is not receiving sufficient attention from the construction industry due to identified constraints discussed in Section 4.3 (Detailed review of behavioural problems). For this reason, the recommendations that can be made in the areas of greater stakeholder satisfaction and an efficient disaster management structure can extend the research within following concepts.

6.5.1 Education system of Sri Lanka

The education system of the country should be reviewed in depth because producing graduates without planning for future requirements will not give anything in return to the country other than unemployed graduates. For the year 2016, the University Grants Commission (UGC) of Sri Lanka admitted 27,603 undergraduate students to 97 various courses of study. Such course structures should be revisited to assess their contribution to the Gross National Product (GDP).

6.5.2 Trade unions in Sri Lanka

Trade unions do not play any strong role in the construction industry except within the government corporations that are have a permanently employed operational workforce. The reason for this is the temporary nature of the industry. Even if a worker is employed for 10 years on different worksites under the same employer, the worker is not considered as a permanent employee. The general aim of the trade unions is to fight for pay rises and other benefits. It is very unlikely to find a

situation where they demand career development or industrial training programmes for their union members.

6.5.3 Gender balanced education

If a person studies in a boys' school and then enters into the construction field, then his probability of interacting with females is less. This could lead to increase in criminal and terrorist activities due to a lack of confidence, embarrassment and desperate situations because human nature has not changed.

6.5.4 Reducing university entrance age to 18 years

In the current education system, university students commence their education after the completion of 20 years of life. This should be reduced by two years. Free higher education in universities is usually limited to 8% to 10% of the total annual student catchment. This means nearly 90% will be forcedly directed towards other areas that are not part of their ambitions. The government of Sri Lanka provides 13 years of free education. It is observed that some of GCE (A Level) students some subject areas beyond ALs in the international arena. If this over teaching can be lowered at least by one year, national education expenditure can be reduced by 8% and vocational education can commence two years earlier. This concept can provide considerable input into the production related industries.

Reducing one year from the upper age limit of secondary education cannot be undertaken as a sudden implementation. Therefore, the research's hypothetical outline is to increase the grade one intake of students to 13 months instead of 12 months or annually. In 12 years' time, the total intake can be reduced to 12 years without large complications. The syllabus can be adjusted gradually to suit that of the international educational arena.

6.6 Limitations

Although the research achieved its aim and all research questions were adequately met, there were some unavoidable limitations.

One limitation was that data collection could not be gained from the C8, C9 and C10 grade contracting organisations since the ICTAD does not have any evaluation criteria for those grades other than their financial capability. Furthermore, it was

planned to carry out several structured interviews with selected senior managers in contracting organisations in order to obtain a general opinion on the hypothetical framework and to collect audited financial statements. This was not required as planned since NCASL agreed to provide support during data collection and public opinion was sought from participants as Q9 in the questionnaire survey (Appendix D).

The findings of this research may not be applicable to other industries that deploy temporarily employed operatives but possible to modify to suit such industries followed by in depth studies and investigations. Future research may replicate the methodology used in this study to identify any additional knowledge enhancing factors in the context of the study. The research area of this thesis was limited to the Sri Lankan construction industry. Hence, the application of the proposed model may be limited to Sri Lanka since human behaviours do vary due to factors such as economic, social, political and religious aspects etc.

6.7 Final note

The Sri Lankan construction industry is suffering from a shortage of human resources for its physical operations even though the unemployment rate is about 5.2%. Construction organisations face difficulties in satisfying their stakeholders due to the unavailability of a dependable operational workforce even though a suitably educated 4.7% of the male population are among the unemployed category. From previous studies, it was identified that the behavioural impositions of the operational workforce have reached a level where the industry needs to pay higher attention to resolve such issues. The unavailability of a suitable pension, retirement benefits or a social security (PR/SS) system for construction operatives appears to be the reason for such behavioural impositions.

Private sector organisations in Sri Lanka do not provide any lifelong social security system for any of their employees (except for a few private banking establishments and a limited number of multinational companies in dairy products' manufacture). Hence, this research aimed to develop a framework to provide a lifelong social security system for the operational workforce in the construction industry in Sri Lanka to overcome stakeholder dissatisfaction with the construction Industry.

The suggested collaboration arrangement is in line with Goal 8 (Develop a global partnership for development) of the Millennium Development Goals (UN Millennium Project, 2000). A national level planning and resources' management structure is an essential need to fulfill the requirements somewhat similar to the UN's Millennium Development Goals. Such a requirements were further explained and discussed in Section 5.5.1 (Merging the Framework with Sri Lanka Qualifications Framework) of this thesis.

Through the research, the task was undertaken to identify the mechanisms available for providing and developing a sustainable framework for a social security system that will not increase the prevailing construction costs. Financing the framework will primarily be reinforcing by utilising and simulating the multiplied risks allowances inherently allowed for various construction projects in different procurement strategies within the current construction industry in Sri Lanka.

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Appendices

Appendix A

Trades in construction

1. Boilermaker; works in nuclear and fossil power plants, shipyards, refineries and chemical plants, on boilers, pressure vessels, and similar equipment
2. Carpenter; a craftsman who performs carpentry, building mainly with wood. Among carpentry's subsidiary trades are those of cabinet maker, cladder, framer, joiner, roofer, and many others. Carpenters unions usually include drywall installer/lather, flooring installer, pile driver, millwright, diver, and diver tender
3. Carpet layer; one who specializes in laying carpet
4. Dredger; may include Lead Dredge-man, Operator, Lever-man, Licensed Tug Operator, Derrick Operator, Spider/Spill Barge Operator, Engineer, Electrician, Chief Welder, Chief Mate, Fill Placer, Operator II, Maintenance Engineer, Licensed Boat Operator, Certified Welder, Mate, Drag Barge Operator, Steward, Assistant Fill Placer, Welder, Boat Operator, Shore-man, Deckhand, Rodman, Scow-man, Cook, Mess-man, Porter/Janitor, and Oiler
5. Electrician; specializing in electrical wiring of buildings and related equipment. Electricians may be employed in the construction of new buildings or maintenance of existing electrical infrastructure. High voltage line and substation construction and maintenance trade titles under electrician include Lineman, Ground-man, Digging Machine Operator, Truck Driver, Cable Splicer, Material Man, Heavy Equipment Operator (line equipment only), Mechanic, Flagman, and Tree Trimmer
6. Elevator mechanic; installs vertical lift and transporting equipment
7. Fencer; a tradesman who builds fences
8. Glazier; installs glass. May be included with Painters
9. Hazardous Material Handler
10. Heavy equipment operator; a driver and operator of heavy equipment used in engineering and construction projects. There may be many special function titles, such as Bargeman, Brakeman, Compressor operator, Elevator operator, Engineer Oiler, Forklift operator, Generator, pump or compressor plant operator, Signalman, Switchman, Conveyor operator, Fireman, Skip-loader operator, Helicopter radioman, Boring machine operator, Box-man or mixer-man, Asphalt plant engineer, Batch plant operator, Bit sharpener, Micro tunnel system operator, Pavement breaker operator, Drill Doctor, Drilling machine operator, Rotary drill operator, Canal liner operator, Canal trimmer operator, etc.

Trades in construction

11. Insulation installer; Includes application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems.
12. Ironworker (or steel erector); erects or dismantles structural steel frames. Structural steel installation is usually crane-assisted. Workers rely on mobile, elevated platforms or scissor lifts. Ironworkers bolt the steelwork together using various tools, power tools and manual tools. Metallic Lathers may be included in this category
13. Laborer; a skilled worker proficient with pneumatic tools, hand tools, blasting, smaller heavy equipment. Laborers may also assist other tradesmen
14. Landscaper; a tradesmen who specializes in landscaping
15. Mason; a tradesman skilled variously in brick and block laying, concrete finishing (the placement, finishing, protecting and repairing of concrete in construction projects). Also stonemason, marble setter and Polisher, tile setter and polisher, terrazzo worker and finisher. Hood-carrier is a subsidiary trade
16. Millwright; installs various industrial equipment
17. House painter and decorator; a tradesman responsible for the painting and decorating of buildings, and is also known as a decorator or house painter. Also includes Paper Hanger, and may include Glazier
18. Pile Driver; a tradesman who installs piles, drills shafts, and constructs certain foundation support elements
19. Plasterer; a tradesman who works with plaster, such as forming a layer of plaster on an interior wall or plaster decorative moldings on ceilings or walls.
20. Plumber; a tradesman who specialises in installing and maintaining systems used for plumbing, heating, drainage, potable (drinking) water or small-sized industrial process plant piping
21. Pipefitter (or steamfitter); a person who lays out, assembles, fabricates, maintains, and repairs large-sized piping systems capable of enabling high-pressure flow.
22. Sheet metal worker; installs HVAC ductwork and related work
23. Fire sprinkler installer; installs fire sprinkler systems. May be included with Plumber
24. Safety manager / Safety Officer
25. Site manager

Trades in construction

26. Steel fixer ("ironworker" USA, also "rod buster" USA/Australia); a tradesman who positions and secures reinforcing bars and mesh used to reinforce concrete on construction projects. This trade is usually included with Ironworkers.
27. Truck driver; or teamster, generally drives a truck or vehicle of some kind, but may also work on material handling and storage
28. Water-proofer
29. Welder; a tradesman who specialises in welding

(List of construction trades, 2014)[1]

[1] *List of construction trades*. (2014, Oct 10). Retrieved Feb 04, 2015, from Wikipedia, the free encyclopedia: http://en.wikipedia.org/wiki/List_of_construction_trades

Appendix B

Nr	GR	Name	Building	Line 1	Line 2	Line 3
1000	SP	Savisevana [Private] Limited	57	5th Lane	Nawala	Nugegoda
1001	C1	A M S K Constructions [Private] Limited	1/29	New Town	Madampe	
1002	C1	Access Engineering Plc	278	Union Place	Colombo 2	
1003	C1	Cml-Mtd Construction Limited	155	Dharmapala Mawatha	Colombo 7	
1004	C1	Consulting Engineers and Contractors [Private] Limited	157/A	Kynsey Road	Colombo 08	
1005	C1	Daya Constructions [Private] Limited	362	Colombo Road	Pepiliyana	Boralesgamuwa
1006	C1	Edward and Christie	64/10	Nawala Road	Nugegoda	
1007	C1	Euroville Engineers and Constructors [Private] Limited	45	Forest Office Lane	Jaffna	
1008	C1	Finite Lanka [Private] Limited	260/1/2	Kandy Road	Yakkala South	Gampaha
1009	C1	Hovael Construction [Private] Limited	245/47	Avissawella Road	Orugodawatte	
1010	C1	International Construction Consortium Limited	70	S D S Jayasinghe Mawatha	Kohuwala	Nugegoda
1011	C1	Isuru Engineering [Private] Limited	983	Pannipitiya Rioad	Battaramulla	
1012	C1	K D A Weerasinghe and Company [Private] Limited	8/16	Thalapathpitiya Road	Nugegoda	
1013	C1	K D Ebert and Sons Holdings [Private] Limited	200	Siriketha	Highlevel Road	Maharagama
1014	C1	Kanthi Construction [Private] Limited	"Kanthipaya"	Thambuttegama Road	Eppawala	
1015	C1	Komuthi Engineering Services [Private] Limited	595	Nawala Road	Rajagiriya	
1016	C1	L H Piyasena and Company [Private] Limited	151	Nawala Road	Narahenpita	
1017	C1	Link Engineering [Private] Limited	137/B	Rajagiriya Road	Rajagiriya	
1018	C1	Maga Engineering [Private] Limited	200	Nawala Road	Narahenpita	Colombo 05
1019	C1	Mega Construction and Suppliers [Private] Limited	20	Colombo Road	Thillayadi	Puttalam
1020	C1	N & A Engineering Services [Private] Limited	50/1/A	New Kandy Road	Kothalawala	Kaduwela
1021	C1	N E M Construction [Private] Limited	629	Baseline Road	Colombo 9	
1022	C1	Nawaloka Construction Company [Private] Limited	42	Negombo Road	Peliyagoda	
1023	C1	Nuwani Construction [Private] Limited	90	Hospital Road	Kiribathgoda	
1024	C1	Orient Construction Company	881/A	Isipathana Place	Hospital Junction	Polonnaruwa
1025	C1	P N D Constructions [Private] Limited	278	Moragahayata	Ratnapura	
1026	C1	R & J Engineering [Private] Limited	Silvery Gardens	Polmmaruwa	Tangalle	
1027	C1	R N Construction [Private] Limited	532/1	Kaduwela Road	Talahena	Battaramulla

Nr	GR	Name	Building	Line 1	Line 2	Line 3
1028	C1	R R Construction [Private] Limited	626/C	Samurdni Mawatha	Cheenagahawela	Heiyanthuduwa
1029	C1	S M A Construction	200/10	"Sethsiri"	Uthuwankanda Road	Talawathugoda
1030	C1	Sanken Construction [Private] Limited	295	Madampitiya Road	Colombo 14	
1031	C1	Sathuta Builders [Private] Limited	71	Negombo Road	Kurunegala	
1032	C1	Sierra Construction [Private] Limited	23	Havelock Road	Colombo 05	
1033	C1	Squire Mech Engineering [Private] Limited	135/1	Old Kottawa Road	Nawinna	Maharagama
1034	C1	Sripalie Contractors [Private] Limited	6	S H Dahanayake Mawatha	Kaluwella	Galle
1035	C1	State Development and Construction Corporation	7	Borupana Road	Ratmalana	
1036	C1	State Engineering Corporation Of Sri Lanka	130	W A D Ramanayake Mawatha	Colombo 02	
1037	C1	Subasinghe Contractors and Earthmovers	294/A	Kohobanwatte	Hapugala	Galle
1038	C1	Sunpower Constructions [Private] Limited	46/38	3rd Floor	Nawam Mawatha	Colombo 02
1039	C1	Tissa Builders and Contractors	Kandalama	Mirigama		
1040	C1	Tudawe Brothers [Private] Limited	505/2	Elvitigala Mawatha	Colombo 05	
1041	C1	V V Karunaratne and Company	579	Bulugaha Junction	Kandy Road	Kelaniya
2001	C2	Access Projects [Private] Limited	278	Union Place	Colombo 2	
2002	C2	Akila Engineering [Private] Limited	180/60	Jayawimanawatte	Siyambalagoda	Polgasowita
2003	C2	Antony Builders	Pannala Road	Diyakalamulla	Kuliyapitiya	
2004	C2	Anura Wijenayake Co [Private] Limited	465/1	Thalawathugoda Road	Madiwela	Kotte
2005	C2	Assalaarachchi Construction [Private] Limited	24/16	3rd Lane	Cancer Hospital Road	Maharagama
2006	C2	City Construction Developers [Private] Limited	100/5	Mirihana Road	Nugegoda	
2007	C2	Construction Managers and Planners [Private] Limited	3/A	Sunethra Lane	Colombo 5	
2008	C2	D M C Construction [Private] Limited	973	Stage II	Anuradhapura	
2009	C2	Darinton Construction [Private] Limited	854	Galle Road	Katukurunda	Kalutara
2010	C2	E L S Construction [Private] Limited	63/3	Neelammahara Road	Katuwawala	
2011	C2	George Steuart Engineering [Private] Limited	11/1	Arcadia Gardens	Rosmead Place	Colombo 07
2012	C2	Gunathilake Construction [Private] Limited	421	Rajagiriya Road	Rajagiriya	
2013	C2	Isuru Builders [Private] Limited	20	Wagolla Road	Lewella, Kandy	Kandy
2014	C2	K E S Engineering [Private] Limited	20/71	Fairfield Gardens	Colombo 08	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
2015	C2	K S J Construction [Private] Limited	92/43/2	1st Lane	Aluthgamawatte	Yakkala
2016	C2	Micro Constructions [Private] Limited	24/A	Negombo Road	Peliyagoda	
2017	C2	Padminie Construction [Private] Limited	37	Jayathilake Mawatha	Panadura	
2018	C2	Pre Fab Engineering Projects [Private] Limited	4	Dehiwala Road	Pepiliyana	
2019	C2	R H Steel Building Systems [Private] Limited	317/3	High Level Road	Colombo 05	
2020	C2	Ruhunu Development [Private] Limited	42/2	Main Street	Battaramulla	
2021	C2	Siridantha Construction Works	Opposite Temple	Wannithammannawa	Anuradhapura	
2022	C2	Sisira Builders [Private] Limited	160/1	Nawala Road	Nugegoda	
2023	C2	Sri Lanka Land Reclamation and Development Corporation	3	Sri Jayawardanapura Mawatha	Welikada	Rajagiriya
2024	C2	Sri Ram Construction	61	Angampitiya	Waikkala	
2025	C2	Star Construction and Engineers [Private] Limited	582	Liyanagemulla	Seeduwa	Katunayake
2026	C2	Sudesh Construction [Private] Limited	Ranasiri	Puttlam Road	Anamaduwa	
2027	C2	Sun Construction	Hungawila	Kalawewa	Vijithapura	
2028	C2	Trio Construction [Private] Limited	177	Galle Road	Walgama	Matara
2029	C2	V V Ramanathan and Company [Private] Limited	Hospital Circular Road	Vavuniya		
2030	C2	Vonlan Constructions [Private] Limited	45/B	Ambatale	Mulleriyawa - New Town	New Town
2031	C2	Wahid Construction	Kammandaluwa	Andigama		
3001	C3	A K K Engineering [Private] Limited	85/5	Rajamalwatte Road	Battaramulla	Sri Jayawardanapura - Kotte
3002	C3	A N M Furniture Centre and Construction Service	279	Main Street	Maruthamunai 02	
3003	C3	A S B Construction [Private] Limited	349	Puttalam Road	Kurunegala	
3004	C3	Abeywardhana Construction	122	Athumalpitiya	Polonnaruwa	
3005	C3	Abeywardhana Construction	122	Athumalpitiya	Polonnaruwa	
3006	C3	Access International [Private] Limited	278	Union Place	Colombo 2	
3007	C3	Amil Builders	955/5/C/1	Kotte Road	Rajagiriya	
3008	C3	Amila Enterprise	14	Ilukmodara	Gurudeniya	
3009	C3	Ancheneye Construction	38	Pioneer Road	Batticaloa	
3010	C3	Asiri Construction	Warapitiya	Darga Town	Kalutara	
3011	C3	Buddhika Construction Company	156/B	Egodawatte Road	Ukuwela	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
3012	C3	Business Promoters and Partners [Private] Limited	4/1	1st Lane	Dehiwala Road	Boralesgamuwa
3013	C3	Canola Construction and Engineering	Ihala Kalankuttiya	Kalankuttiya	Galnewa	
3014	C3	Central Engineering Consultancy Bureau	415	Bauddhaloka Mawatha	Colombo 7	
3015	C3	Central Suppliers [Private] Limited	132/A	Kalugalla Mawatha	Kegalle	
3016	C3	Dharmadasa Construction and Enterprises	40	Old Kesbewa Road	Gangodawila	Nugegoda
3017	C3	E D C Construction [Private] Limited	106	D S Senanayake Mawatha	Colombo 8	
3018	C3	East Lanka Engineering [Private] Limited	50	Wammiyadi Road	Addalai	Chenai 12
3019	C3	Farzan Building Construction	256	Mudaliyar Road	Akkaraipattu 04	
3020	C3	G G C International [Private] Limited	26 E	Old Kesbewa Road	Delkanda	Nugegoda
3021	C3	G V M Silva and Sons	380	A C B C Building	Bauddhaloka Mawatha	Colombo 7
3022	C3	Giga Engineering [Private] Limited	13/18	Avarihena Road	Polhengoda	Colombo 5
3023	C3	Hani Engineering Works	22	Ariyanayagam Road	Thirukkovil 02	
3024	C3	Industry Serv Engineers	35	Custom House Road	Negombo	
3025	C3	Kandy Constructions	Nelligalawatte Galwala	Sirimalwatte	Gunnepana	Kandy
3026	C3	Kasun Sandu Construction [Private] Limited	1st Km Post	Parasangaswewa Road	Anuradhapura	
3027	C3	Kemyo [Private] Limited	12	St Michale Garden II	Batakettara	Piliyandala
3028	C3	M2 Lanka Engineering [Private] Limited	137	Pereru Road	Kantale	
3029	C3	Master Builders Engineering Pvt	125/2/2/3	Common Road	Akkaraipattu 2	
3030	C3	N K S Construction	Panakaduwa	Rotumba		
3031	C3	Nazeeha Hardware Stores	Main Street	Eravur 3		
3032	C3	Newland Industries [Private] Limited	Aladeniya	Warellagama	Kandy	
3033	C3	Nimna Enterprises	"Hasanthi"	Pinnawala	Balangoda	
3034	C3	Nimsara Construction and Engineering	12	River Side Road	Badulla	
3035	C3	Nimsara Construction and Engineering [Private] Limited	No 12	Riverside Road	Badulla	
3036	C3	Nirupama Contractors	64	Buddagaya Mawatha	Anuradhapura	
3037	C3	Penthouse Engineers [Private] Limited	20	Colombo Road	Katunayake	
3038	C3	Priyankara Construction	22	Petiwatta	Wathugedara	
3039	C3	Ranasiha Lanka Construction [Private] Limited	12	Chruch Road	Gampaha	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
3040	C3	Ratnayake Construction	151	Arawe Gedara	Marassana	
3041	C3	Ruwan Trade Centre	7	Meda Mawatha	Siddamulla	Piliyandala
3042	C3	Sahan Engineering and Construction [Private] Limited	278/2	Hansagiri Road	Gampaha	
3043	C3	Sarath Construction Company	Temple Road	Gampaha		
3044	C3	Senkadagala Enterprises [Private] Limited	49	New Town	Katugasthota	
3045	C3	Siripala Builders [Private] Limited	"Sripali"	Arahena	Ratmalketiya	Beliatta
3046	C3	Southern Construction Engineering [Private] Limited	124/4	Mataragewatte	Bope Road	Galle
3047	C3	Suhada Enterprises	83	Tissa Road	Wellawaya	
3048	C3	Sumanasekara Construction [Private] Limited	8/1/3	Sunethradevi Road	Kohuwala	Nugegoda
3049	C3	Sunbeam Construction Company [Private] Limited	446/1	Pitipana South	Homagama	
3050	C3	Tritech Engineers [Private] Limited	87	Makola South	Makola	
3051	C3	UDAYA Constructions [Private] Limited	"Udaya Niwasa"	Sri Sunanda Road	Walgama	Matara
3052	C3	Unique Engineering [Private] Limited	385	Araliya Gardens	Rajagiriya	
3053	C3	Vijay Construction and Company	Thilai Vasa	Paddiruppu	Kaluwanchikudi	
3054	C3	Weerasooriya Builders [Private] Limited	367/58	Nawalapitiya Road	Jayamalpura	Gampola
3055	C3	Wemara Construction [Pvt] Limited	650/30	Dharshana Mawatha	Liyanagemulla	Seeduwa
4001	C4	Ananda Constructions	3/28/B	First Lane	Katuwawala Mawatha	Boralesgamuwa
4002	C4	Asahi Constructions [Private] Limited	469/2	Hill Street	Dehiwala	
4003	C4	Athulya Engineering [Private] Limited	504/D	Wadugoda	Boossa	
4004	C4	B K G Constructions [Private] Limited	109/4	Beliatta Road	Walasmulla	
4005	C4	Basnayake Constructions [Private] Limited	234/2/C	Kesel Pandura Junction	Makola South	Makola
4006	C4	Buddhika Builders [Private] Limited	56/7	Koswatte Road	Nawala	Rajagiriya,
4007	C4	C & C Engineering [Private] Limited	58b/2	Queen Mary's Road	Gampaha	
4008	C4	Chatura Construction Company [Private] Limited	36	Bazzar Street	Badulla	
4009	C4	Conmix [Private] Limited	536	Seible Place	Peradeniya Road	Kandy
4010	C4	Coral Property Developers [Private] Limited	03	1st Chapple Lane	Colombo 06	
4011	C4	D S Construction and Earth Movers	123/A	Kandy Road	Yakkala	
4012	C4	Denuwan Engineering [Private] Limited	102	Mahiyangana Road	Badulla	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
4013	C4	Dilini Builders [Private] Limited	59	South Gonawila	Dankotuwa	
4014	C4	Donhem Telecom Company [Private] Limited	24/C	Talahena	Malabe	
4015	C4	Ediriweera Construction	23/57/A	Gamunupura	Ampara	
4016	C4	Focus Marketing and Engineering Co[Private] Limited	276	Trinco Road	Batticaloa	
4017	C4	Gamini Builders	30	Mahinda Mawatha	Hawa Eliya	Nuwara Eliya
4018	C4	Gamini Construction	39/A	Ranala	Ranala	
4019	C4	Global Constructions Lanka [Private] Limited	111	Kimbulapitiya Road	Negombo	
4020	C4	Hanco Constructions [Private] Limited	258	Havelock Road	Colombo 05	
4021	C4	Independence Architectural Homes Private Ltd	07	1st Floor	Independenace Avenue	Colombo 7
4022	C4	International Building Systems [Private] Limited	182/1A	1st Floor	Castle Street	Colombo 8
4023	C4	Intervest Engineering and Construction [Private] Limited	181	Dharmapala Mawatha	Colombo 07	
4024	C4	Jayarathne Contract	Jayaratne Rice Mill	Kalankuttiya	Anuradhapura	
4025	C4	Jayasinghe Contractors	Udagama	Hettipola	Hettipola	
4026	C4	K D S Karunaratne and Sons	119/1	Kalapaluwawa Road	Koswatte	Battaramulla
4027	C4	Kondasinghe Constructions	123	4th Lane	Jayamalapura	Gampola
4028	C4	Kumarage Enterprises	Liyanagedara	Ihala Lelwala	Wanduramba	
4029	C4	L G Construction	B/343	Kandy Road	Ampara	
4030	C4	Lohitha Construction	1	Sinhagama	Pandulagama	Anuradhapura,
4031	C4	Lucky Construction	Jawa Street	Kinniya 6		
4032	C4	Luminex [Private] Limited	24	New Galle Road	Moratwa	
4033	C4	M C W Builders	4/342	Benwala Road	Indiketiya	Ambalangoda,
4034	C4	M F Construction Lanka [Private] Limited	1	Hijra Street	Kinniya 3	
4035	C4	Malalatunga Constructions [Private] Limited	Horana Road	Nebada		
4036	C4	Malwatte Contructors	1/22	Dharmawasa Mawatha	Ulapane	
4037	C4	Manamperi Engineering [Private] Limited	245	Old Tangalle Road	Matara	
4038	C4	Masakorala Construction [Private] Limited	274/7	Highlevel Road	Kottawa	Pannipitiya
4039	C4	Muruges and Work and Construction	Main Street	Chenkaladi		
4040	C4	Nayomi Builders	3 Ela	Siyambalagaswila	Ruhunu Ridiyagama	Ambalantota

Nr	GR	Name	Building	Line 1	Line 2	Line 3
4041	C4	Nesa Builders Pte Ltd	54	St Mary's Road	Mount Lavinia	
4042	C4	Node Engineering Consortium	19	Terace Street	Hambantota	
4043	C4	P Jayamanna and Sons	71	Keppetipola Mawatha	Kolonnawa	Wellampitiya,
4044	C4	P L P Constructions	14	Nuwara Eliya Road	Welimada	
4045	C4	P Suraweera Civil Construction Contractors	"Vijaya"	Oluwatte	Walgama	Matara
4046	C4	Panditharatne Construction	16/1	Dewala Lane	Nugegoda	
4047	C4	Panthila Civil Engineers	8/4/B	Joswella Place	Mirihana	Nugegoda,
4048	C4	Pasan Enterprises	17/2	Tarkat Road	Indiwinna	Hambantota,
4049	C4	Progressive Builders and Resorts [Private] Limited	104/11	Grand Pass Road	Colombo 14	
4050	C4	R C D C Constructions Company [Private] Limited	118	Jayanthipura	Battaramulla	
4051	C4	Rajakumari Construction	155	Buddagaya Mawatha	Anuradhapura	
4052	C4	Rajarata Construction and Development	247	Stage 2	Anuradhapura	
4053	C4	Ranmal Engineering and Developments	408/5B	Yatiwawala	Katugastota	
4054	C4	Red Cross Macinery Organization	307	T B Jayah Mawatha	Colombo 10	
4055	C4	Resources Development cnd Construction [Private] Limited	35/7	Noyes Road	Chilaw	
4056	C4	Ruhlins [Private] Limited	8	Vimalam Nallur Cross Road	Jaffna	
4057	C4	S D S Construction	64	Kirindiwita	Gampaha	
4058	C4	S M A Careem [Private] Limited	5	Amman Kovil Road Corner	Main Street	Kalmunai
4059	C4	S S P Engineers [Private] Limited	8/188	Koswatta	Kothalawala	Bandaragama
4060	C4	Sam Dam Construction Company	88	Kaltota Road	Balangoda	
4061	C4	Saman Traders	62	Puttlam Road	Nochchiyagama	
4062	C4	Samararathne Builders	13	Gangadara Mawatha	Mt Lavinia	
4063	C4	Samarasinghe Contractors [Private] Limited	Thalawa	Kariyamaditthta		
4064	C4	Sanhill Engineering Private Limited	Waratenna	Hall Oluwa	Kandy	
4065	C4	Saptara Engineering [Private] Limited	713/7	7th Lane	Romiyel Mawatha	Panagoda,
4066	C4	Satro Construction [Private] Limited	22/A	Dharmarama Road	Thanthirimulla	Panadura
4067	C4	Savin Builders	31	Welagedara	Badulla	
4068	C4	Senecta Technologies [Private] Limited	195/20	Welivita Road	Malabe	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
4069	C4	Senura Civil Engineering [Private] Limited	219/1/B	1st Lane	Kalapaluwawa	Rajagiriya
4070	C4	Shakthi Civil Construction [Private] Limited	C/2/4	Temple Road	Maradana	
4071	C4	Shanika Enterprises	113/D	Thelembugahamula Junction	Kadawala	Katana
4072	C4	Shyaam Builders	Sivan Road	Urumpirai		
4073	C4	Sinha Ruwan Costruction	65/A/1	New Lane 2	Dangedara	Galle
4074	C4	Sinthu Construction and Civil Engineering	Old DRO Lane	Chenkalady		
4075	C4	Sonakma Engineering [Private] Limited	22	Mavak Oya	Rathmalgoda	Poruwadanda
4076	C4	Subasinghe Constructions	"Dharshana"	Karandagolla	Ambakote	
4077	C4	Sunil Jayarathna Construction	Ihala Obadayagama	Kalankuttiya	Galnewa	
4078	C4	Suranga Builders	18/2	Major Gunarathne Mawatha	Temple Road	Mount Livania
4079	C4	T S D Construction and Engineering [Private] Limited	14/40	1st Lane	Hospital Road	Rambukkana
4080	C4	Tarmac Engineering [Private] Limited	244/1/A	St Frncis Mawatha	Dalugama	Kelaniya
4081	C4	Techno Build	46	Buthpitiya	Gampaha	
4082	C4	Theshan Engineering [Private] Limited	694	Negombo Road	Seeduwa	Katunayake
4083	C4	Threesinha Industries [Private] Limited	1564	Kotte Road	Rajagiriya	
4084	C4	U B Construction Prvate Limitedtd	112/21	Poorwarama Road	Colombo 5	
4085	C4	Udjitha Builders [Private] Limited	7/A	Malpana	Kengalla	Kandy
4086	C4	Uni-Eff [Private] Limited	61	Rodrigo Place	Colombo 15	
4087	C4	Vasiri Construction Company [Private] Limited	164	Kesbewa Road	Boralesgamuwa	
4088	C4	Waterman Engineering [Private] Limited	29	D H Perera Mawatha	Rattnapitiya	Boralesgamuwa
4089	C4	Wickrama Construction and Transport	Tholabowatta	4th Mile Post	Passara	
4090	C4	Wijaya Builders	1/4	Boruppa	Gunnepana	
4091	C4	Wijekamal Constructions [Private] Limited	E/52	Udukumbura	Nelundeniya	
5001	C5	2K Construction [Private] Limited	370/3	New Kandy Road	Weliweriya	
5002	C5	3M Engineering Private Limited	148/A	Udakanampella	Pugoda	
5003	C5	Al Safa Consultants and Constructions [Private] Limited	20	Al Hilal Road	Sainthamaruthu 11	
5004	C5	Arcyn Engineering [Private] Limited	120	Mulleriyawa North	Mulleriyawa New Town	
5005	C5	B M Constructions [Private] Limited	597/14/A	Pattinigodella Estate	Pore	Athurugiriya

Nr	GR	Name	Building	Line 1	Line 2	Line 3
5006	C5	Balkan Construction [Private] Limited	11/6/3	St Lawrance Road	Colombo 6	
5007	C5	Bright Builders [Private] Limited	29/4	Sarvodaya Mawatha	Kesbewa	Piliyandala
5008	C5	Ceyoka [Private] Limited	55	Negombo Road	Peliyagoda	
5009	C5	Chance Engineering [Private] Limited	55	Dharmapala Place	Rajagiriya	
5010	C5	Civitech Constructions [Private] Limited	153/2	Amunugoda	Imbulgoda	Gampaha
5011	C5	Dhanu Contractors [Private] Limited	46/62	Wattarantenna Road	Kandy	
5012	C5	Field Construction [Private] Limited	37/2	Hill Street	Dehiwala	
5013	C5	Gayathra Construction [Private] Limited	149/F	Hickgahawatte	Galthuda	Panadura
5014	C5	Illeperuma Builders [Private] Limited	161	Madampe Road	Kuliyapitiya	
5015	C5	Imalshi Contractors Pvtl Ltd	109/3	Kawdana Road	Dehiwala	
5016	C5	Industrial Engineering Enterprises Co [Private] Limited	650/14	Industrial Estate	Galle Road	Ratmalana
5017	C5	J N Construction Private Ltd	52/4	Manaveriya	Kochchikade	
5018	C5	J S M Construction [Private] Limited	173/3/4	Highway Paradise	Halpita	Polgasowita
5019	C5	Jayagi Construction [Private] Limited	24/1	3rd Lane	Cancer Hospital Road	Maharagama
5020	C5	Kalhari Builders [Private] Limited	34	Pepiliyana Road	Nugegoda	
5021	C5	Kent Engineers [Private] Limited	27	Malwatte Avenue	Kohuwala	
5022	C5	Keshara Engineering [Private] Limited	323	Colombo Road	Piliyandala	
5023	C5	Khan Engineering [Private] Limited	204	Perukkuwattan	Kottantivu	Puttlam
5024	C5	M K G Construction[Private] Limited	46/4	Thappawatta Road	Godigamuwa	Maharagama
5025	C5	Maganeguma [Private] Limited	81/4	Nawa Nuge Road	Peliyagoda	Kelaniya
5026	C5	Mavik Enterprises[Private] Limited	383	Mahawatta	Bokundara	Piliyandala
5027	C5	Nada Civil Engineering [Private] Limited	26/A	Upstair Road	Batticaloa	
5028	C5	Osma Engineeing Services [Private] Limited	7/B	Vidyala Mawatha	Avissawella	
5029	C5	Praka Construction [Private] Limited	40	Forest Office Lane	Chundikuli	Jaffna
5030	C5	R S Project [Private] Limited	13/A	Oruthota Road	Gampaha	
5031	C5	Ralic Engineering [Private] Limited	707/A	Ambillawatta Road	Boralesgamuwa	
5032	C5	Rohan Rodrigo and Co [Private] Limited	116	Reclamation Road	Colombo 11	
5033	C5	Rotel Constructions [Private] Limited	146/S/1	Pearl Park	Negombo Road	Wattala

Nr	GR	Name	Building	Line 1	Line 2	Line 3
5034	C5	S B L Construction [Private] Limited	"Sewwandi"	Nahakadiya	Lunuwatte	
5035	C5	S M I Engineering Company [Private] Limited	154	Vijayakumarathunga Mawatha	Colombo 5	
5036	C5	S M S Holdings [Private] Limited	71/A	Pagoda Road	Nugegoda	
5037	C5	S N K Enterprises [Private] Limited	122	Kithulampitiya Road	Kahaduwatte	Galle
5038	C5	Samod Construction[Private] Limited	361/7	Regal Park	Henry Pedris Mawatha	Galle
5039	C5	Smacs Consolidated Development [Private] Limited	5	Main Street	Kalmunai	
5040	C5	Soul Engineering [Private] Limited	8/B	Queens Terrace	Bauddhaloka Mawatha	Kurunegala
5041	C5	Task Engineering [Private] Limited	VC25	3rd Mile Post	Ampitiya	
5042	C5	Turbo Group Civil Engineering Construction	90/1	Church Lane	Thavasikulam	Kodikaram
5043	C5	V Lanka Construction [Private] Limited	195	Karishac Court	Baseline Road	Colombo 9
5044	C5	Vertex Scan Engineering Company	81/1	Kumara Kovil Road	Iruthayapuram	Batticaloa
5045	C5	Vinseth Engineering [Private] Limited	681/1	Jethawana Road	Colombo 14	
5046	C5	Walker Sons and Company Engineers [Private] Limited	18	St Michael's Road	Colombo 3	
5047	C5	Wijayarathne Constructions [Private] Limited	Randapola Junction	Meerigama		
5048	C5	World Scan [Private] Limited	81/1	Melbourn Avenue	Colombo 4	
6001	C6	A R Enterprises [Private] Limited	127/1	Fiscal Road	Akkaraipattu 3	
6002	C6	Agelta Construction [Private] Limited	471	Sarananda Pirivena Road	Peradeniya	
6003	C6	Arenco [Private] Limited	143	O P O Road	Sainthamaruthu 1	
6004	C6	Aruna Builders [Private] Limited	100/A	Kawdana Road	Dehiwala	
6005	C6	Chamma International Constructions [Private] Limited	59/2	Sooriyamal Mawatha	Divulapitiya	Boralesgamuwa
6006	C6	Construction and Development Company [Private] Limited	157	S D S Jayasinghe Mawatha	Nugegoda	
6007	C6	D C C Engineering [Private] Limited	21/3/125	Amity Shopping Complex	High Level Road	Maharagama
6008	C6	Hewa Construction [Private] Limited	146/B	Nagahawatte	Katuwawala	Boralesgamuwa
6009	C6	High Tech Creation [Private] Limited	88/2/A	Kandasamy Kovil Road	Vavuniya	
6010	C6	Indo Fab Engineering Lanka [Private] Limited	114	Main Street	Colombo 11	
6011	C6	Industrial Building Systems [Private] Limited	Noorani Industrial Estate	Waikkala	Kochchikade	
6012	C6	Lakjaya Associate [Private] Limited	378	Badulla Road	Dickarawa	Bandarawela
6013	C6	Meco Engineering [Private[Limited	Sri Sumanawansa Mawatha	Kabillawela South	Bandarawela	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
6014	C6	Navodha Engineering [Private] Limited	434	Galle Road	Panadura	
6015	C6	Omega Steels [Private] Limited	562/84	Jayanthi Road	Anuradhapura	
6016	C6	Pearl Lanka Engineering Services [Private] Limited	284/14	4th Cross Road	Gatambuwana Road	Piliyandala
6017	C6	Prasanga Enterprise [Private] Limited	72	Kannakipuram	Orr's Hill	Trincomalee
6018	C6	Primedare Maintenance House [Private] Limited	454	Nawala	Rajagiriya	
6019	C6	Sadhana Construction [Private] Limited	1006/A	Church Road	Thalangama South	Battaramulla
6020	C6	Sanasa Engineering and Development Company [Private] Limited	42	Sanasa Square	Courts Road	Gampaha
6021	C6	Saw Engineering [Private] Limited	94/2/1	2nd Floor	Udeshi City Complex	Kiribathgoda
6022	C6	Sisara Constructions [Private] Limited	42/2	Mangala Road	Meddawatte	Matara
6023	C6	Siyatha Constructions [Private] Limited	86	Ranpokuna	Medagoda	Matara
6024	C6	Solid Lanka Engineering [Private] Limited	46/9	Rock View Garden	Thenuekumbura	Kandy
6025	C6	Thiers Engineering [Private] Limited	453/1	Colombo Road	Mampe North	Piliyandala
6026	C6	Thilaka Engineering Enterprises [Private] Limited	05	Sandycroft Watta	Maithree Mawatha	Ekala
7002	C7	A D Senadeera and Company [Private] Limited	4	Bodhiya Road	Udahamulla	Nugegoda
7003	C7	Acorn Engineering [Private] Limited	12/5/A	Shanthi Mawatha	Homagama	
7004	C7	Aim Constructions and Engineering [Private] Limited	24	Douglas Watte	Yatiyana	Minuwangoda
7005	C7	Al-Zimmiz International [Private] Limited	21	Police Station Road	Police Station Road	Kalminai
7006	C7	Anuradha Construction [Private] Limited	300	Thelangapatha	Wattala	
7007	C7	Asian Engineering Services [Private] Limited	6/A	Sri Sunandarama Road	Kalubowila	Dehiwala
7008	C7	Bell Constructions [Private] Limited	119/6	Rajamaha Vihara Mawatha	Kotte	
7009	C7	C & S Constructions [Private] Limited	426/7	Mankada Road	Pahala Biyanwila	Kadawatha
7010	C7	Cleantech [Private] Limited	498	Galle Road	Colombo 03	
7011	C7	D A S Trading Company [Private] Limited	59/9	Yakkala Road	Gampaha	
7012	C7	Dahamco Enterprises [Private] Limited	8/A	Ratnapura Road	Munagama	Horana
7013	C7	Dharshaka Enterprises [Private] Limited	A/63/1	Alupotha	Menikkadawara	Thuntota
7014	C7	Enginering Technocracy [Private] Limited	54/3	Madapatha	Piliyandala	
7015	C7	Finco [Private] Limited	49/16	Galle Road	Colombo 3	
7016	C7	G K Holdings Lanka (Private) Limited	Pahala Kanogama	Indigahawatta	Katupotha	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
7017	C7	Golden Homes and Constructions [Private] Limited	38/1/B	Kirigampamunuwa	Polgasowita	
7018	C7	Hanney Construction [Private] Limited	44/80	Indrajothi Road	Rathmalana	
7019	C7	I P C Agro Engineering and Constructions [Private] Limited	165/27/3	Milcaste Estate	Negombo Road	Divulapitiya
7020	C7	Intergrated Farmers Company (Private) Ltd	17/10	Negombo Road	Wattala	
7021	C7	J S Constructions [Private] Limited	24	Buddhist Centre Road	Waragoda	Kelaniya
7022	C7	Jayavi Holdings [Private] Limited	3	Kirula Place	Colombo 5	
7023	C7	Jupiter Construction (Private) Limited	261/F	Shanthipura	Thalawathugoda	
7024	C7	K S B Constructions and Business [Private] Limited	Sivam Road	Urumbirai East	Kurumbirai	
7025	C7	Koala [Private] Limited	55	Negombo Road	Peliyagoda	
7026	C7	Lakvin Construction [Private] Limited	238	Stage 3	Anuradhapura	
7027	C7	Lex Duco [Private] Limited	66	Dutugemunu Street	Pamankada	Colombo 06
7028	C7	Macson Mesh Industries [Private] Limited	304	Deans Road	Colombo 10	
7029	C7	Maple Construction [Private] Limited	84	Vairavar Kovil Road	Vairavar Puliyankulam	Vavuniya
7030	C7	Meceta Engineering [Private] Limited	13/1	Old Quarry Road	Mount Lavinia	
7031	C7	Mora Engineering [Private] Limited	103/A	Mannar Road	Vavuniya	
7032	C7	Natio Engineering and Construction [Private] Limited	Bibila Junction	Dambulla Road	Naula	
7033	C7	Nest Creations [Private] Limited	274/1/2	Court Side	Anuradhapura	
7034	C7	Nihal Enterprises [Private] Limited	255/1	Makola North	Makola	
7035	C7	Ogelco Engineering [Private] Limited	16	Werala Road	Wadduwa	
7036	C7	R A Construction and Engineering [Private] Limited	238/6	Silva Place	Ratmalana	
7037	C7	S D B L North East Construction Company [Private] Limited	340/2/1	R A De Mel Mawatha	Colombo 3	
7038	C7	Sanet Lanka [Private] Limited	96	Saranankara Mawatha	Hidellana	Ratnapura
7039	C7	Sarvo - Tech [Private] Limited	98	"Dhamsak Mandiraya"	Rawathawatte Road	Moratuwa
7040	C7	Semdil Trading Company (Private) Limited	2/A	Polwatte Junction	Minuwangoda	
7041	C7	Senarath Engineering and Agro Business [Private] Limited	Maddumamulla Estate	Thalmmehera	Pannala	
7042	C7	Shasa Engineering [Private] Limited	68/12	Dibbedda Road	Nalluruwa	Panadura
7043	C7	Solanma Engineering (Private) Limited	432/1	Mathugama Road	Ganima	Dodangoda
7044	C7	Span Construction (Private) Limited	Chilaw Road	Major Chandrasena Street	Hettipola	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
7045	C7	Sumo Engineering [Private] Limited	419	Kand Road	Peliyagoda	Kelaniya
7046	C7	Tasma Civil Engineering [Private] Limited	163/4	Ambalama Junction	Samurdhi Mawatha	Siyambalape
7047	C7	Thadartha Engineering and Construction Company	9/1/C	1st Lane	Udawela New Town	Pollnnaruwa
7048	C7	Tithira Construction [Private] Limited	289	Thimbirigasyaya Road	Colombo 5	
7049	C7	Uni Mass Engineering [Private] Limited	6/A	Galagedara Lane	Katugastota	Kandy
7050	C7	V S Construction [Private] Limited	95/9	Girilenarama Mawatha	Morahenagama	Hatton
7051	C7	Vidun Construction [Private] Limited	42/F	Gemunupura	Kothalawala	Kaduwela
7052	C7	Volva Construction [Private] Limited	190	West Angampitiya	Waikkala	
7053	C7	Welagedara Heavy Construction [Private] Limited	69	Lorry Gedara	Walasmulla Road	Beliatta
7054	C7	Worldten Builders and Suppliers [Private] Limited	7/B/2	Udayar Road	Sammanthurai	
7055	C7	21st Century Property Development [Private] Limited	51	Madapatha	Piliyandala	
7056	C7	A I E Constructions [Private] Limited	312	Kithulampitiya Road	Galle	
7057	C7	Advanced Engineering and Research [Private] Limited	63	Station Road	Gampola	
7058	C7	Alumart Engineering [Private] Limited	875	Bluemendhall Road	Colombo 15	
7059	C7	Ambika Construction Company [Private] Limited	15	Kathirkamathamby	Selvanayagapuram	Trincomalee
7060	C7	Arham Zein Construction [Pvt]	Hijra Street	Kinniya 3		
7061	C7	Asset Engineering [Private] Limited	45/1	Alfred House Gardens	Colombo 3	
7062	C7	Bitumix Engineering (Private) Limited	23/40	Diyawanna Gardens	Pagoda Road	Nugegoda
7063	C7	Canmart Engineers [Private] Limited	52/3	Weerapuranappu Mawatha	Laxapathiya	Motaruwa
7064	C7	D A D Construction and Engineering [Pvt] Limited	E/77	Dematanpitiya	Hakahinna	
7065	C7	D S Ranasinghe Construction [Private] Limited	24/1/A	Kudabuthgamuwa	Mulleriyawa New Town	
7066	C7	Dhanushka Enterprises [Private] Limited	Durekkanda Mawatha Junction	Rathnapura		
7067	C7	Eim Construction and Consultant [Private] Limited	1/10	Soysapura Flats	Moratuwa	
7068	C7	Essential Maintenance (Private) Ltd	60/C	Gurugewatta	Kaduwela	
7069	C7	Foresee International [Private] Limited	42	Horana Road	Pililyandala	
7070	C7	G S M B Technical Services [Private] Limited	4	Senanayaka Building	Galle Road	Dehiwala
7071	C7	Gunarathne Group Of Companies (Private) Limited	Pinkanda	Dodanduwa		
7072	C7	Harindu Construction and Property Developers [Private] Limited	181/A	Highlevel Road	Maharagama	

Nr	GR	Name	Building	Line 1	Line 2	Line 3
7073	C7	Imalshi Contractors (Pvtl Ltd	109/3	Kawdana Road	Dehiwala	
7074	C7	Island Contractors [Private] Limited	Akkaraichenai	Mutur 01		
7075	C7	Janathakshan (Guarantee) Ltd	5	Lionel Edirisinghe Mawatha	Colombo 5	
7076	C7	Junes Holdings (Private) Ltd	157/3/2	Dharmapala Mawatha	Colombo 7	
7077	C7	K & S Engineering [Private] Limited	68/15/A	Matale Road	Katugastota	
7078	C7	Keep On Track Engineering Services and Supplies [Private] Limited	68	Huda Lane	Kattankudy 3	
7079	C7	Lago Engineering and Construction [Private] Limited	Mallakele Estate	Naththandiya		
7080	C7	Lead Engineering Solutions [Private] Limited	574/5A	Kandy Road	Rammuthugala	Kadawatha
7081	C7	Lucky Homes [Private] Limited	145/1/A	High Level Road	Pannipitiya	
7082	C7	Makyas (Private) Limited	372/A	Highlevel Road	Pannipitiya	
7083	C7	Mathurata Engineering [Private] Limited	336/25	Siyambalape North	Siyambalape	
7084	C7	Meezan Engineering [Private] Limited	51	Anagarika Dharmapala Mawatha	Dehiwala	
7085	C7	Mufa Multi Business [Private] Limited	59/4	Temple Lane	Kalubowila	Dehiwala
7086	C7	Neco Group (Private) Limited	121/A	Aiyanayake Devala Road	Munneswarama	Chilaw
7087	C7	New Lanka Construction [Private] Limited	20	Periyamadu	Mannar	
7088	C7	Nipuna Enterprises [Private] Limited	272/B	Asiri Place	Sudharshana Mawatha	Malabe
7089	C7	Prashans Constructions [Private] Limited	23	Dhammadaja Mawatha	Horetuduwa	Moratuwa
7090	C7	Royat Engineering [Private] Limited	500/17	Ruwanpura	Aggona	Angoda
7091	C7	S D K Construction [Private] Limited	Colombo Road	Lansigama	Katuneriya	
7092	C7	Sanilco Homes and Constructions [Private] Limited	614	Negombo Road	Mabola	Wattala
7093	C7	Saviko Company (Private) Limited	Galwanguwa	Kuliyapitiya Road	Narammala	
7094	C7	Senaka Builders (Private) Limited	212/12	Nelum Place	Kalapaluwawa	Rajagiriya
7095	C7	Sethmi Holdings [Private] Limited	56	Highlevel Road	Maharagama	
7096	C7	Sivajini Constructions [Private] Limited	14	Trinco Road	Chenkalady	Batticaloa
7097	C7	Solid S C [Private] Limited	148	UC Quarters	Dharmapala Mawatha	Anuradhapura
7098	C7	Stride Engineering [Private] Limited	45	Sivan Kovil Road	Thonikkal	Vavuniya
7099	C7	Susanhinda [Private] Limited	Jaya Sevana	Akkara 500	Hingureara	Embilipitiya
7100	C7	Tele - Pix Technologies [Private] Limited	164	Peradeniya Road	Kandy	Kandy

Nr	GR	Name	Building	Line 1	Line 2	Line 3
7101	C7	Thilini Enterprise [Private] Limited	255/1	Balasooriyawatte	Mawathagama	
7102	C7	U D I Organisation [Private] Limited	77/A	Sampath Garden	Nelum Avenue	Kandy
7103	C7	Upul Builders and Enterprises [Private] Limited	40/2	Mulgampola Road	Kandy	
7104	C7	V S Enterprises (Private) Limited	360/A/1	Pannipitiya Road	Thalawathugoda	
7105	C7	Vista Engineering [Private] Limited	472	Lake Road	Boralesgamuwa	
7106	C7	W A P Fernando Construction Company [Private] Limited	125/D	Weehena	Mahawewa	
7107	C7	Welko [Private] Limited	35/9	Galle Road	Dehiwala	
7108	C7	Wuf and Innovators [Private] Limited	400/40/M	Bulugahawatta	Ihalabiyanvila	Kadawatha

Appendix C

Ministry of Construction and Engineering Services

Institute for Construction Training and Development (ICTAD)

Instructions for Registration as a Construction Contractor under National Registration and Grading System of ICTAD

For Grades From C10 to C6

November 2008

Institute for Construction Training and Development (ICTAD)
"Savsiripaya"
123, Wijerama Mawatha
Colombo 07.

Tel. : 2686236 / 2699801 / 2695965 / 2686092 / 2686856
Fax : 2699738
E-mail : ictad@sltnet.lk
Website : www.ictad.lk

How to obtain the ICTAD Registration

1. Your business has to be registered at the Registrar of Business or at the Divisional Secretary's Office and the registration certificate should be obtained. Nature of business should be mentioned as "Construction Work".

2. The application for the 'National Registration and Grading of Construction Contractors' could be purchased from the 'Information Centre' of ICTAD at a price of Rs. 310/= or can be received through post by sending a money order for Rs. 327/= to the Chairman – ICTAD, encashable from the Borella Post Office. The Guideline for Registration and Grading (ICTAD/ID/10) will be useful to complete the application form. The price of the Guideline is Rs. 470/=.

3. You are requested to submit the duly perfected application form together with the photo copies of the Business Registration Certificate & documents to prove the construction work experience to the Information Centre – ICTAD. All photo copies submitted must be authenticated by a Notary Public or an Attorney-at-law. Also, the applicant must complete the Affidavit attached to the Part II of the application form and the two copies of the summary sheet in Section v.

4. The highest value of the contract which can be obtained by you is decided by the grade received by you. The highest values of each grade is given below.

Grade C10	-	up to Rs. 1.0 million
Grade C9	-	up to Rs. 2.0 million
Grade C8	-	up to Rs. 5.0 million
Grade C7	-	up to Rs. 10.0 million
Grade C6	-	up to Rs. 25.0 million

5. The grading of the contractors are carried out as per the 'Guideline for Registration & Grading of Construction Contractors'. As such each grade is required to fulfil the minimum point requirement given in the guideline. Details of minimum point requirement is given below.

Table 1

Grade	Minimum Point Requirement				Total Points Required
	Financial Ability	Professional Staff	Technical Staff	Plant & Equipment	
C10	0.5	-	1.0	-	1.5
C9	1.0	-	1.0	-	2.0
C8	2.0	-	1.0	0.5	3.5
C7	5.0	2.0	1.0	1.5	10.0
C6	6.0	2.0	2.5	2.5	20.0

Those who expect to obtain the registration under grade C6 must fulfil the point requirement of 2.0 for the work done during last 5 years, points 1.5 for the work done during last year and points 1.5 for the largest job completed in each speciality.

6. You may submit fo. wing documents in order to obtain the points mentioned in the chart given before.

(a) Financial Ability

i. Audited Financial Statements (This is essential for grade C6)

ii. Permanent Over Drafts (P.O.D) granted to the contractor.

iii. Wealth Certificates issued by the Divisional Secretary are considered only for Grades C10 to C7. However, only a half of the financial requirement can be fulfilled from such wealth certificates. The balance half should be fulfilled from any other financial source. (Only 50% of the value of the wealth certificates are considered in allocating points)

Eg:-

Grade	Value of the Wealth Certificate in Rs.	Other Finances Rs.
C10	100,000/=	50,000/=
C9	200,000/=	100,000/=
C8	400,000/=	200,000/=
C7	1,000,000/=	500,000/=

iv. Savings Accounts – Average balance for last 3 (three) months is considered here. A copy of the savings account book to be submitted together with the application form.

v. Fixed Deposits - The minimum deposit period should be 6 (six) months. A copy of the certificate should be submitted.

vi. Current Account - As the average value of the highest and lowest balance to be calculated, the statements for last 6 (six) months to be submitted.

viii. The minimum financial ability required for each grade is given below.

C10 - Rs. 100,000/=
C9 - Rs. 200,000/=
C8 - Rs. 400,000/=
C7 - Rs. 1,000,000/=
C6 - Rs. 2,000,000/=

Additional points will be allowed for higher financial abilities.

(b) Details of Staff

i. Professional Staff

Points under professional staff is not essential for C10, C9 & C8 grades. But it is essential to obtain 2.0 points under professional staff for C7 and C6 grades. If any of the partners of the company are falling in to this category, you may prove it by submitting copies of educational certificates. If not you have to obtain the service from a consultant. If so such service agreement, qualifications, and the letter of consent from the consultant should be submitted. The maximum points which could be allocated to a consultant is limited to 2.0 and he should fall in to the category of Engineering Assistant or a higher category as given on Annexure I of (page 40 – 41) of the Guideline for Grading of Construction Contractors (ICTAD/ID/10).

Instead You may obtain the service of the Engineer attached to the branch NCASL office.

ii. Supervisory Staff

Contractor can obtain 1.0 point under this area, if he has work experience for a minimum of 5 years, or if he has successfully followed the special course for small scale contractors organized by ICTAD. For additional points contractor should have permanent supervisory staff working for him. Qualifications required for such supervisory staff is given in Annexure I of the Guideline (ICTAD/ID/10) under the Technical Assistant category and below.

Plant & Equipment

The minimum point requirement for plant & equipment under different grades are given on Table 1. The contractor must essentially own the plants under 'Concreting' in Annex II. The point requirement for C8 is 0.5 and C7 is 1.5.

Additional information on requirements for grade C6 is given on Para 2.3.2.3, charts 6A to 6F and on Annexure II of ICTAD/ID/10. Documents should be submitted to prove the ownership of plant and equipment, as per the Section 'F' of the application form.

Experience

(a) Contractor must submit the copies of the relevant pages of the ICTAD Record Book (from pg. 49 to pg. 82) with the endorsements from client organizations to prove the work experience. (This is essential for Grade C6 only)

Following information could be forwarded.

1. Details of registration from different state organizations
2. Contractor's record books issued by different state sector organizations
3. Agreements and work completion letters

(b) Information on Work Experience during last 5 years

Completion letters issued by the state organizations are considered for state sector works. Private sector work is considered only when the completion letters issued by project consultants and the certified BOQQ are submitted

(c) Information on Largest Job Completed

Details on the largest job completed in each speciality should be submitted for this.

Other Details

The owner of the company **must always be present to obtain the ICTAD Record Book**. The ICTAD Record Book can be obtained from the Development Division, on any week day before 3.00 p.m.

Appendix D

Founded 1981

Major & Specialist Constructors

National Construction Association of Sri Lanka

'Idikireem Medura' 350A, Pannipitiya Road, Pelawatta, Battaramulla.
Tel: 2177045, Fax: 4209878, Email: ceo@mscsl.org, info@mscsl.org
Web: www.mscsl.org, Skype: majorspecialistconstructors 1989
Regular Member of the International Federation of Asian & Western Pacific Contractors' Associations

Incorporated 1989

Date : 13 November 2013
Reference : SW/0000/A

Managing Director

Dear Sir,

Study to provide a Lifelong Social Security System [Pension Scheme] for Operational Workforce of Construction Industry in Sri Lanka

Achieving the desired time, cost and quality requirements of the clients are always at a challenge. A major difficulty is managing the behavioral problems of the operational workforce. This study carrying out by **Mr Sujeeva Wijewickreme [Chartered Builder and Chartered QS]** is focused towards developing a responsible operational workforce by eliminating their disturbing behavior.

The proposal will be on a platform reinforced with a lifelong social security system [Pension Scheme through the government] aims to remove the short term thinking pattern of the current workforce. Design is focused to motivate the school leavers towards construction industry as well and there onwards providing training and career development for them through fulfilling hierarchies of human needs [I.e. Physiological, Safety, Social, Esteem and Self Actualization].

Therefore, kindly support Mr Wijewickreme by fulfilling the following requirements;

- ✓ Complete, sign and stamp the attached study questionnaire and post within 21 days
- ✓ Provide copies of brief format "Audited Statements" for past five [5] years

Confidentiality requirements of the documents and data that you are providing to this study will be managed in accordance with the UK and Sri Lankan data protection standards.

Thank you.

Yours faithfully,

Major & Specialist Constructors
National Construction Association of Sri Lanka

Brig Madura Wijeyewickrema RSP USP MSc MAIR
(SL Army - Retd)
Chief Executive Officer

University of Salford MANCHESTER

Sujeeva P Wijewickreme
School of the Built Environment

Maxwell Building, University of Salford
Salford M5 4WT, United Kingdom

Date : 13 November 2013
Reference : SW/0000/B

Managing Director

Dear Sir,

Invitation to Participate for a
Research Study towards providing a Lifelong Social Security System [Pension Scheme] for the Construction Workforce in Sri Lanka

You are cordially invited to complete the attached questionnaire and return the same together with the requested documents listed there in [Brief format audited statements for recent 5 years].

Information and data that you are requested to provide will be kept in strict confidentiality according to the Code of Practice guidelines issued by UK Research Integrity office (UKRIO, 2009) and other UK and Sri Lankan acts as described in the attachments. Obtained data will be used for this research related purposes only.

Selection of participating organisations was based on a primary evaluation of your performance for the past 5 years. **Only limited number of originations was short listed from your similar ICTAD Grading of contractors for this research and you are one of them.**

This research is focused towards eliminating the temporary employment mentality from the physical production workforce of the construction industry by bringing them to more secured employment footing with a partnering arrangement. By this mechanism, it is anticipated to develop more reliable and responsible construction workforce especially for physical production.

I strongly believe that your hands on experience strengthened with tacit knowledge will produce valuable data for the success of this research study and finally to the construction community at large.

If you have any questions or concerns regarding this study or require further particulars, kindly contact the undersigned.

Thank you in advance for your generous assistance with this research study.

Yours faithfully,

Sujeeva P Wijewickreme
PhD Candidate, Chartered QS and Chartered Builder

University of Salford MANCHESTER

Sujeeva P Wijewickreme
School of the Built Environment

Questionnaire Survey

Research Study towards providing a Lifelong Social Security System [Pension Scheme] for the Operational Workforce of the Construction Industry in Sri Lanka

1. General Information of Organisation

Name of Company : _____

Year established : _____

2. How does your organisation procure manpower for physical production?

	Recruiting Category	:	**%**
a.	Direct Labour - Permanent	:	
b.	Direct Labour - Casual	:	
c.	Indirect - Labour subcontractors - Output based	:	
d.	Indirect - Labor supply contractors	:	
e.	Other _____	:	

3. Does your organisation monitor EPF /ETF and gratuity payments of indirectly sourced labour?

[With reference to items "c." and "d." of question 2 above]

a. No ☐

b. Sometimes ☐

c. Most of the time ☐

d. Always ☐

Acronyms: EPF Employees Provident Fund
ETF Employers Trust Fund

4. What was your organisation's annual turnover for last 5 years?

a. 2012/2013 Rs. _____

b. 2011/2012 Rs. _____

c. 2010/2011 Rs. _____

d. 2009/2010 Rs. _____

e 2008/2009 Rs. _____

5. What is your organisation's target turnover for next 3 years?

a. 2013/2014 Rs. _____

b. 2014/2015 Rs. _____

c. 2015/2016 Rs. _____

Sujeeva P Wijewickreme
School of the Built Environment

6. How does your organisation weigh the following behavioral problems of workforce against Time, Cost and Quality impacts for construction projects?

		Degree of Time Impact					Degree of Cost Impact					Degree of Quality Impact				
	Behavioral Problem	**0 to 5%**	**5 to 10%**	**10 to 15%**	**15 to 20%**	**Greater than 20%**	**0 to 5%**	**5 to 10%**	**10 to 15%**	**15 to 20%**	**Greater than 20%**	**0 to 5%**	**5 to 10%**	**10 to 15%**	**15 to 20%**	**Greater than 20%**
a.	High labour turnover	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
b.	Poor quality of workmanship	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
c.	Poor, temporary or irregular attendance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
d.	Lack of trade knowledge and skill	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
e.	Lack of cost concerns	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
f.	Irresponsibility and lack of reliability	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
g.	Unfair demanding of wages / labour rates	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
h.	Adamant behavior and lack of loyalty	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
i.	Reluctant to learn / undergo training	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
j.	Carelessness and lack of safety concerns	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
k.	Unreasonable / unethical sudden demanding	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
l.	Migrating at the tail end of the project	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
m.	Other	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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School of the Built Environment

7. What is the impact of material wastage due to mistakes and slipups by workforce?

a. Less than 5% ☐
b. 5% to 10 % ☐
c. 10% to 15% ☐
d. 15% to 20% ☐
e. Over 20% ☐

8. In your assessment, what degree of impact could develop the scarcity of operational workforce?

		Degree of impact				
	Behavioral Problem	**Nil**	**Low**	**Medium**	**High**	**Very high**
a.	Poor retirement benefits	☐	☐	☐	☐	☐
b.	Dissimilarities in salary scales	☐	☐	☐	☐	☐
c.	Gray areas in the career development	☐	☐	☐	☐	☐
d.	Temporary nature of the occupation	☐	☐	☐	☐	☐
e.	Lack of social recognition	☐	☐	☐	☐	☐
f.	Non availability of recreation facilities on site	☐	☐	☐	☐	☐
g.	Being away from family and relatives	☐	☐	☐	☐	☐
h.	Social and Political influences	☐	☐	☐	☐	☐
i.	Safety and sanitary facilities	☐	☐	☐	☐	☐
j.	Interpersonal relationships	☐	☐	☐	☐	☐
k.	Lack of trouble free communication	☐	☐	☐	☐	☐
l.	Influence from the dependents	☐	☐	☐	☐	☐
m.	Improper gender balance	☐	☐	☐	☐	☐
n.	Behaviors of the immediate supervisor	☐	☐	☐	☐	☐
o.	Other 1	☐	☐	☐	☐	☐
p.	Other 2	☐	☐	☐	☐	☐

University of Salford MANCHESTER

Sujeeva P Wijewickreme
School of the Built Environment

9. Do you believe that by providing a lifelong social security system [Pension Scheme] to the operational workforce, can we overcome from the aforementioned behavioral problems?

a. No ☐ b. Sometimes ☐

c. Most of the time ☐ d. Definitely ☐

Participant's Confirmation:

- I confirm that I have read and understood the Participant Information Sheet [Appendix A] explaining the above research study and that I have had the opportunity to ask questions about the project. ☐
- I understand that my participation is voluntary and that I am free to withdraw at any time, without providing a reason. ☐
- I understand that, if I decide to participate in this study, then the results obtained from this study, may be kept for possible use in future studies. ☐
- I understand that my anonymity is assured and that only the researchers involved in this study at the University of Salford, UK, will use the data. I thus give permission for these individuals to use this information as they wish within academia. ☐

Participant

Name .....

Signature ....

Position ..... **Stamp** **Date**

Checklist

a. Sign and stamp this questionnaire

b. Attach copies of **"Brief format Audited Statements"** for past five [5] years

c. A Business Card [If any]

Returning Procedure

a. Please use the provided 'Addressed and Prepaid' envelope to return the documents within 21 days.

University of Salford MANCHESTER

Participant Information Sheet

Title of Study:

To Provide a Lifelong Social Security System for the Operational Workforce of the Construction Industry in Sri Lanka.

Study Subjects:

You are being invited to participate in this research which is a study on the current situation of the human resource difficulties experienced by the construction industry from the behavioural attitudes of the Operational Workforce in Sri Lanka.

Prior to taking part in this research, it is important for you to understand why the research is being done and what it will involve. Please take your time to read the following information carefully. You may also wish to talk to others about this study. Kindly inquire for clarifications or further details and please take time to decide whether or not you wish to take part in this study.

Thank you for reading and understanding some of the basic requirements of this research.

What is the purpose of this study?

This research is focused on generating a sustainable model of a time, cost and quality orientated operational workforce for the construction industry to reap a greater stakeholder satisfaction. The task will be introduced on a platform developed through a lifelong social security system for the operational workforce of the construction industry in Sri Lanka.

The following aims are planned to be addressed during this research.

a. To identify the behavioral factors of the operational workforce of the construction industry that affects time, cost and quality of the construction outputs.
b. To review the social security systems currently available for the operational workforce of the construction industry.
c. To carryout investigations to earmark the causes for unavailability of a proper, sustainable and lifelong social security system for the operational workforce of the construction industry.
d. To critically evaluate the current construction management process to identify the risk multiplication areas to be used as a fund raising mechanism.
e. Developing a sustainable lifelong social security model for the operational workforce of the construction industry to achieve a greater stakeholder satisfaction and for the purpose of validating this research.

Is it compulsory to take part in this study?

No. Participating in this study is completely voluntary and you may withdraw at any time. Also, even after agreeing to participate in our study, you are still free to withdraw at any time without further reasoning.

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Will there be any future obligations?

No. After evaluating the questionnaire related submissions, we may request for a secondary interview with you if required to gather further details or for clarifications. This will be arranged at a location of your preference at a date and time feasible to you. The whole interview will take approximately 60 minutes. The transcribed data will be sent to you for confirmation. With your permission, the interview will be recorded. The recorded interview and information will only be used anonymously and for academic purposes. It will not be possible for any participants be personally identified. Information on individuals (such as name, gender, age, ethnicity, religion and so on) will not be revealed under any circumstances.

Meanwhile, we would like to indicate to you the following points for which your consent is required. This is completely at your discretion. We will only use the records in ways that you agree to:

- In any use of these records, your personal information will not be identified.
- The anonymous records may be studied, transcribed and analysed by the interviewer only according to the research aims.
- The anonymous records may be used for scientific publications and / or meetings.
- The anonymous records may be shown in presentations to scientific or non-scientific groups.

Please be assured that confidentiality is highly protected for this survey. The transcribed interviews will be kept with no identifying information. The personal information collected about you in the beginning of the interview is only for discerning patterns in the data collected and would not be used to identify you personally. All data collected will be kept and accessed only by the researcher and the supervisors of this research and will not be made available for other parties or be made public.

What do I need to do?

Upon invitation and you decide that you would like to take part in the secondary interview, please contact the researcher who will arrange a convenient appointment time for you to participate and for us to answer any questions you may have. If you consent to the information on this sheet, you need to sign a consent form. Please be ensured that you can withdraw at any time even after signing the consent form.

What are the potential benefits from taking part in this study?

Whilst there are no immediate benefits for those participating in this research project, it is hoped that this work will help to provide first hand evidence of the current situation. This study will also give us an opportunity to deepen our knowledge related to shortcomings in the current situation of the human resource difficulties experienced by the construction industry from the behavioural attitudes of the physical production workforce.

What are the potential risks, discomforts and inconveniences from taking part in this study?

There will be no possible disadvantages and risks of whatsoever for participating in this study. There are no risks of severe injury or discomfort that may occur. This is because the research

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Participant Information Sheet

study only deals with limited respondents and only deals with the technical issues. As participation is voluntary, you may wish to discontinue the interview at any time or choose not to answer any particular question or not to participate at all.

Will I be paid for taking part?

No. You will not be paid for your participation in this research, but you will receive a token of appreciation for your participation.

What will happen if I don't want to carry on with the study?

You are free to withdraw from the study at any time without reasoning.

What if there is a problem?

If you have any concerns about any aspect of this study, you may want to speak with the main researcher who will answer your questions. If you remain unhappy and wish to complain formally, you can do this by either contacting the supervisors or the universities involved with this study directly.

Will my participation in this study be kept confidential?

All information obtained in connection with this study will be treated as privileged and confidential. All information will be anonymous so that you cannot be identified, except by a single Participant Identification Form, which will be saved electronically on a password protected computer. The results obtained from this study will be kept for possible use in future studies, whereby all personal data will be deleted in three years from the completion of the research.

What will happen to the results of this study?

The findings will be published in the form of a report, which will be included in a thesis that forms part of a researcher's doctoral degree. Furthermore, it is also likely that the researcher will write a scientific paper based on the findings of this study, and this paper will be published in professional journals or at conferences.

Who is organising and funding this study?

This is a post-graduate research is for the fulfilling requirements of PhD in Management, Economic Research and Information Technology at The University of Salford. The research is organised by the School of the Built Environment at The University of Salford. There will be no funding or sponsoring organisation for this research project other than the voluntary supporters.

Who has reviewed the study?

The researcher's supervisors and The University of Salford Ethics Committee has reviewed all aspects of this study.

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Participant Information Sheet

Contact details for further information

1. **PhD Candidate**

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3. **Local Supervisor [University of Moratuwa, Sri Lanka]**

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Thank you,

Yours faithfully,

Sujeeva P Wijewickreme
PhD Candidate, Chartered QS and Chartered Builder

Appendix E

SRI LANKA

SURVEY OF CONSTRUCTION INDUSTRIES 2011

Department of Census & Statistics

SURVEY OF CONSTRUCTION

INDUSTRIES

2011

Department of Census & Statistics

ISBN 978-955-577-820-6

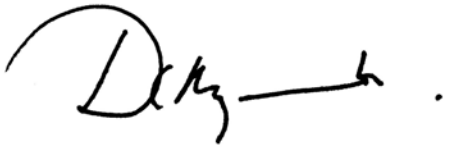
Published in 2012.

PREFACE

The first Survey of Construction Industry was conducted in 1993 with the assistance of Institute for Construction Training and Development (ICTAD). Thereafter this Department continues to conduct the survey ones in two years cater to the needs of National Planners and other data users.

This publication provides the Survey results for the year 2011 in which the reference period was 2010. The frame for this survey was the list of contractors registered with ICTAD.

Any suggestions to improve this survey are most welcome.



D.C.A. Gunawardena,
Director General of Census & Statistics.

Department of Census & Statistics,
4 & 5 floors,
Rotunda Tower,
No 109, Galle road,
Colombo 03
07 December 2012.

ACKNOWLEDGEMENT

The planning, collection and processing of data were done by the staff of the Industry and Construction Division under the overall guidance Mrs.H.D.E.Somarathne the Director, and she was assisted by Mr.U.S. Wanapushpa, and Mrs.B.G.K.Premalatha Senior Statisticians.

B.G.K.Premalatha Senior Statistician performed a crucial role in planning and supervising of survey work. The Computer assisted data processing using the software package Visual Basic & Statistical Tables using the SPSS/PC+ were done by Ms. W.S.D. Jayasundara, Statistical Officer, Ms.W.T.K.T.P.Kularathne Statistical Assistant under the supervision of Mr.R.D.N.Premawansa, Statistician.

Data collection at the follow up stage was done by the Statistical Officers / Statistical Assistants attached to the Divisional Secretariat Division and the Industry, Construction, Trade & Services Division of the Department under the supervision of District, Deputy Directors/ Senior Statisticians/ Statisticians. As well as all staff officers of the Industry, Construction, Trade & Services Division

The co-operation given by the respondents is also much appreciated.

CONTENTS

Table No. :

Chart No. :

Survey of Construction Industries – Sri Lanka 2011

1. Introduction

Survey of Construction Industry was conducted in 1993 for the first time in Sri Lanka mainly to furnish data regarding input, output and their trends to the Institute for Construction Training and Development (ICTAD). The Department of Census and Statistics continues to conduct the survey ones in two years cater to the requirements of the data users along with the rapid development of the construction industry in Sri Lanka.

2. Scope and Coverage

In this survey, all construction activities undertaken by the private, government and semi-government contractors who were registered with ICTAD, were covered. Therefore, construction activities undertaken by the international organizations and the informal sector were not represented in this survey.

Information is collected relating to the following sectors of the construction industry.

i. Building construction
ii. Highway construction
iii. Bridge construction
iv. Water supply & drainage
v. Irrigation & land drainage
vi. Dredging & Reclamation
vii. Other constructions

All construction activities, except building construction, mentioned above are categorized under Civil Engineering activities.

3. Methodology

The Survey of Construction Industries was aimed to cover 975 sample units in all provinces during the reference year 2010. The department introduced a very simple questionnaire for the survey from the year 2000 considering the difficulties to obtain the information of construction activities. In order to collect information such as value of contract, value of work done, value of raw material used, salaries, other services and value of subcontract.

Field officers of the department were sent to the establishments directly to collect the information from contractors. For the non responding contractors, field officers had to visit quite a number of times to get the questionnaire completed. The collection of accurate

data from contractors is very tedious and time consuming. Sometimes officers had to visit them several times in order to get a good response.

4. Frame

List of contractors registered with the ICTAD and among those who were engaged in construction activities in the year 2010 have been used as the frame for this survey.

5. Sample Design

Stratified Systematic Sampling method was used for the survey and the list of contractors registered with the ICTAD was divided into 2 strata according to the grading system which the ICTAD has devised based on the financial terms. Contractors of all type of construction activities categorized under grade 1 to grade 5 and Contractors of all type of construction activities except building categorized under grade 6 to grade 10 were canvassed 100% and a probability sample was selected from other grades 6 to grade 10 in building construction as shown below.

Sample Frame	Strata	Sample Fraction	Sample size
List of contractors registered with ICTAD	grade 1-5	100%	339
	grade 6-10 (except building)	100%	312
	grade 6-10 (building)	15%	324
Total			**975**

6. Concepts & Definitions

(a) Reference Period

Data relating to construction activities carried out during the calendar year 2010 or financial year 2010 April to 2011March.

(b) Employment

This refers to the average number of persons engaged in construction activity during the reference period, including skilled labourers, unskilled labourers, technical, professional and other paid workers.

(c) Salaries & Wages

Amount paid as salaries, wages or subcontract on work done during the period.

(d) Output

Value of work done during the year 2010.

(e) Input

Expenditure on goods (raw materials), other services and subcontract

Input = Value of goods + Value of other services + Value of subcontract.

(f) Value Added

Value added is the increment addition to the value of raw materials and other expenditure that is contributed by the contractor. It is computed as follows.

Output – Input = Value added

7. Survey Results

The Survey of Construction Activities was not covered all construction activities carried out during the reference period in the island. The survey covers all the construction activities carried out by the contractors registered with ICTAD.

Therefore it is clear that;

a. The construction activities carried out other than by the ICTAD registered contractors such as construction of houses in the rural sector and urban sector;

b. Large scale construction activities carried out by foreign contractors are not covered by this survey.

According to the Annual Survey of Construction Industries, the total estimated value of work done by all type of construction activities in Sri Lanka was Rs. 78,320 million in 2010. The highest contribution to this value has been made by the building construction sector which accounted for 48.0 % of the total value of work done.

The major share of the value of work done of building construction sector (which amounted Rs. 37,623 million) has come from the private and public sector. The type of high way construction was the second highest contributor to the value of work done, amounting to 32.6% of the total value.

Table 1 : Some Selected Indicators of Construction Activities Classified by Type of Construction Activity - 2010
(All Sectors)

Type of Construction Activity		No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
Building	Housing Units	308	5,100,271,958	2,977,385,742	1,166,252,380	1,811,133,361	1,135,299,767	17,198,613	13,754,000	8,945	288,565,611
	Collective living quarters	66	2,723,376,771	763,087,163	242,317,300	520,769,865	231,247,776	10,351,924	717,600	1,227	55,634,379
	Office Building	380	17,530,247,319	7,934,617,642	3,391,875,964	4,542,741,678	2,540,681,980	285,062,373	566,131,611	8,084	699,787,805
	Market Complex	64	2,010,448,182	1,897,084,485	1,268,898,155	628,186,330	1,235,735,596	1,618,059	31,544,500	1,009	118,869,134
	Factories	30	4,075,884,259	4,002,510,320	1,068,644,687	2,933,865,632	845,443,460	95,627,310	127,573,917	686	90,597,022
	School Building	351	5,416,851,688	3,075,272,650	1,967,087,400	1,108,185,249	1,645,691,162	66,897,246	254,498,993	6,222	477,414,626
	Hospital Building	136	5,306,728,572	2,207,025,681	1,408,970,173	798,055,509	1,189,892,112	92,684,389	126,393,672	2,225	274,054,210
	Other Building	492	49,422,681,838	11,720,319,726	6,713,578,116	5,006,741,610	5,005,988,506	505,338,216	1,202,251,394	7,087	497,875,384
	Repair & Maintenance	953	3,768,199,937	3,045,203,254	2,204,412,762	840,790,492	1,685,100,823	37,553,270	481,758,669	8,418	503,025,589
	Group Total	**2,780**	**95,354,690,524**	**37,622,506,663**	**19,432,036,937**	**18,190,469,726**	**15,515,081,182**	**1,112,331,400**	**2,804,624,356**	**43,904**	**3,005,823,761**
Highway	Rehabilitation	193	12,127,703,513	8,520,984,897	5,803,034,363	2,717,950,533	5,045,093,663	703,431,275	54,509,425	7,657	983,673,153
	New work	88	31,868,342,343	14,341,186,234	12,141,270,461	2,199,915,773	11,762,829,977	250,545,851	127,894,634	3,074	460,716,954
	Repair & Maintenance	77	6,656,319,501	2,642,413,026	1,299,437,515	1,342,975,512	1,175,052,714	63,877,582	60,507,219	3,330	222,988,226
	Group Total	**358**	**50,652,365,357**	**25,504,584,157**	**19,243,742,339**	**6,260,841,818**	**17,982,976,354**	**1,017,854,708**	**242,911,278**	**14,061**	**1,667,378,333**
Bridge	Bridge	86	9,984,330,382	3,172,485,065	1,841,172,929	1,331,312,136	1,545,092,758	196,207,958	99,872,213	2,257	323,256,563
	Culvert	26	74,721,583	73,147,856	39,261,704	33,886,152	37,665,007	1,596,697	-	407	20,471,521
	Causeway	3	50,955,457	50,955,457	40,281,280	10,674,177	40,281,280	-	-	51	1,450,449
	Repair & Maintenance	3	7,519,016	4,778,020	4,081,351	696,670	3,931,850	149,500	-	15	336,375
	Group Total	**118**	**10,117,526,438**	**3,301,366,398**	**1,924,797,264**	**1,376,569,135**	**1,626,970,895**	**197,954,155**	**99,872,213**	**2,730**	**345,514,908**
Water supply & Drainage	Water Supply	59	14,471,808,480	6,247,898,345	2,999,408,925	3,248,489,420	1,687,407,528	387,522,935	924,478,462	2,030	230,040,455
	Drainage	25	826,532,993	820,881,893	629,708,829	191,173,064	587,504,141	42,204,687	-	708	72,063,339
	Pump house	16	291,913,791	145,463,591	82,568,614	62,894,977	75,600,614	6,758,000	210,000	240	38,678,714
	Repair & Maintenance	4	11,552,948	11,552,948	4,904,346	6,648,602	2,299,696	2,604,651	-	65	2,858,800
	Group Total	**104**	**15,601,808,212**	**7,225,796,777**	**3,716,590,714**	**3,509,206,063**	**2,352,811,979**	**439,090,273**	**924,688,462**	**3,043**	**343,641,308**
Irrigation & Land Drainage	Anicut	9	25,075,254	25,075,254	16,184,062	8,891,192	16,124,062	48,000	12,000	90	5,351,856
	Sluices	9	48,407,499	48,407,499	26,185,625	22,221,874	25,831,310	354,315	-	209	16,944,154
	Spill	3	3,997,624	3,997,624	2,530,497	1,467,127	2,530,497	-	-	45	1,285,700
	Dam	18	1,066,530,318	481,357,418	288,980,809	192,376,609	227,386,809	61,594,000	-	347	34,346,010
	Irrigation canal	60	1,096,326,786	349,586,631	236,970,974	112,615,657	191,190,496	43,705,728	2,074,750	1,171	63,389,950
	Repair & Maintenance	14	58,533,153	53,437,379	36,015,200	17,422,179	33,297,150	1,518,050	1,200,000	398	13,020,251
	Group Total	**113**	**2,298,870,634**	**961,861,805**	**606,867,167**	**354,994,638**	**496,360,324**	**107,220,093**	**3,286,750**	**2,260**	**134,337,921**
Dredging & Reclamation	Filling	3	28,643,575	28,643,575	19,799,218	8,844,357	14,070,503	-	5,728,714	93	2,435,056
	Retaining wall	3	15,847,000	15,847,000	7,729,150	8,117,850	4,664,400	523,250	2,541,500	60	4,485,000
	Group Total	**6**	**44,490,575**	**44,490,575**	**27,528,368**	**16,962,207**	**18,734,903**	**523,250**	**8,270,214**	**153**	**6,920,056**
Other	Other Construction	79	5,003,790,304	3,659,140,334	2,609,472,241	1,049,668,093	189,438,476	53,500,470	2,366,533,295	1,220	184,832,800
	Group Total	**79**	**5,003,790,304**	**3,659,140,334**	**2,609,472,241**	**1,049,668,093**	**189,438,476**	**53,500,470**	**2,366,533,295**	**1,220**	**184,832,800**
Total		**3,558**	**179,073,542,044**	**78,319,746,709**	**47,561,035,030**	**30,758,711,680**	**38,182,374,113**	**2,928,474,349**	**6,450,186,568**	**67,371**	**5,688,449,087**

Table 2 : Some Selected Indicators of Construction Activities Classified by Type of Construction Activity - 2010
(Private Sector)

Type of Construction Activity		No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
Building	Housing Units	264	953,348,893	848,353,877	534,997,865	313,356,013	520,932,751	8,085,113	5,980,000	8,314	176,934,201
	Collective living quarters	3	146,629,600	22,425,000	18,384,015	4,040,985	17,364,425	1,019,590	-	36	1,940,510
	Office Building	30	5,126,983,456	3,117,298,341	736,922,427	2,380,375,915	542,078,930	51,581,587	143,261,909	496	87,044,067
	Market Complex	49	319,027,000	296,051,000	205,061,600	90,989,400	174,713,100	598,000	29,750,500	752	82,259,000
	Factories	18	3,617,722,798	3,576,820,258	808,172,428	2,768,647,830	596,200,295	84,398,216	127,573,917	173	24,858,860
	School Building	6	1,847,820,000	522,136,419	461,069,159	61,067,261	269,706,178	14,794,074	176,568,907	194	50,830,000
	Hospital Building	9	388,174,771	274,131,342	244,445,222	29,686,119	175,059,205	34,712,474	34,673,544	150	18,460,634
	Other Building	120	32,313,156,805	5,143,199,499	2,952,001,586	2,191,197,912	2,151,720,142	241,019,215	559,262,230	1,798	42,848,781
	Repair & Maintenance	253	400,188,276	400,188,276	254,657,909	145,530,367	231,130,409	14,016,000	9,511,500	2,458	59,413,870
	Group Total	**752**	**45,113,051,599**	**14,200,604,012**	**6,215,712,211**	**7,984,891,802**	**4,678,905,435**	**450,224,269**	**1,086,582,507**	**14,371**	**544,589,923**
Highway	Rehabilitation	16	168,444,819	159,540,016	112,562,332	46,977,684	92,907,226	19,057,106	598,000	287	26,889,920
	New work	6	787,247,897	273,989,768	267,760,357	6,229,411	267,760,357	-	-	57	2,360,677
	Repair & Maintenance	6	4,250,781	4,250,781	3,552,120	698,661	3,552,120	-	-	27	499,928
	Group Total	**28**	**959,943,497**	**437,780,565**	**383,874,809**	**53,905,756**	**364,219,703**	**19,057,106**	**598,000**	**371**	**29,750,525**
Bridge	Bridge	6	218,829,728	83,122,000	50,520,353	32,601,647	49,324,353	1,196,000	-	90	5,461,295
	Group Total	**6**	**218,829,728**	**83,122,000**	**50,520,353**	**32,601,647**	**49,324,353**	**1,196,000**	**-**	**90**	**5,461,295**
Water supply & Drainage	Water Supply	22	11,957,187,826	4,053,395,606	2,089,832,662	1,963,562,945	893,843,136	350,298,346	845,691,180	1,193	167,933,165
	Group Total	**22**	**11,957,187,826**	**4,053,395,606**	**2,089,832,662**	**1,963,562,945**	**893,843,136**	**350,298,346**	**845,691,180**	**1,193**	**167,933,165**
Other	Other Construction	17	2,273,987,706	1,927,147,706	1,369,257,830	557,889,876	8,653,260	154,570	1,360,450,000	291	68,672,668
	Group Total	**17**	**2,273,987,706**	**1,927,147,706**	**1,369,257,830**	**557,889,876**	**8,653,260**	**154,570**	**1,360,450,000**	**291**	**68,672,668**
Total		**825**	**60,523,000,356**	**20,702,049,889**	**10,109,197,865**	**10,592,852,026**	**5,994,945,887**	**820,930,291**	**3,293,321,687**	**16,316**	**816,407,576**

Table 3 : Some Selected Indicators of Construction Activities Classified by Type of Construction Activity - 2010
(Public Sector)

Type of Construction Activity		No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
Building	Housing Units	44	4,146,923,064	2,129,031,864	631,254,515	1,497,777,349	614,367,015	9,113,500	7,774,000	631	111,631,410
	Collective living quarters	63	2,576,747,171	740,662,164	223,933,285	516,728,879	213,883,351	9,332,334	717,600	1,192	53,693,869
	Office Building	350	12,403,263,862	4,817,319,301	2,654,953,537	2,162,365,764	1,998,603,050	233,480,785	422,869,702	7,588	612,743,738
	Market Complex	15	1,691,421,185	1,601,033,485	1,063,836,555	537,196,930	1,061,022,496	1,020,059	1,794,000	257	36,610,134
	Factories	12	458,161,461	425,690,061	260,472,259	165,217,802	249,243,165	11,229,095	-	514	65,738,164
	School Building	345	3,569,031,688	2,553,136,230	1,506,018,242	1,047,117,989	1,375,984,984	52,103,171	77,930,086	6,028	426,584,626
	Hospital Building	127	4,918,553,801	1,932,894,340	1,164,524,950	768,369,389	1,014,832,907	57,971,915	91,720,128	2,075	255,593,576
	Other Building	373	17,109,525,032	6,577,120,228	3,761,576,530	2,815,543,698	2,854,268,365	264,319,002	642,989,164	5,289	455,026,603
	Repair & Maintenance	699	3,368,011,661	2,645,014,978	1,949,754,853	695,260,124	1,453,970,414	23,537,270	472,247,169	5,959	443,611,718
	Group Total	**2,028**	**50,241,638,925**	**23,421,902,651**	**13,216,324,726**	**10,205,577,924**	**10,836,175,747**	**662,107,131**	**1,718,041,849**	**29,533**	**2,461,233,838**
Highway	Rehabilitation	177	11,959,258,694	8,361,444,881	5,690,472,031	2,670,972,850	4,952,186,437	684,374,169	53,911,425	7,370	956,783,233
	New work	82	31,081,094,446	14,067,196,466	11,873,510,104	2,193,686,362	11,495,069,619	250,545,851	127,894,634	3,017	458,356,277
	Repair & Maintenance	71	6,652,068,720	2,638,162,245	1,295,885,395	1,342,276,850	1,171,500,595	63,877,582	60,507,219	3,303	222,488,298
	Group Total	**330**	**49,692,421,860**	**25,066,803,592**	**18,859,867,530**	**6,206,936,062**	**17,618,756,651**	**998,797,602**	**242,313,278**	**13,690**	**1,637,627,808**
Bridge	Bridge	80	9,765,500,654	3,089,363,065	1,790,652,577	1,298,710,489	1,495,768,405	195,011,958	99,872,213	2,167	317,795,268
	Culvert	26	74,721,583	73,147,856	39,261,704	33,886,152	37,665,007	1,596,697	-	407	20,471,521
	Causeway	3	50,955,457	50,955,457	40,281,280	10,674,177	40,281,280	-	-	51	1,450,449
	Repair & Maintenance	3	7,519,016	4,778,020	4,081,350	696,670	3,931,850	149,500	-	15	336,375
	Group Total	**112**	**9,898,696,710**	**3,218,244,398**	**1,874,276,911**	**1,343,967,488**	**1,577,646,542**	**196,758,155**	**99,872,213**	**2,640**	**340,053,613**
Water supply & Drainage	Water Supply	37	2,514,620,654	2,194,502,739	909,576,263	1,284,926,475	793,564,392	37,224,590	78,787,282	837	62,107,290
	Drainage	25	826,532,993	820,881,893	629,708,829	191,173,064	587,504,141	42,204,687	-	708	72,063,339
	Pump house	16	291,913,791	145,463,591	82,568,614	62,894,977	75,600,614	6,758,000	210,000	240	38,678,714
	Repair & Maintenance	4	11,552,948	11,552,948	4,904,346	6,648,602	2,299,696	2,604,650	-	65	2,858,800
	Group Total	**82**	**3,644,620,386**	**3,172,401,171**	**1,626,758,052**	**1,545,643,118**	**1,458,968,843**	**88,791,927**	**78,997,282**	**1,850**	**175,708,143**
Irrigation & Land Drainage	Anicut	9	25,075,254	25,075,254	16,184,062	8,891,192	16,124,062	48,000	12,000	90	5,351,856
	Sluices	9	48,407,499	48,407,499	26,185,625	22,221,874	25,831,310	354,315	-	209	16,944,154
	Spill	3	3,997,624	3,997,624	2,530,497	1,467,127	2,530,497	-	-	45	1,285,700
	Dam	18	1,066,530,318	481,357,418	288,980,809	192,376,609	227,386,809	61,594,000	-	347	34,346,010
	Irrigation canal	60	1,096,326,786	349,586,631	236,970,974	112,615,657	191,190,496	43,705,728	2,074,750	1,171	63,389,950
	Repair & Maintenance	14	58,533,153	53,437,379	36,015,200	17,422,179	33,297,150	1,518,050	1,200,000	398	13,020,251
	Group Total	**113**	**2,298,870,634**	**961,861,805**	**606,867,167**	**354,994,638**	**496,360,324**	**107,220,093**	**3,286,750**	**2,260**	**134,337,921**
Dredging & Reclamation	Filling	3	28,643,575	28,643,575	19,799,218	8,844,357	14,070,503	-	5,728,714	93	2,435,056
	Retaining wall	3	15,847,000	15,847,000	7,729,150	8,117,850	4,664,400	523,250	2,541,500	60	4,485,000
	Group Total	**6**	**44,490,575**	**44,490,575**	**27,528,368**	**16,962,207**	**18,734,903**	**523,250**	**8,270,214**	**153**	**6,920,056**
Other	Other Construction	62	2,729,802,598	1,731,992,628	1,240,214,411	491,778,217	180,785,216	53,345,900	1,006,083,295	929	116,160,132
	Group Total	**62**	**2,729,802,598**	**1,731,992,628**	**1,240,214,411**	**491,778,217**	**180,785,216**	**53,345,900**	**1,006,083,295**	**929**	**116,160,132**
Total		**2,733**	**118,550,541,688**	**57,617,696,820**	**37,451,837,165**	**20,165,859,654**	**32,187,428,226**	**2,107,544,058**	**3,156,864,881**	**51,055**	**4,872,041,511**

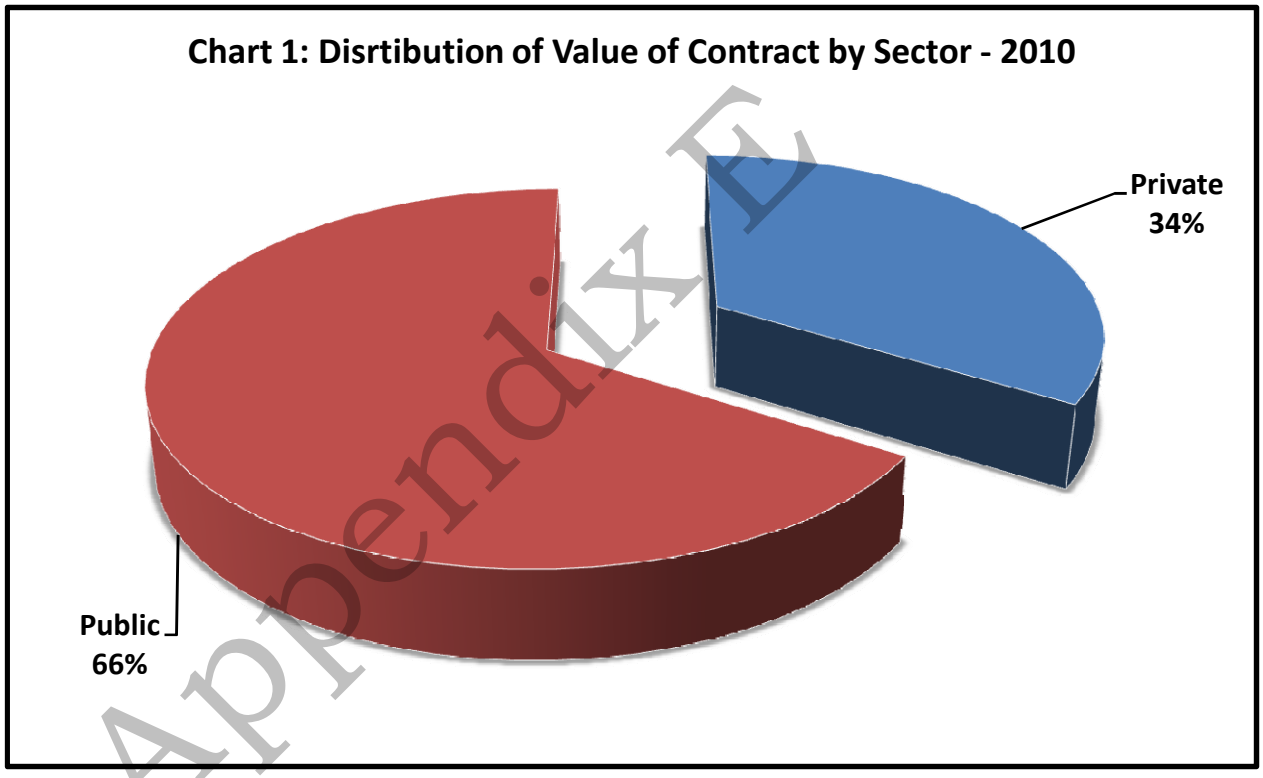


Chart 1: Disrtibution of Value of Contract by Sector - 2010
Private
34%
Public
66%

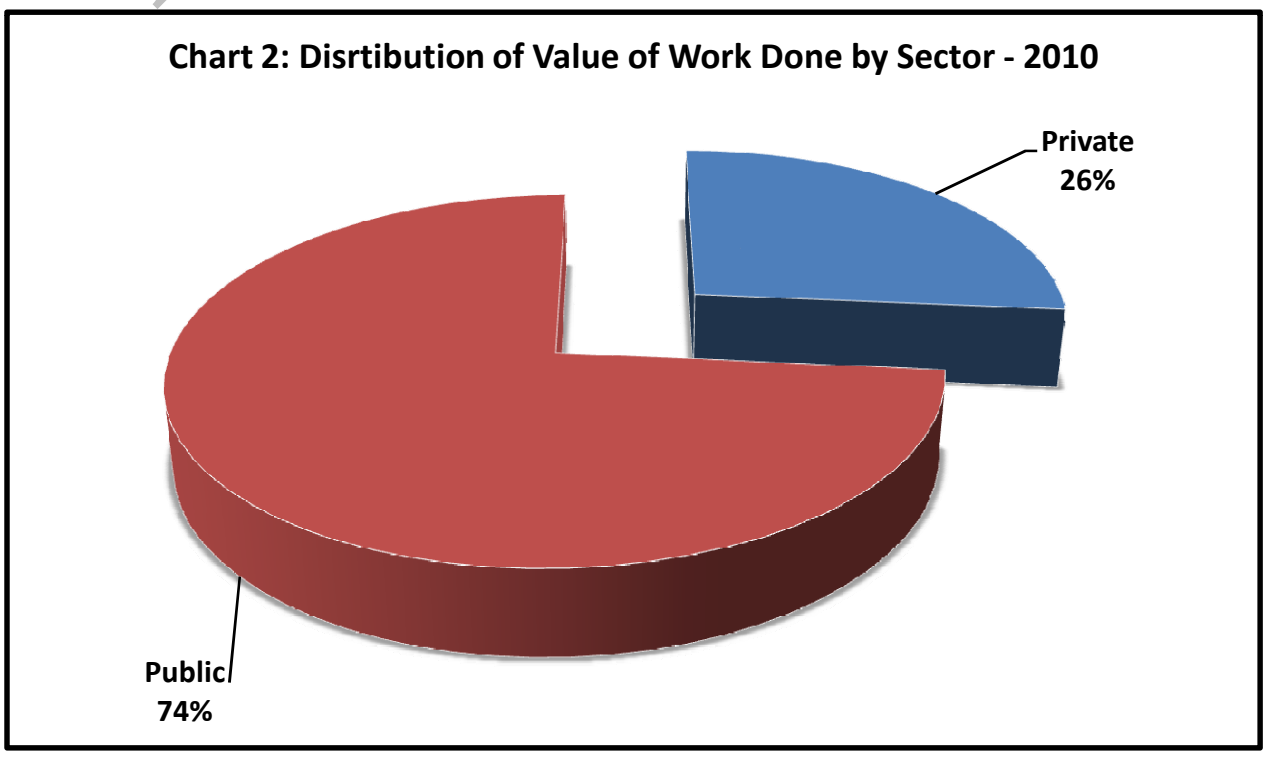


Chart 2: Disrtibution of Value of Work Done by Sector - 2010
Private
26%
Public
74%

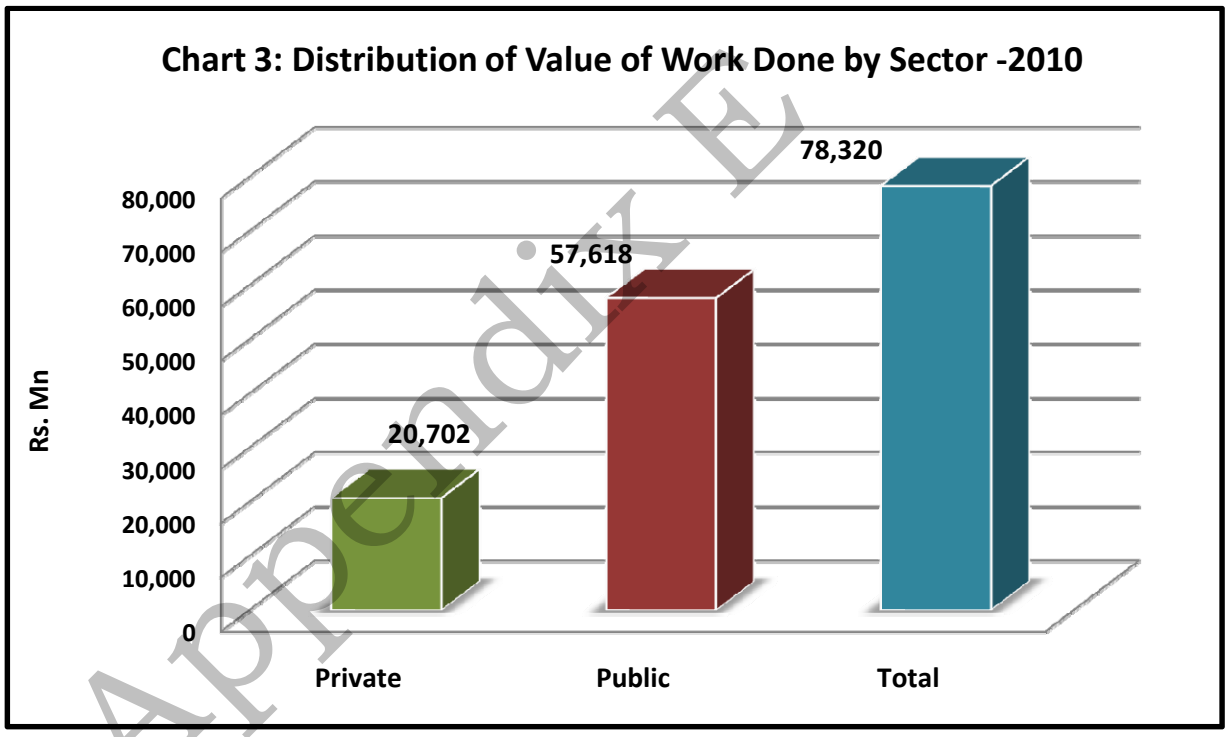


Chart 3: Distribution of Value of Work Done by Sector -2010
Rs. Mn
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
20,702
57,618
78,320
Private
Public
Total

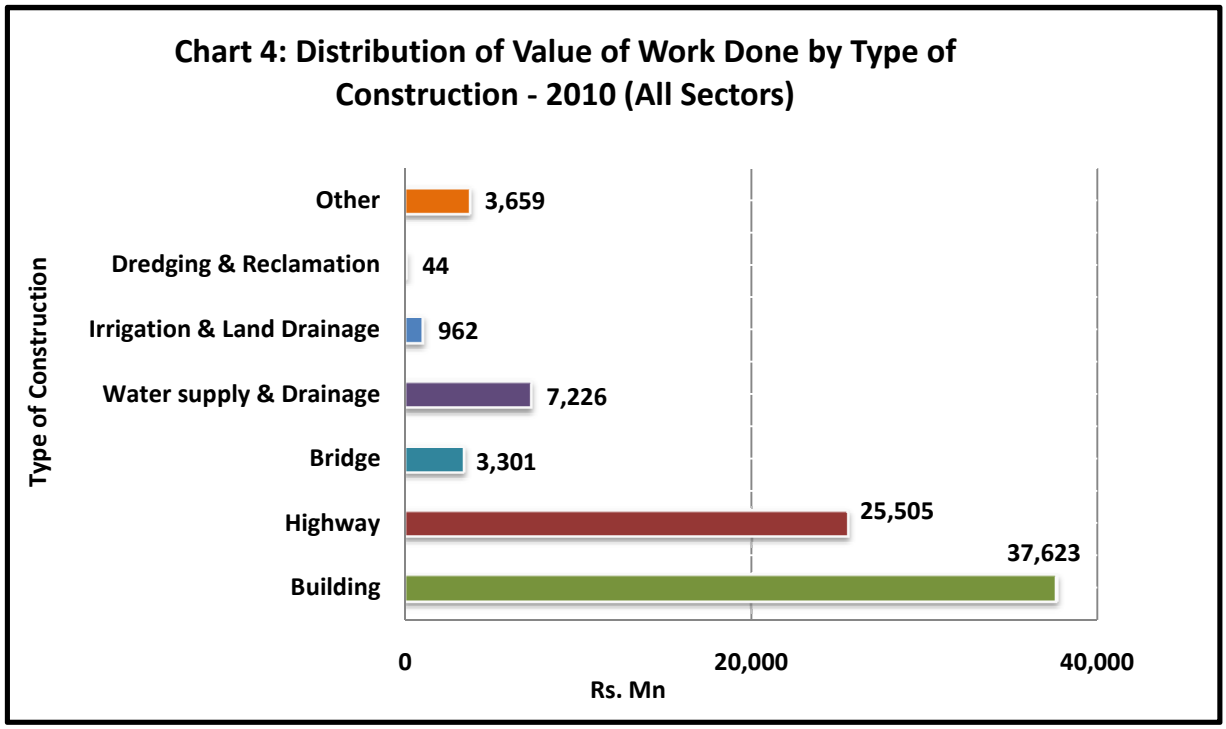


Chart 4: Distribution of Value of Work Done by Type of Construction - 2010 (All Sectors)
Type of Construction
Other
3,659
Dredging & Reclamation
44
Irrigation & Land Drainage
962
Water supply & Drainage
7,226
Bridge
3,301
Highway
25,505
Building
37,623
0
20,000
40,000
Rs. Mn

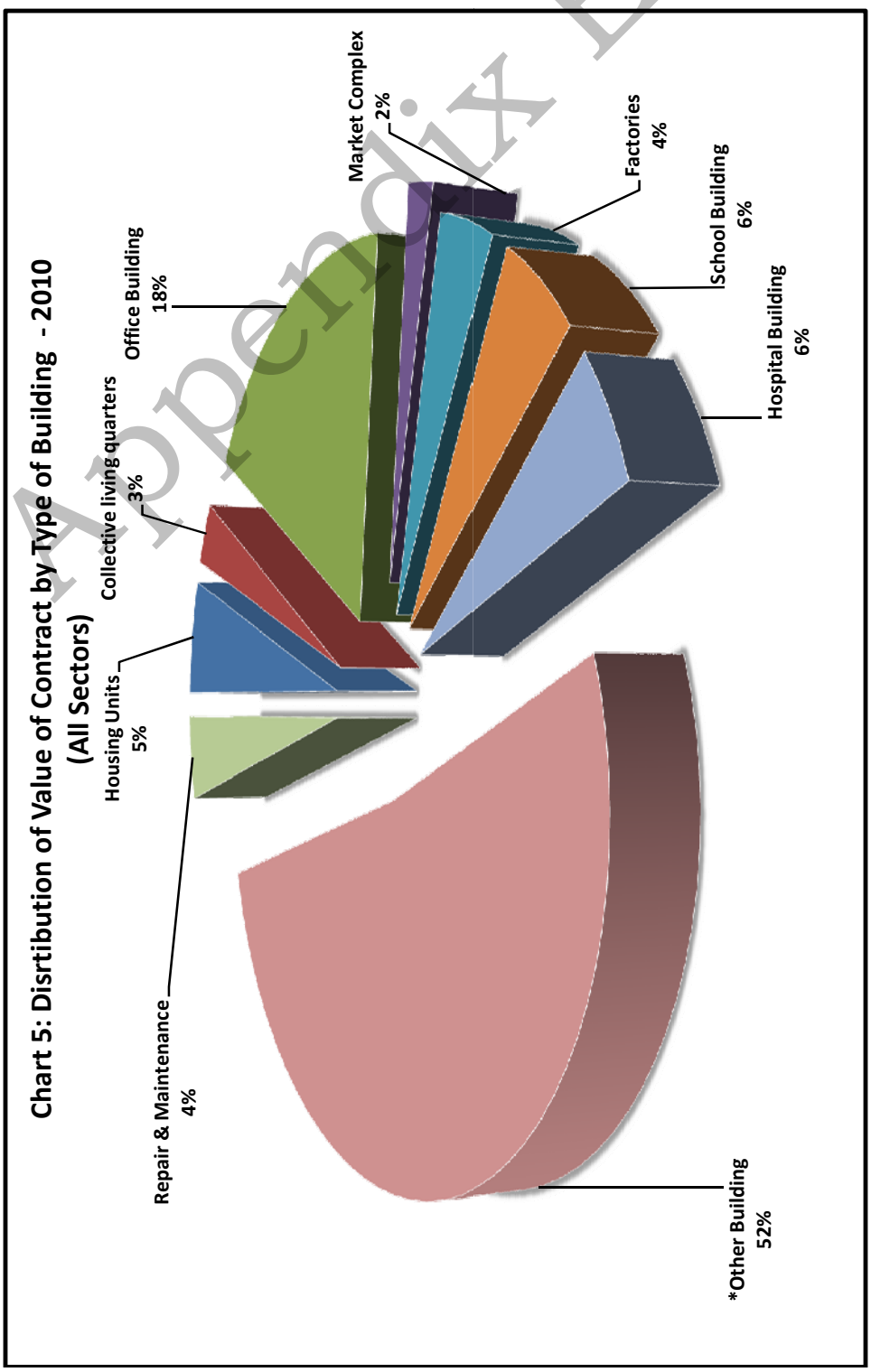


Chart 5: Disrtibution of Value of Contract by Type of Building - 2010
(All Sectors)
Market Complex 2%
Factories 4%
School Building 6%
Hospital Building 6%
*Other Building 52%
Repair & Maintenance 4%
Housing Units 5%
Collective living quarters 3%
Office Building 18%

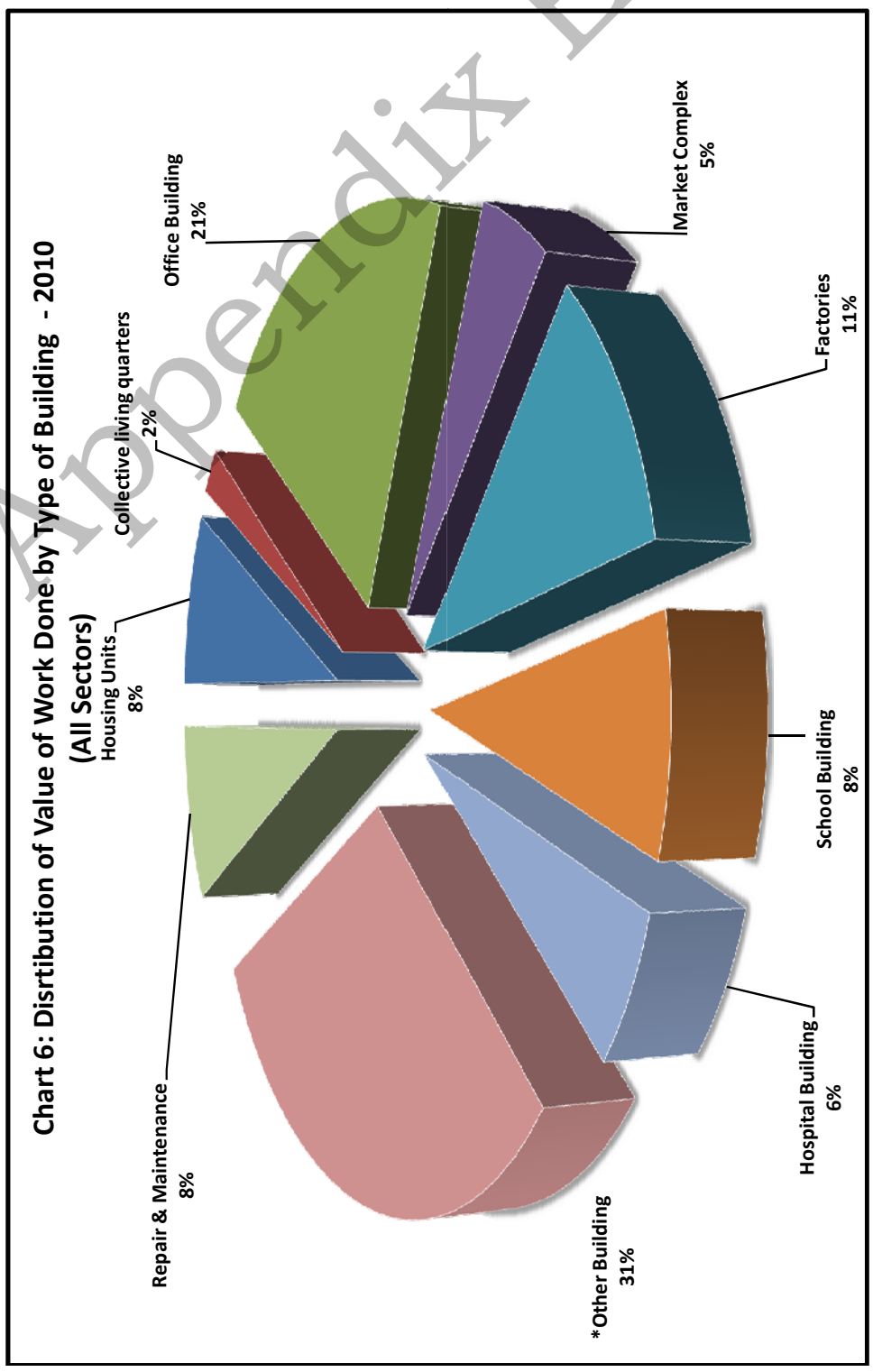


Chart 6: Disrtibution of Value of Work Done by Type of Building - 2010
(All Sectors)
Office Building
21%
Market Complex
5%
Collective living quarters
2%
Factories
11%
Housing Units
8%
School Building
8%
Repair & Maintenance
8%
Hospital Building
6%
*Other Building
31%

Table 4 : Raw Materials Consumed Classified by Type of Construction Activity - 2010
(All Sectors)

Type of Construction Activity		Raw Materials Used (Rs.)								Total
		Cement	Sand	Rubble & Metal	Bricks	Timber	Iron & Steel	Roofing Materials	Other	
Building	Housing Units	183,537,101	105,990,886	61,559,162	133,891,880	150,930,641	401,429,583	59,442,085	38,518,429	1,135,299,767
	Collective living quarters	61,905,603	19,019,121	14,536,914	27,380,001	26,834,095	45,301,772	20,203,262	16,067,003	231,247,776
	Office Building	475,036,887	213,331,747	209,596,404	178,442,588	278,303,987	553,465,049	143,159,421	489,345,898	2,540,681,980
	Market Complex	280,944,271	126,346,327	95,663,420	132,344,056	167,386,802	321,335,793	97,848,036	13,866,891	1,235,735,596
	Factories	108,404,423	35,210,593	23,929,912	33,977,660	49,736,988	181,319,326	298,594,969	114,269,586	845,443,460
	School Building	324,213,256	134,916,191	107,523,999	130,537,289	165,608,333	504,921,896	114,839,285	163,130,912	1,645,691,162
	Hospital Building	204,602,270	126,892,962	98,098,823	89,936,382	107,075,219	349,483,608	92,667,596	121,135,251	1,189,892,112
	Other Building	1,337,960,737	366,752,809	292,906,145	481,680,156	492,152,167	964,007,139	176,994,951	893,534,406	5,005,988,506
	Repair & Maintenance	215,274,277	127,164,616	117,147,586	82,086,593	224,509,540	268,269,528	163,833,829	486,814,856	1,685,100,823
	Group Total	**3,191,878,825**	**1,255,625,252**	**1,020,962,365**	**1,290,276,605**	**1,662,537,772**	**3,589,533,694**	**1,167,583,434**	**2,336,683,232**	**15,515,081,182**
Highway	Rehabilitation	1,198,085,787	741,557,928	1,506,858,590	104,324,900	31,915,350	367,472,007	452,208	1,094,426,893	5,045,093,663
	New work	50,387,282	2,480,818,540	5,069,895,941	38,182,970	4,650,132	35,567,390	119,600	4,083,208,124	11,762,829,977
	Repair & Maintenance	41,282,086	43,878,448	313,561,674	35,435,776	159,288	27,752,347	-	712,983,096	1,175,052,714
	Group Total	**1,289,755,155**	**3,266,254,916**	**6,890,316,205**	**177,943,646**	**36,724,770**	**430,791,744**	**571,808**	**5,890,618,113**	**17,982,976,354**
Bridge	Bridge	349,425,737	128,287,095	249,778,344	2,052,121	42,020,480	241,156,332	-	532,372,650	1,545,092,758
	Culvert	12,689,889	5,195,434	6,954,955	274,500	577,352	7,855,354	-	4,117,522	37,665,007
	Causeway	7,475,000	962,780	1,943,500	-	-	29,900,000	-	-	40,281,280
	Repair & Maintenance	777,400	254,150	598,000	-	-	1,554,800	-	747,500	3,931,850
	Group Total	**370,368,026**	**134,699,459**	**259,274,799**	**2,326,621**	**42,597,832**	**280,466,486**	-	**537,237,672**	**1,626,970,895**
Water supply & Drainage	Water Supply	166,563,954	98,015,794	100,365,283	18,292,624	31,002,682	362,784,200	5,240,591	905,142,398	1,687,407,528
	Drainage	109,674,856	76,854,556	65,497,176	35,485,398	17,005,640	130,684,899	149,500	152,152,117	587,504,141
	Pump house	9,863,790	4,865,061	8,790,065	388,252	2,307,220	40,221,876	4,230,850	4,933,500	75,600,614
	Repair & Maintenance	286,344	153,820	1,663,852	-	-	35,880	-	159,800	2,299,696
	Group Total	**286,388,944**	**179,889,231**	**176,316,376**	**54,166,274**	**50,315,543**	**533,726,855**	**9,620,941**	**1,062,387,815**	**2,352,811,979**
Irrigation & Land Drainage	Anicut	5,711,136	3,821,725	2,226,645	90,000	1,490,934	2,202,919	345,000	235,703	16,124,062
	Sluices	8,977,003	3,570,317	5,172,942	1,115,046	1,452,617	4,807,603	568,342	167,440	25,831,310
	Spill	986,891	657,929	328,966	-	227,745	328,966	-	-	2,530,497
	Dam	90,111,137	53,240,945	37,070,522	209,300	17,136,958	28,048,197	-	1,569,750	227,386,809
	Irrigation canal	48,858,220	28,174,674	45,300,306	1,836,120	6,527,957	33,949,660	1,644,500	24,899,058	191,190,496
	Repair & Maintenance	14,414,700	5,566,450	5,384,200	672,750	674,500	4,820,450	-	1,764,100	33,297,150
	Group Total	**169,059,087**	**95,032,040**	**95,483,581**	**3,923,216**	**27,510,711**	**74,157,795**	**2,557,842**	**28,636,051**	**496,360,324**
Dredging & Reclamation	Filling	-	-	-	-	-	-	-	14,070,503	14,070,503
	Retaining wall	1,495,000	523,250	448,500	299,000	299,000	897,000	254,150	448,500	4,664,400
	Group Total	**1,495,000**	**523,250**	**448,500**	**299,000**	**299,000**	**897,000**	**254,150**	**14,519,003**	**18,734,903**
Other	Other Construction	22,692,723	13,722,852	40,749,915	6,777,222	8,892,271	20,290,380	469,430	75,843,684	189,438,476
	Group Total	**22,692,723**	**13,722,852**	**40,749,915**	**6,777,222**	**8,892,271**	**20,290,380**	**469,430**	**75,843,684**	**189,438,476**
Total		**5,331,637,760**	**4,945,747,000**	**8,483,551,741**	**1,535,712,584**	**1,828,877,899**	**4,929,863,954**	**1,181,057,605**	**9,945,925,570**	**38,182,374,113**

Table 5 : Raw Materials Consumed Classified by Type of Construction Activity - 2010
(Private Sector)

Type of Construction Activity		Raw Materials Used (Rs.)								Total
		Cement	Sand	Rubble & Metal	Bricks	Timber	Iron & Steel	Roofing Materials	Other	
Building	Housing Units	97,739,528	82,823,405	47,820,236	115,402,246	104,693,453	26,927,238	29,372,716	16,153,929	520,932,751
	Collective living quarters	3,049,800	1,796,990	3,138,005	2,006,290	-	6,326,840	-	1,046,500	17,364,425
	Office Building	134,271,843	36,138,249	40,418,351	34,281,612	38,347,237	156,665,966	25,404,837	76,550,835	542,078,930
	Market Complex	21,032,400	9,350,100	9,170,700	15,402,600	29,387,200	65,416,700	12,152,100	12,801,300	174,713,100
	Factories	53,180,143	14,164,694	7,595,871	13,703,568	14,660,066	115,931,476	271,904,091	105,060,386	596,200,295
	School Building	63,367,133	10,962,461	16,408,677	23,886,380	11,330,461	116,237,613	2,819,127	24,694,323	269,706,178
	Hospital Building	14,506,643	5,121,123	9,877,465	-	13,582,371	75,175,130	6,323,850	50,472,623	175,059,205
	Other Building	653,610,535	134,545,814	119,334,420	185,771,278	222,121,346	363,372,709	34,071,754	438,892,285	2,151,720,142
	Repair & Maintenance	32,470,754	16,896,576	19,611,730	11,681,628	59,830,887	31,573,144	20,339,780	38,725,910	231,130,409
	Group Total	**1,073,228,779**	**311,799,412**	**273,375,455**	**402,135,602**	**493,953,021**	**957,626,816**	**402,388,255**	**764,398,091**	**4,678,905,435**
Highway	Rehabilitation	26,041,946	13,336,110	44,834,380	1,495,000	256,914	235,600	3,708	6,703,568	92,907,226
	New work	2,706,967	2,221,271	1,497,990	-	-	-	-	261,334,130	267,760,357
	Repair & Maintenance	29,900	14,950	-	89,700	-	-	-	3,417,570	3,552,120
	Group Total	**28,778,813**	**15,572,331**	**46,332,370**	**1,584,700**	**256,914**	**235,600**	**3,708**	**271,455,268**	**364,219,703**
Bridge	Bridge	1,046,500	2,603,112	29,478,410	-	-	897,000	-	15,299,331	49,324,353
	Group Total	**1,046,500**	**2,603,112**	**29,478,410**	**-**	**-**	**897,000**	**-**	**15,299,331**	**49,324,353**
Water supply & Drainage	Water Supply	71,464,094	52,104,638	43,563,944	2,863,583	22,368,070	206,818,417	3,474,326	491,186,063	893,843,136
	Group Total	**71,464,094**	**52,104,638**	**43,563,944**	**2,863,583**	**22,368,070**	**206,818,417**	**3,474,326**	**491,186,063**	**893,843,136**
Other	Other Construction	1,598,538	538,200	1,363,258	992,680	304,980	493,350	275,080	3,087,175	8,653,260
	Group Total	**1,598,538**	**538,200**	**1,363,258**	**992,680**	**304,980**	**493,350**	**275,080**	**3,087,175**	**8,653,260**
Total		**1,176,116,724**	**382,617,693**	**394,113,437**	**407,576,565**	**516,882,985**	**1,166,071,183**	**406,141,369**	**1,545,425,928**	**5,994,945,887**

Table 6 : Raw Materials Consumed Classified by Type of Construction Activity - 2010
(Public Sector)

Type of Construction Activity		Raw Materials Used (Rs.)								
		Cement	Sand	Rubble & Metal	Bricks	Timber	Iron & Steel	Roofing Materials	Other	Total
Building	Housing Units	85,797,572	23,167,481	13,738,926	18,489,634	46,237,189	374,502,345	30,069,368	22,364,500	614,367,015
	Collective living quarters	58,855,806	17,222,131	11,398,909	25,373,711	26,834,095	38,974,934	20,203,263	15,020,503	213,883,351
	Office Building	340,765,043	177,193,497	169,178,053	144,160,976	239,956,750	396,799,083	117,754,584	412,795,063	1,998,603,050
	Market Complex	259,911,871	116,996,227	86,492,720	116,941,456	137,999,602	255,919,093	85,695,936	1,065,591	1,061,022,496
	Factories	55,224,280	21,045,901	16,334,041	20,274,093	35,076,922	65,387,850	26,690,878	9,209,200	249,243,165
	School Building	260,846,123	123,953,729	91,115,322	106,650,909	154,277,872	388,684,282	112,020,158	138,436,589	1,375,984,984
	Hospital Building	190,095,627	121,771,839	88,221,358	89,936,382	93,492,848	274,308,478	86,343,746	70,662,628	1,014,832,907
	Other Building	684,350,201	232,206,995	173,571,725	295,908,877	270,030,820	600,634,429	142,923,197	454,642,121	2,854,268,365
	Repair & Maintenance	182,803,523	110,268,040	97,535,856	70,404,965	164,678,653	236,696,384	143,494,049	448,088,946	1,453,970,414
	Group Total	**2,118,650,046**	**943,825,840**	**747,586,910**	**888,141,003**	**1,168,584,751**	**2,631,906,878**	**765,195,179**	**1,572,285,141**	**10,836,175,747**
Highway	Rehabilitation	1,172,043,841	728,221,818	1,462,024,210	102,829,900	31,658,436	367,236,407	448,500	1,087,723,325	4,952,186,437
	New work	47,680,315	2,478,597,269	5,068,397,951	38,182,970	4,650,132	35,567,390	119,600	3,821,873,994	11,495,069,619
	Repair & Maintenance	41,252,186	43,863,498	313,561,674	35,346,076	159,288	27,752,347	-	709,565,526	1,171,500,595
	Group Total	**1,260,976,342**	**3,250,682,585**	**6,843,983,835**	**176,358,946**	**36,467,856**	**430,556,144**	**568,100**	**5,619,162,845**	**17,618,756,651**
Bridge	Bridge	348,379,237	125,683,983	220,299,934	2,052,121	42,020,480	240,259,332	-	517,073,319	1,495,768,405
	Culvert	12,689,889	5,195,434	6,954,955	274,500	577,352	7,855,354	-	4,117,522	37,665,007
	Causeway	7,475,000	962,780	1,943,500	-	-	29,900,000	-	-	40,281,280
	Repair & Maintenance	777,400	254,150	598,000	-	-	1,554,800	-	747,500	3,931,850
	Group Total	**369,321,526**	**132,096,347**	**229,796,389**	**2,326,621**	**42,597,832**	**279,569,486**	**-**	**521,938,341**	**1,577,646,542**
Water supply & Drainage	Water Supply	95,099,860	45,911,156	56,801,339	15,429,041	8,634,613	155,965,783	1,766,265	413,956,335	793,564,392
	Drainage	109,674,856	76,854,556	65,497,176	35,485,398	17,005,640	130,684,899	149,500	152,152,117	587,504,141
	Pump house	9,863,790	4,865,061	8,790,065	388,252	2,307,220	40,221,876	4,230,850	4,933,500	75,600,614
	Repair & Maintenance	286,344	153,820	1,663,852	-	-	35,880	-	159,800	2,299,696
	Group Total	**214,924,850**	**127,784,593**	**132,752,432**	**51,302,691**	**27,947,473**	**326,908,438**	**6,146,615**	**571,201,752**	**1,458,968,843**
Irrigation & Land Drainage	Anicut	5,711,136	3,821,725	2,226,645	90,000	1,490,934	2,202,919	345,000	235,703	16,124,062
	Sluices	8,977,003	3,570,317	5,172,942	1,115,046	1,452,617	4,807,603	568,342	167,440	25,831,310
	Spill	986,891	657,929	328,966	-	227,745	328,966	-	-	2,530,497
	Dam	90,111,137	53,240,945	37,070,522	209,300	17,136,958	28,048,197	-	1,569,750	227,386,809
	Irrigation canal	48,858,220	28,174,674	45,300,306	1,836,120	6,527,957	33,949,660	1,644,500	24,899,058	191,190,496
	Repair & Maintenance	14,414,700	5,566,450	5,384,200	672,750	674,500	4,820,450	-	1,764,100	33,297,150
	Group Total	**169,059,087**	**95,032,040**	**95,483,581**	**3,923,216**	**27,510,711**	**74,157,795**	**2,557,842**	**28,636,051**	**496,360,324**
Dredging & Reclamation	Filling	-	-	-	-	-	-	-	14,070,503	14,070,503
	Retaining wall	1,495,000	523,250	448,500	299,000	299,000	897,000	254,150	448,500	4,664,400
	Group Total	**1,495,000**	**523,250**	**448,500**	**299,000**	**299,000**	**897,000**	**254,150**	**14,519,003**	**18,734,903**
Other	Other Construction	21,094,185	13,184,652	39,386,657	5,784,542	8,587,291	19,797,030	194,350	72,756,509	180,785,216
	Group Total	**21,094,185**	**13,184,652**	**39,386,657**	**5,784,542**	**8,587,291**	**19,797,030**	**194,350**	**72,756,509**	**180,785,216**
Total		**4,155,521,036**	**4,563,129,307**	**8,089,438,304**	**1,128,136,019**	**1,311,994,914**	**3,763,792,771**	**774,916,236**	**8,400,499,642**	**32,187,428,226**

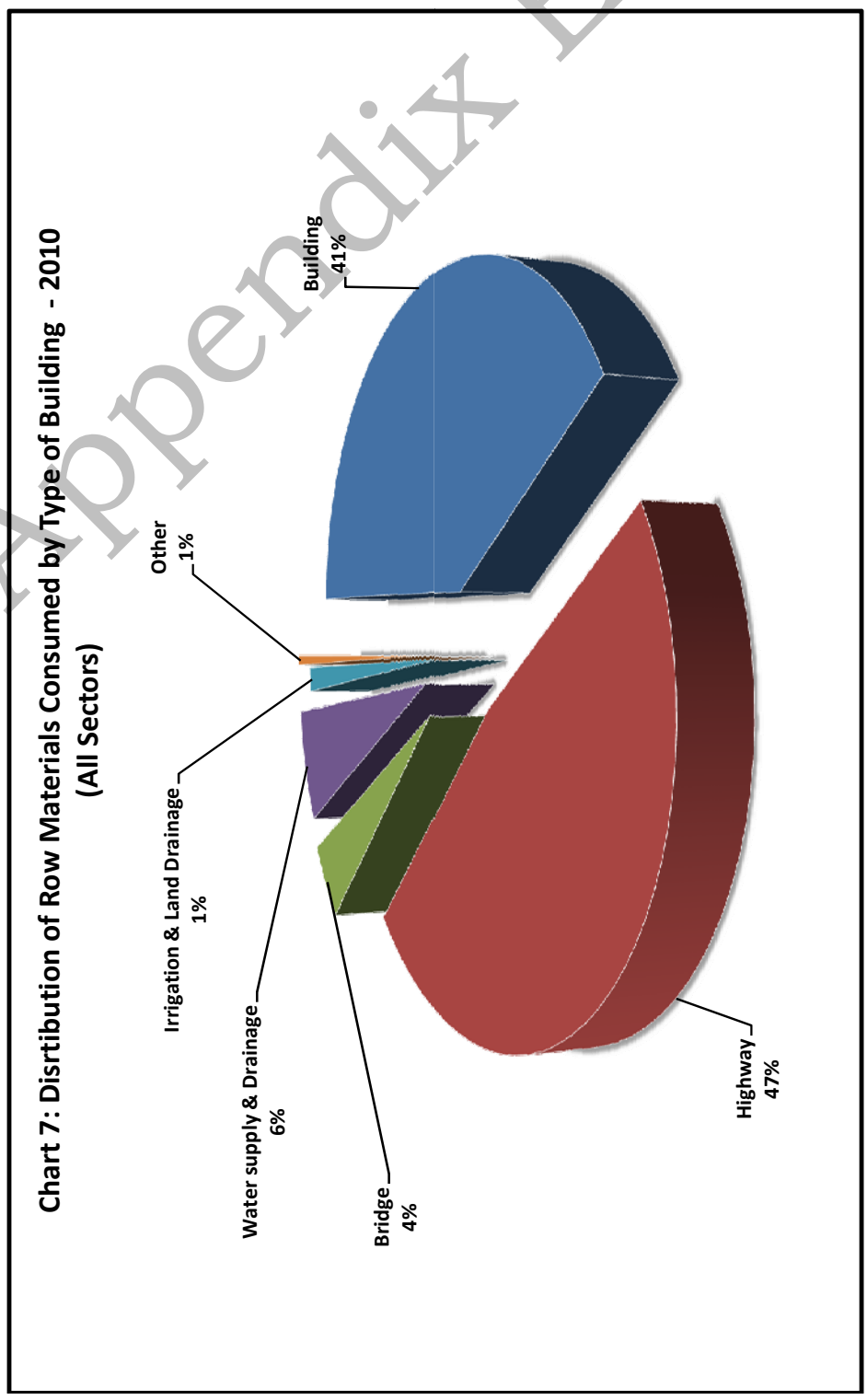


Chart 7: Disrtibution of Row Materials Consumed by Type of Building - 2010
(All Sectors)
Building 41%
Other 1%
Irrigation & Land Drainage 1%
Water supply & Drainage 6%
Bridge 4%
Highway 47%

Table 7 : Average No. of Employees and Salaries Classified by Type of Construction Activity - 2010 (All Sectors)

Type of Construction Activity		Male Employees (No.)	Salaries for Male Employees (Rs.)	Female Employees (No.)	Salaries for Female Employees (Rs.)
Building	Housing Units	8,533	281,921,302	413	6,644,309
	Collective living quarters	1,174	50,514,064	54	5,120,315
	Office Building	7,739	633,582,709	345	66,205,096
	Market Complex	997	116,439,484	12	2,429,650
	Factories	685	89,853,232	3	743,792
	School Building	6,060	462,249,027	163	15,165,599
	Hospital Building	2,078	238,915,047	147	35,139,163
	Other Building	6,982	482,497,805	105	15,377,579
	Repair & Maintenance	8,337	501,118,818	80	1,906,771
	Group Total	**42,585**	**2,857,091,488**	**1,322**	**148,732,274**
Highway	Rehabilitation	7,405	968,067,126	252	15,606,027
	New work	2,739	413,062,334	335	47,654,620
	Repair & Maintenance	1,866	123,686,038	1,464	99,302,188
	Group Total	**12,010**	**1,504,815,498**	**2,051**	**162,562,835**
Bridge	Bridge	2,171	308,333,207	86	14,923,356
	Culvert	407	20,471,521	-	-
	Causeway	39	1,116,765	12	333,684
	Repair & Maintenance	15	336,375	-	-
	Group Total	**2,632**	**330,257,868**	**98**	**15,257,040**
Water supply & Drainage	Water Supply	1,771	215,554,764	258	14,485,691
	Drainage	642	68,650,792	66	3,412,547
	Pump house	231	37,481,398	9	1,197,316
	Repair & Maintenance	65	2,858,800	-	-
	Group Total	**2,709**	**324,545,754**	**333**	**19,095,554**
Irrigation & Land Drainage	Anicut	90	5,351,856	-	-
	Sluices	164	14,585,044	45	2,359,110
	Spill	27	1,136,200	18	149,500
	Dam	323	32,997,819	24	1,348,191
	Irrigation canal	1,045	61,122,030	126	2,267,920
	Repair & Maintenance	293	10,962,234	105	2,058,017
	Group Total	**1,942**	**126,155,183**	**318**	**8,182,738**
Dredging & Reclamation	Filling	72	401,856	21	2,033,200
	Retaining wall	60	4,485,000	-	-
	Group Total	**132**	**4,886,856**	**21**	**2,033,200**
Other	Other Construction	1,155	172,429,907	65	12,402,892
	Group Total	**1,155**	**172,429,907**	**65**	**12,402,892**
Total		**63,165**	**5,320,182,554**	**4,208**	**368,266,533**

Table 8 : Average No. of Employees and Salaries Classified by Type of Construction Activity - 2010 (Private Sector)

Type of Construction Activity		Male Employees (No.)	Salaries for Male Employees (Rs.)	Female Employees (No.)	Salaries for Female Employees (Rs.)
Building	Housing Units	7,956	176,822,201	358	112,000
	Collective living quarters	30	1,611,610	6	328,900
	Office Building	440	70,267,108	57	16,776,959
	Market Complex	752	82,259,000	-	-
	Factories	173	24,858,860	-	-
	School Building	194	50,830,000	-	-
	Hospital Building	150	18,460,634	-	-
	Other Building	1,783	41,114,581	15	1,734,200
	Repair & Maintenance	2,458	59,413,870	-	-
	Group Total	**13,936**	**525,637,864**	**436**	**18,952,059**
Highway	Rehabilitation	287	26,889,920	-	-
	New work	57	2,360,677	-	-
	Repair & Maintenance	27	499,928	-	-
	Group Total	**371**	**29,750,525**	-	-
Bridge	Bridge	90	5,461,295	-	-
	Group Total	**90**	**5,461,295**	-	-
Water supply & Drainage	Water Supply	1,172	167,440,180	21	492,985
	Group Total	**1,172**	**167,440,180**	**21**	**492,985**
Other	Other Construction	261	62,513,268	30	6,159,400
	Group Total	**261**	**62,513,268**	**30**	**6,159,400**
Total		**15,830**	**790,803,132**	**487**	**25,604,444**

Table 9 : Average No. of Employees and Salaries Classified by Type of Construction Activity - 2010 (Public Sector)

Type of Construction Activity			Columns			
			Male Employees (No.)	**Salaries for Male Employees (Rs.)**	**Female Employees (No.)**	**Salaries for Female Employees (Rs.)**
Rows	**Building**	Housing Units	577	105,099,101	55	6,532,309
		Collective living quarters	1,144	48,902,454	48	4,791,415
		Office Building	7,300	563,315,601	288	49,428,137
		Market Complex	245	34,180,484	12	2,429,650
		Factories	511	64,994,372	3	743,792
		School Building	5,865	411,419,027	163	15,165,599
		Hospital Building	1,929	220,454,413	147	35,139,163
		Other Building	5,199	441,383,224	90	13,643,379
		Repair & Maintenance	5,879	441,704,948	80	1,906,771
		Group Total	**28,649**	**2,331,453,624**	**886**	**129,780,215**
	Highway	Rehabilitation	7,118	941,177,206	252	15,606,027
		New work	2,682	410,701,657	335	47,654,620
		Repair & Maintenance	1,839	123,186,110	1,464	99,302,188
		Group Total	**11,639**	**1,475,064,973**	**2,051**	**162,562,835**
	Bridge	Bridge	2,081	302,871,912	86	14,923,356
		Culvert	407	20,471,521	-	-
		Causeway	39	1,116,765	12	333,684
		Repair & Maintenance	15	336,375	-	-
		Group Total	**2,542**	**324,796,573**	**98**	**15,257,040**
	Water supply & Drainage	Water Supply	599	48,114,584	237	13,992,706
		Drainage	642	68,650,792	66	3,412,547
		Pump house	231	37,481,398	9	1,197,316
		Repair & Maintenance	65	2,858,800	-	-
		Group Total	**1,537**	**157,105,574**	**312**	**18,602,569**
	Irrigation & Land Drainage	Anicut	90	5,351,856	-	-
		Sluices	164	14,585,044	45	2,359,110
		Spill	27	1,136,200	18	149,500
		Dam	323	32,997,819	24	1,348,191
		Irrigation canal	1,045	61,122,030	126	2,267,920
		Repair & Maintenance	293	10,962,234	105	2,058,017
		Group Total	**1,942**	**126,155,183**	**318**	**8,182,738**
	Dredging & Reclamation	Filling	72	401,856	21	2,033,200
		Retaining wall	60	4,485,000	-	-
		Group Total	**132**	**4,886,856**	**21**	**2,033,200**
	Other	Other Construction	894	109,916,639	35	6,243,492
		Group Total	**894**	**109,916,639**	**35**	**6,243,492**
	Total		**47,335**	**4,529,379,422**	**3,721**	**342,662,089**

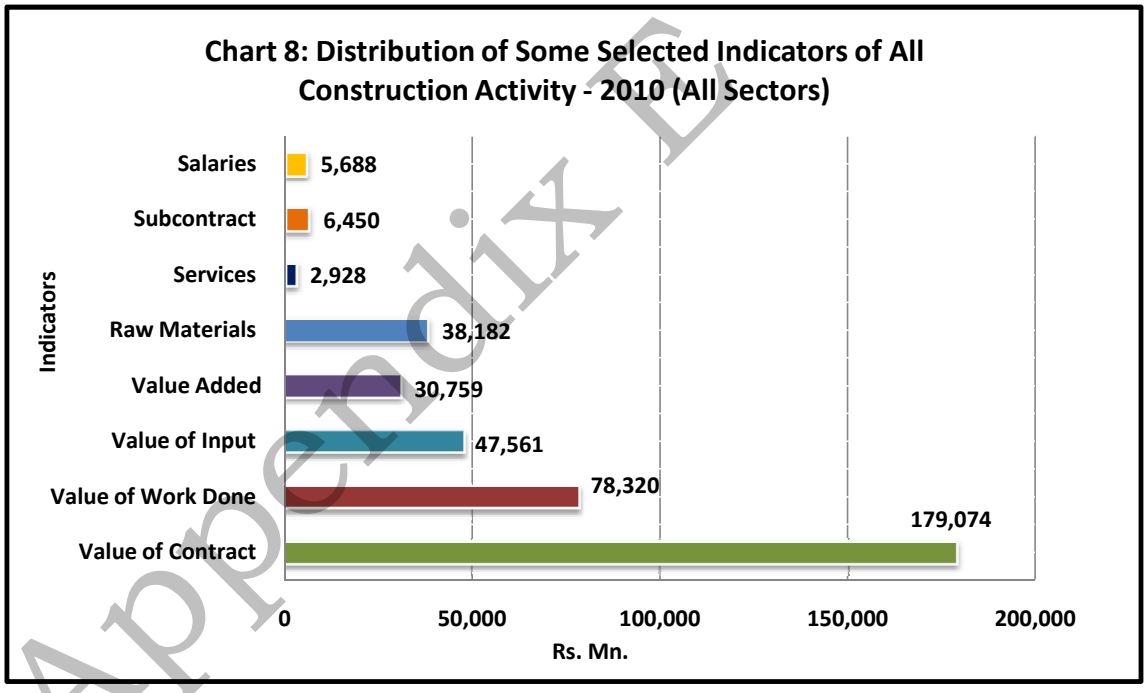


Chart 8: Distribution of Some Selected Indicators of All Construction Activity - 2010 (All Sectors)
Indicators
Salaries
Subcontract
Services
Raw Materials
Value Added
Value of Input
Value of Work Done
Value of Contract
5,688
6,450
2,928
38,182
30,759
47,561
78,320
179,074
0
50,000
100,000
150,000
200,000
Rs. Mn.

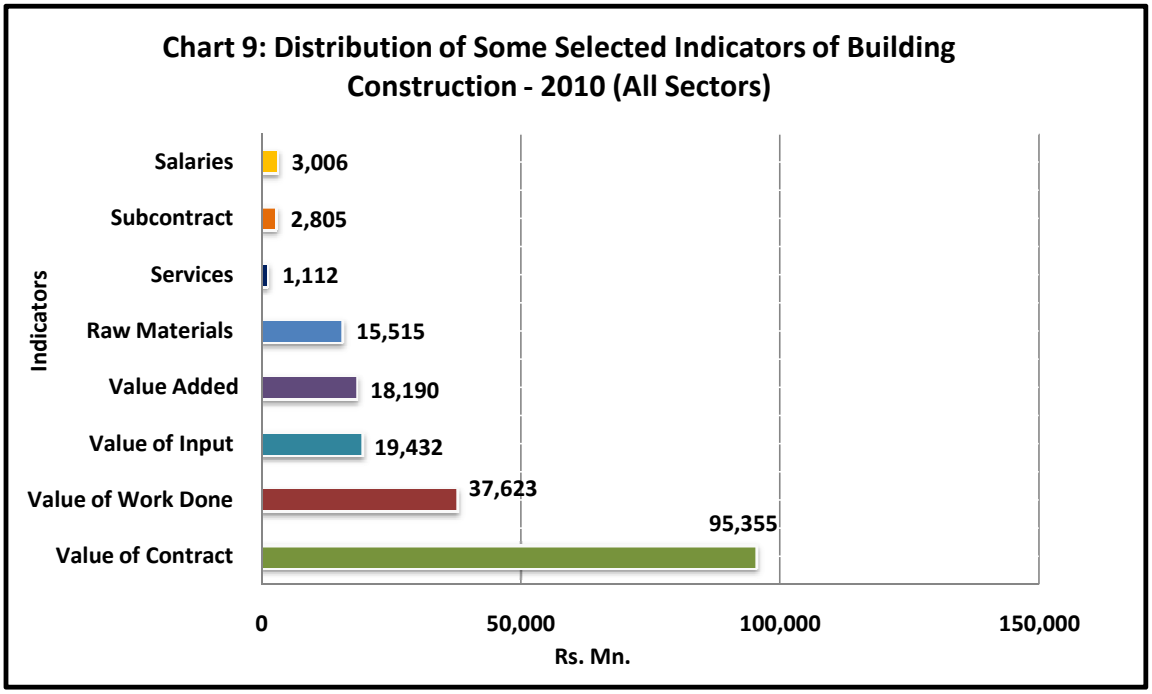


Chart 9: Distribution of Some Selected Indicators of Building Construction - 2010 (All Sectors)
Indicators
Salaries
Subcontract
Services
Raw Materials
Value Added
Value of Input
Value of Work Done
Value of Contract
3,006
2,805
1,112
15,515
18,190
19,432
37,623
95,355
0
50,000
100,000
150,000
Rs. Mn.

Table 10 : Some Selected Indicators of Construction Activities Classified by Value of Work Done Size Class - 2010
(All Sectors)

Value of Work Done Size Class (Rs.)	No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
less than 250,000	96	31,417,923	10,647,189	7,177,802	3,469,386	3,248,071	3,864,490	65,240	317	1,580,679
250,000 - 499,999	359	146,027,224	145,819,419	94,808,209	51,011,210	84,757,007	8,106,452	1,944,750	2,033	35,745,246
500,000 - 999,999	361	252,575,303	236,687,025	153,263,562	83,423,464	131,413,648	21,036,273	813,640	2,957	51,597,559
1,000,000 - 14,999,999	2,188	16,269,319,323	9,428,758,040	6,072,388,703	3,356,369,337	5,333,964,417	373,159,025	365,265,261	35,622	1,857,538,486
15,000,000 - 49,999,999	333	17,583,868,058	8,377,183,249	5,043,828,085	3,333,355,164	3,661,946,230	455,004,899	926,876,956	8,993	1,134,360,600
50,000,000 & above	221	144,790,334,214	60,120,651,789	36,189,568,669	23,931,083,120	28,967,044,739	2,067,303,210	5,155,220,721	17,447	2,607,626,517
Total	**3,558**	**179,073,542,045**	**78,319,746,711**	**47,561,035,030**	**30,758,711,681**	**38,182,374,112**	**2,928,474,350**	**6,450,186,568**	**67,369**	**5,688,449,086**

Table 11 : Some Selected Indicators of Construction Activities Classified by Value of Work Done Size Class - 2010
(Private Sector)

Value of Work Done Size Class (Rs.)	No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
less than 250,000	32	24,446,956	3,676,220	2,183,639	1,492,583	242,138	1,941,500	-	155	813,080
250,000 - 499,999	84	34,016,587	34,016,587	21,842,014	12,174,573	19,039,514	2,772,500	30,000	578	9,435,300
500,000 - 999,999	124	84,559,708	75,419,000	47,215,823	28,203,176	42,279,673	4,936,150	-	616	10,804,210
1,000,000 - 14,999,999	474	2,026,561,273	1,538,154,258	1,011,956,998	526,197,259	916,457,440	45,364,381	50,135,177	11,959	323,004,016
15,000,000 - 49,999,999	42	1,306,834,420	1,112,381,714	725,366,453	387,015,261	562,023,468	23,621,682	139,721,304	1,088	115,292,274
50,000,000 & above	69	57,046,581,412	17,938,402,111	8,300,632,937	9,637,769,174	4,454,903,653	742,294,078	3,103,435,206	1,920	357,058,695
Total	**825**	**60,523,000,356**	**20,702,049,890**	**10,109,197,864**	**10,592,852,026**	**5,994,945,886**	**820,930,291**	**3,293,321,687**	**16,316**	**816,407,575**

Table 12 : Some Selected Indicators of Construction Activities Classified by Value of Work Done Size Class - 2010
(Public Sector)

Value of Work Done Size Class (Rs.)	No. of Activities	Total Value of Contract (Rs.)	Value of Work Done (Rs.)	Input (Rs.)	Value Added (Rs.)	Raw Materials Consumed (Rs.)	Value of Services (Rs.)	Value of Subcontract (Rs.)	Average No. of Employees	Salaries for Employees (Rs.)
less than 250,000	64	6,970,967	6,970,968	4,994,163	1,976,805	3,005,933	1,922,991	65,240	162	767,599
250,000 - 499,999	275	112,010,637	111,802,832	72,966,195	38,836,637	65,717,493	5,333,952	1,914,750	1,455	26,309,946
500,000 - 999,999	237	168,015,595	161,268,026	106,047,738	55,220,287	89,133,975	16,100,123	813,640	2,341	40,793,349
1,000,000 - 14,999,999	1,714	14,242,758,050	7,890,603,783	5,060,431,705	2,830,172,077	4,417,506,977	327,794,644	315,130,084	23,663	1,534,534,470
15,000,000 - 49,999,999	291	16,277,033,637	7,264,801,535	4,318,461,632	2,946,339,903	3,099,922,762	431,383,217	787,155,653	7,905	1,019,068,325
50,000,000 & above	152	87,743,752,802	42,182,249,678	27,888,935,732	14,293,313,945	24,512,141,086	1,325,009,132	2,051,785,514	15,527	2,250,567,822
Total	**2,733**	**118,550,541,689**	**57,617,696,821**	**37,451,837,166**	**20,165,859,655**	**32,187,428,226**	**2,107,544,059**	**3,156,864,881**	**51,053**	**4,872,041,511**

Table 13 : Materials Used Classified by Value of Work Done Size Class - 2010
(All Sectors)

Value of Work Done Size Class (Rs.)	No. of Activities	Raw Materials Used (Rs.)								
		Cement	Sand	Rubble & Metal	Bricks	Timber	Iron & Steel	Roofing Materials	Other	Total
less than 250,000	96	657,335	335,339	301,532	280,234	335,258	97,052	214,226	1,027,094	3,248,072
250,000 - 499,999	359	11,760,614	8,993,867	8,444,683	9,584,477	10,309,787	11,529,081	8,881,988	15,252,510	84,757,007
500,000 - 999,999	361	20,361,792	10,982,947	16,755,449	11,040,410	29,228,957	12,898,522	14,568,400	15,577,170	131,413,648
1,000,000 - 14,999,999	2,188	942,918,232	543,915,220	563,879,482	456,294,747	559,165,309	997,659,764	379,775,047	890,356,616	5,333,964,417
15,000,000 - 49,999,999	333	595,156,842	340,142,938	535,613,667	290,198,771	265,700,032	713,549,246	220,046,069	701,538,664	3,661,946,230
50,000,000 & above	221	3,760,782,945	4,041,376,690	7,358,556,926	768,313,943	964,138,551	3,194,130,290	557,571,875	8,322,173,519	28,967,044,739
Total	**3,558**	**5,331,637,760**	**4,945,747,001**	**8,483,551,739**	**1,535,712,582**	**1,828,877,894**	**4,929,863,955**	**1,181,057,605**	**9,945,925,573**	**38,182,374,113**

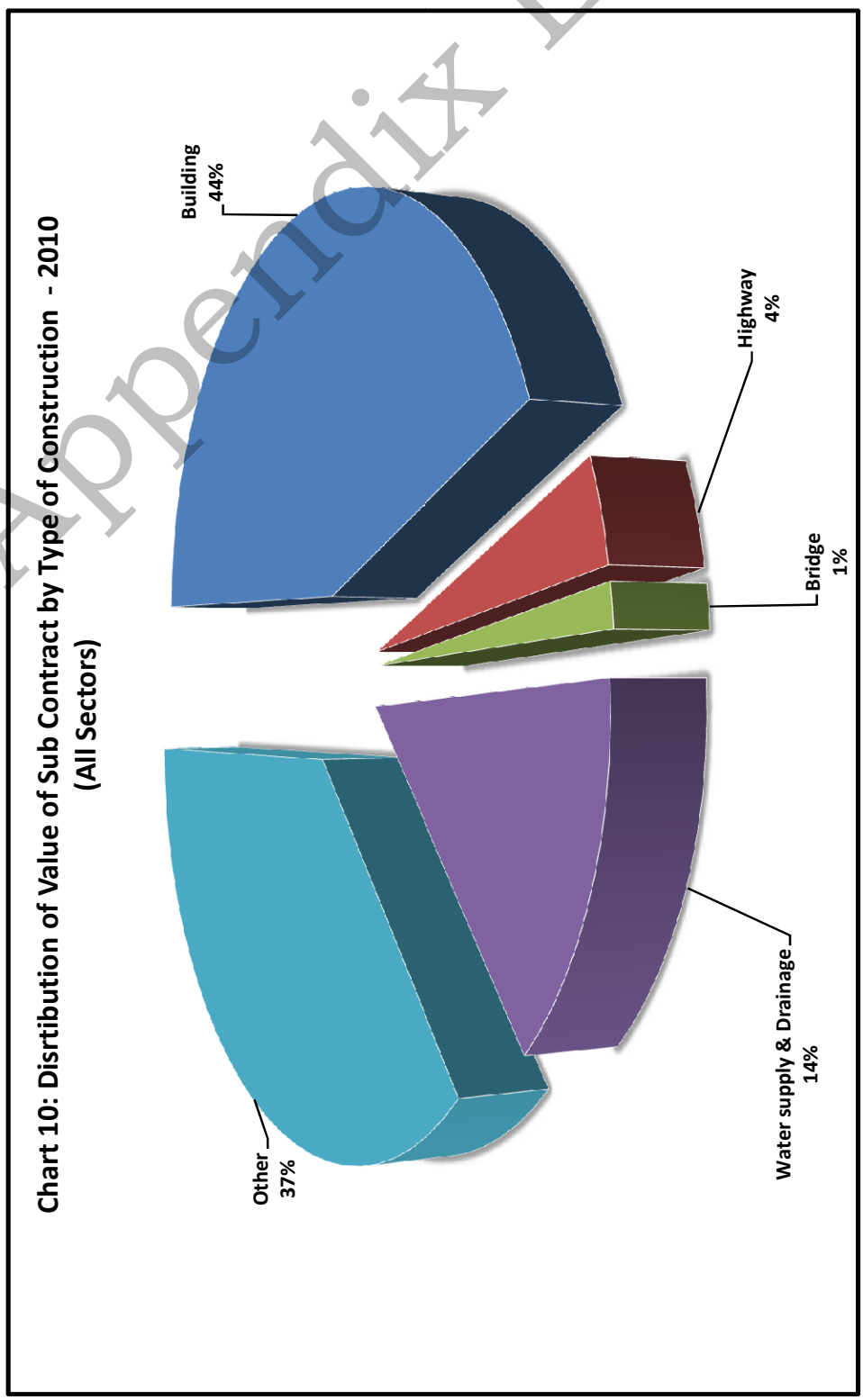


Chart 10: Disrtibution of Value of Sub Contract by Type of Construction - 2010
(All Sectors)
Building
44%
Highway
4%
Bridge
1%
Water supply & Drainage
14%
Other
37%

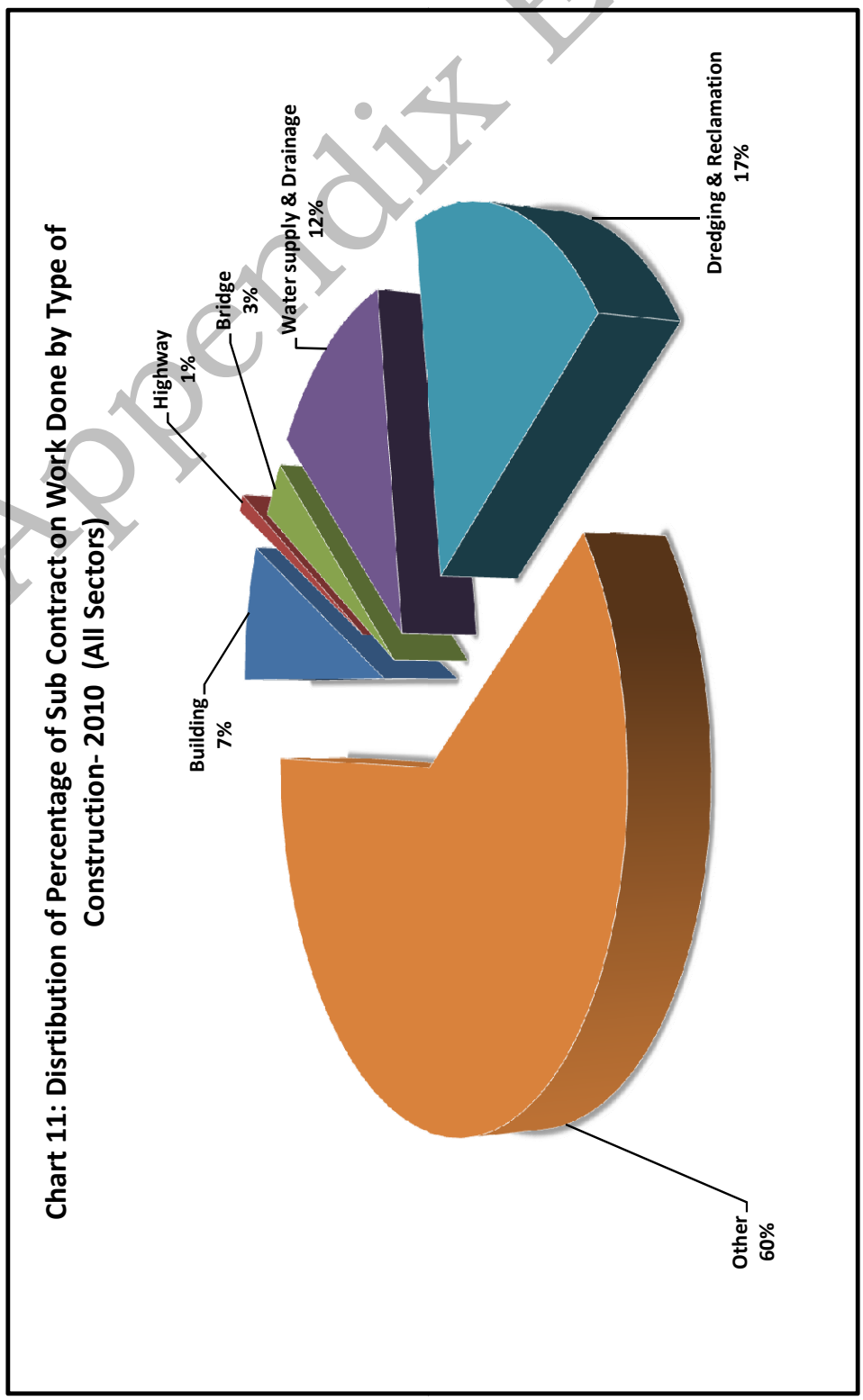


Chart 11: Disrtibution of Percentage of Sub Contract on Work Done by Type of Construction- 2010 (All Sectors)
Highway 1%
Bridge 3%
Water supply & Drainage 12%
Dredging & Reclamation 17%
Building 7%
Other 60%

Table 14 : Value of Contract for New Building by Floor Area of the Building - 2010 (All Sectors)

Floor Area Size Class (Sq. feet)	Floor Area of the Building (Sq. feet)	Value of Contract for New Building (Rs.)
less than 500	15,477	31,763,270
500 - 999	37,146	131,877,390
1000 - 1499	105,415	291,944,511
1500 - 1999	83,893	383,549,197
2000 & above	28,436,317	68,691,742,239
Total	**28,678,248**	**69,530,876,607**

Appendix F

Validated on 20 February 2015

Sri Lanka Qualifications Framework (SLQF)

Updated Version – February 2015

Ministry of Higher Education

TABLE OF CONTENTS

INTRODUCTION

There has been a significant increase in the mobility of learners and academics in the recent past across countries and regions of the world requiring national higher education systems to support and accommodate such developments. In that light, the Sri Lanka Qualifications Framework (SLQF) is an important element of systems development in the higher education sector, which at the end offers a transparent and coherent framework for the learner to optimize his/her objective of learning throughout life, while at the same time improving many vital aspects of learning and assessing the learning process. The establishment of the SLQF will help improve many aspects and processes in the learning and the methods of delivery. It will also enhance the quality of education at home while at the same time provide a clear system to develop links with the higher education institutions abroad.

The SLQF is a nationally consistent framework for all higher education qualifications offered in Sri Lanka. The SLQF applies to all higher education institutions (HEIs) both public and private, which provide post-secondary education. It recognizes the volume of learning of students and identifies the learning outcomes that are to be achieved by the qualification holders. The SLQF comprises twelve levels and the descriptors of each of these levels are comprehensively defined. Since the volume of learning is considered in the SLQF, the number of credits that should be earned by students for each qualification is also given. With the objective of having a uniform system in naming a qualification, the designators and qualifiers of each qualification have been identified in the SLQF. The abbreviations for each qualification were also identified to maintain uniformity. The purposes and scope, and attributes expected for the award of each qualification, as well as the minimum admission requirements along with possible progression opportunities are also stated in the SLQF.

The SLQF integrates the National Vocational Qualifications Framework (NVQF) developed by the Tertiary and Vocational Education Commission and the pathways of lateral mobility between the vocational education sector and the higher education sector have also been identified. The SLQF helps in the recognition of accredited prior learning in order to facilitate the vertical mobility within the higher education system.

With the globalization of higher education, national qualifications frameworks have been developed in many countries. These have not only helped to evaluate the higher educational qualifications obtained from different countries but also have facilitated the appropriate international interpretation of national qualification levels. The SLQF also contributes to the evaluation of qualifications obtained from cross border HEIs as the levels identified in this framework are based on the learning outcomes of the qualification holders. The SLQF will assist in the evaluation and recognition of qualifications offered by Sri Lankan HEIs and this will be useful to the qualification holders to identify the level of their qualifications. In addition, the SLQF will assist potential employers to know the level of learning and the attributes of a particular qualification holder.

The SLQF is useful to the HEIs, both in the state sector and non-state sector in designing courses as the minimum level of learning outcomes required for each qualification is indicated by the minimum number of credits that should be earned by a qualification holder. Thus, the SLQF will contribute towards strengthening the quality of higher education qualifications offered by universities and other HEIs in Sri Lanka.

The SLQF does not deal with the designing and offering of short term courses by any HEI that will meet specific learning outcomes. These courses may be of a few months duration and a certificate may be awarded on completion of such courses. Those certificates are not aligned with the qualifications identified in the SLQF. In addition, honorary degrees and certificates of attendance are not included in the SLQF. The honorary doctorate is differentiated from doctoral degrees in the SLQF.

This is an updated version of the SLQF published by the Ministry of Higher Education (First Edition in June 2012, Second Edition in October 2012 and Third Edition in January 2013) and this version supersedes all previous versions.

AIM AND OBJECTIVES OF SLQF

The aim of the SLQF is to create an integral national framework for learning achievements by recognizing and accrediting qualifications offered by different institutions engaged in higher education and vocational training in Sri Lanka.

The objectives of the SLQF are to;

i) enhance the quality of higher education and training at all levels;
ii) facilitate access to higher learning and thereby contribute to full personal development of learners and to social and economic development of the country;
iii) enhance equity in higher education, training and employment opportunities;
iv) assist employers to identify the levels of knowledge, skills and competencies of qualification holders;
v) develop positive attitudes in qualification holders;
vi) facilitate lateral and vertical mobility, and progression within higher education and career pathways;
vii) provide guidance in comparing qualifications offered by different institutions;
viii) help in developing higher education and vocational training programmes at appropriate levels;
ix) recognize prior learning; and
x) promote lifelong learning.

KEY BENEFITS

The SLQF will be useful to all stakeholders of higher education including students, parents, employers, as well as education and training providers.

- For learners, the SLQF will be useful to recognize and evaluate prior learning and identify the pathways of acquiring higher qualifications. This will enable learners to develop their full potential and thereby contribute to the social and economic development of the country at large.
- The level descriptors given in the SLQF will be useful for employers to identify the levels of competencies of qualification holders. It will also help in comparing the qualifications so that the supply and demand for knowledge, skills and competencies could be properly matched. Further, the SLQF will be useful in comparing the qualifications offered by different institutions. This will help the employers to find appropriate qualification holders for their business needs.
- The SLQF describes the credit requirements for each qualification level as well as intended learning outcomes. Therefore, for higher education providers, both in the state and private sectors, the SLQF will be useful in designing their academic programmes.
- The SLQF enables all stakeholders of post-secondary education to identify the full range of qualifications offered in the higher education system in Sri Lanka and comparable levels of vocational education and training. This helps to understand how qualifications are related to each other and how they contribute to the enhancement of knowledge and understanding, and improvement of intellectual abilities including analytical skills, evaluation skills, problem solving skills and soft skills.
- The SLQF will also be useful to the general public to have access to appropriate lifelong education and training, which helps them to fulfill their personal as well as social and economic potential.
- The SLQF will be useful to programme approving agencies to identify the appropriate levels of qualifications offered by different HEIs. Further, it helps in evaluating different qualifications offered by HEIs, both local and foreign, which will be useful when taking decisions in recruitment and promotion in the academic, technical and professional sectors.

GENERAL PRINCIPLES

Levels of Qualifications

- The SLQF consists of twelve levels. The demand for learning outcomes and complexity of learning increase with each level. The first two levels (levels 1-2) are senior secondary level education qualifications and the next four levels (levels 3-6) are undergraduate qualifications. The other six levels (levels 7-12) are postgraduate qualifications. The levels are not necessarily directly related to the years of study.
- The SLQF levels, the qualifications awarded at each level and the minimum credit requirement for each level are summarized in Table 1. The comparable levels of NVQF are also identified in the SLQF. Different levels of the SLQF with some examples and comparable NVQF levels are given in Table 2.

Naming of Qualifications

- **Qualification type** is the first name given to a qualification. The SLQF comprises the following qualification types:

  Senior Secondary Level: - Certificate, and Advanced Certificate

  Undergraduate Level: - Diploma, Higher Diploma, Bachelors, and Honours Bachelors

  Postgraduate Level: -Postgraduate Certificate, Postgraduate diploma, Masters, and Doctorate.
- In principle, irrespective of the length of the programme, all Bachelors Degrees and Bachelors Honours Degrees are placed respectively at level 5 and level 6 in the SLQF
- The **designator** is the second name given to a qualification. This indicates the broad area of study or discipline. All degrees, i.e., Bachelors, Masters and Doctoral degrees have designators. The examples are Bachelor of Arts, Bachelor of Science, Master of Commerce, Doctor of Philosophy and Doctor of Science. However, designators are not used for Diplomas and Certificates. The linking word between the qualification type and designator is 'of', which is omitted when abbreviating. E.g. BA, BSc, MCom.
- The **qualifier** is the third name given to a qualification. This is used to indicate the field of specialization of a qualification. The qualifier may be used in all qualification types, i.e. degrees, diplomas and certificates. The linking word between the qualifier and the qualification type or its designator, as the case may be, is 'in'. Some examples are Bachelor of Science Honours in Chemistry, Postgraduate Certificate in Library Science, and Master of Philosophy in Environmental Science. When abbreviating, the word 'in' is dropped and the qualifier is placed within brackets. E.g. PGCert (Lib Sc), MPhil (EnvSc), BScHons (Chemistry).
- Some qualifications may include a second qualifier too. This second qualifier qualifies the first qualifier. Examples are Bachelor of Science in

Engineering in Mechanical Engineering. When abbreviating both qualifiers are placed within brackets and the words 'in' are dropped. E.g. BSc (Eng) (MechEng).

- When there is no designator, the qualifier may follow the qualification type. E.g. Postgraduate Diploma in Environmental Management. When abbreviating, the word 'in' is dropped and the qualifier is placed within brackets. E.g. PGDip (EnvMgmt). The qualification types that do not have a designator may include a second qualifier too; E.g. Postgraduate Certificate in Fine Arts in Drama. Such a qualification is abbreviated as PGCert (Fine Arts) (Drama).
- In order to use a qualifier, at least 50% of the minimum total credits for the qualification and at least 50% of the minimum number of credits at the exit level of the qualification must be in the field of specialization denoted by the qualifier. The same applies to the second qualifier as well.

Volume of learning

- The volume of learning at each level is described in terms of **credits**.
- In the SLQF credit system, the student workload of study programme is defined as 1500 **notional learning hours** per academic year. The notional learning hours include direct contact hours with teachers and trainers, time spent in self-learning, preparation for assignments, carrying out assignments and assessments. The need to undertake any or all of these will be considered when a credit is being allocated to a course unit or a module, when the syllabus is designed. It is understood that the combination of learning activities may vary from one course unit or module to another.
- In designing a particular course unit or a module, its workload should be computed based on the total amount of learning activities a student is expected to complete in order to achieve the foreseen learning outcomes and the workload expressed in time should match the number of credits available for the course unit or module.
- The minimum number of credits per course unit or module is 1. The number of credits per course unit or module should be indicated by whole numbers. One credit is considered equivalent to 50 notional learning hours for a taught course, laboratory studies course or field studies/clinical work. In case of industrial training, including time allocated for assessments and in case of research, including time allocated for literature survey, one credit is considered equivalent to a minimum of 100 notional hours.
- Learning outcomes must be assessed by valid and reliable methods of assessment. Credits have to be earned by students after successful completion of the work required and appropriate assessment of learning outcomes.
- Every qualification type of Levels 1 - 12 on the SLQF has a credit value allocated to each of its component parts and to the whole qualification.

Minimum Volume of Learning for each Level of SLQF

SLQF Level	Qualification Awarded	Minimum Volume of Learning for the Award
12	Doctor of Philosophy / MD with Board Certification/Doctor of Letters/Doctor of Science	Minimum 3 years of fulltime or equivalent time of original research after SLQL 6 or above
11	Master of Philosophy / DM	Minimum 2 years of fulltime or equivalent time of original research after SLQL 5 or above
10	Masters with course work and a research component	60 credits after SLQL 5 or SLQL 6 which include a research component of minimum 15 credits
9	Masters with course work	30 credits after SLQL 5 or SLQL 6
8	Postgraduate Diploma	25 credits after SLQL 5 or SLQL 6
7	Postgraduate Certificate	20 credits after SLQL 5 or SLQL 6
6	Honours Bachelors	120 credits after SLQL 2 or 90 credits after SLQL 3 or 60 credits after SLQL 4 or 30 credits after SLQL 5
5	Bachelors, Bachelors Double Major	90 credits after SLQL 2 or 60 credits after SLQL 3 or 30 credits after SLQL 4
4	Higher Diploma	60 credits after SLQL 2 or 30 credits after SLQL 3
3	Diploma	30 credits after SLQL 2
2	Advanced Certificate (GCE A/L or equivalent)	
1	Certificate (GCE O/L or equivalent)	

Table 1

Different SLQF Levels with Higher Education Qualification Types and Comparable Levels of NVQF

The comparable NVQ and SLQF levels have been recognised on the basis of significant similarities in the learning outcomes stated under respective level descriptors in the two frameworks by a panel of experts. Degree level qualification (NVQ 7) is benchmarked to internationally accepted standard for a Bachelor degree (SLQF Level 5). Nonetheless, the proportion of cognitive outcomes and psychomotor outcomes may differ in the two qualifications, especially in qualifications below SLQF 2 (NVQ 4). Further, the attributes of two qualification holders, below the degree level, at comparable SLQF and NVQ levels may differ.

SLQF Level	Qualification awarded	Comparable NVQ Levels
12	Doctor of Philosophy / MD with Board Certification/Doctor of Letters/Doctor of Science	
11	Master of Philosophy / DM	
10	Masters with course work and a research component	
9	Masters with course work	
8	Postgraduate Diploma	
7	Postgraduate Certificate	
6	Honours Bachelors	
5	Bachelors, Bachelors Double Major	7
4	Higher Diploma	6
3	Diploma	5
2	Advanced Certificate (GCE A/L or equivalent)	4
1	Certificate (GCE O/L or equivalent)	3
		2

Table 2

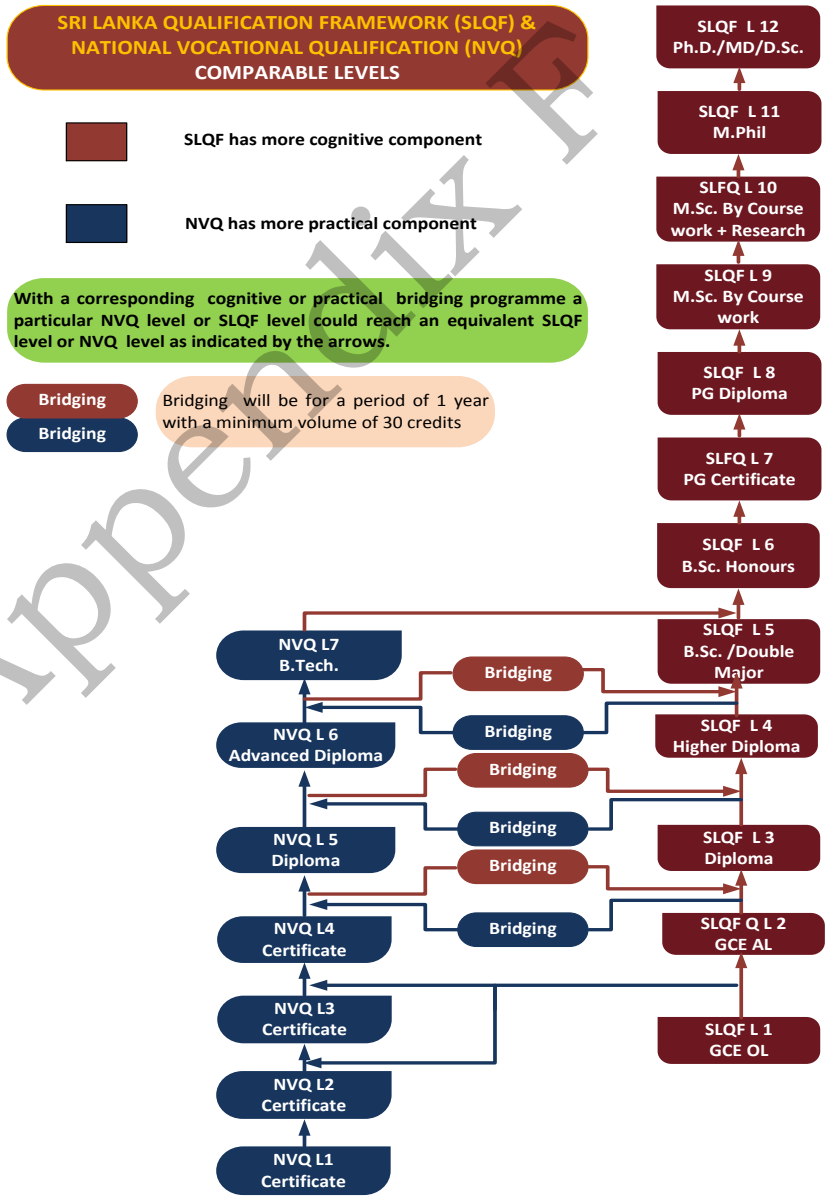


Figure 1

Learning Outcomes

- Learning outcomes are statements that describe what learners should know, understand and can demonstrate upon the completion of a course or study programme.
- In SLQF, the learning outcomes are stated in two parts.
- The first part, called the level descriptor, is a set of outcome statements, achievement of which is assessed and which a student should be able to demonstrate for the fulfilment of requirements of part-qualifications i.e. the course units or modules that make up the qualification, for award of the qualification. This part will be of significance to the HEIs to systematically design and review courses or study programmes. It is essential that the curriculum and assessments to provide all students with the opportunity to achieve, and to demonstrate the achievement of the intended outcomes stated under respective level descriptors.
- The second part, called the attributes of the qualification holders, is a set of statements of the wider abilities that the typical student is expected to have developed by the end of the course or study programme. It will be useful for HEIs to share with stakeholders the general capabilities of the holders of the qualification. It is by first considering these attributes that the learning outcomes in the level descriptors are defined. Hence, in this sense, these attributes could be termed as precursors to the study programme learning outcomes, rather than the actual learning outcomes.
- Comprehensive statements on the expected specific learning outcomes in particular subject areas are not addressed in the SLQF. They are available in the respective subject benchmark statements for the Bachelors and Honours Bachelor qualifications.
- Some qualification types may consist of one or more levels of part-qualifications. For example, the SLQ levels 3, 4 and 5 are normally corresponding sequentially to the first, second and third years of an undergraduate study programme leading to Bachelors qualification type. However, there is no expectation that, for example, the learners should necessarily follow all Level 3 course units or modules only during the first year of undergraduate study. The HEI has the freedom to determine the most appropriate structure and progression towards achieving the intended attributes for the award of the qualification.

Qualification descriptors

- The qualification descriptors stated in the SLQF for each level provide the specifications such as the SLQF exit level, the qualification type with designators and the qualifiers, the number of credits required at each level, the purpose and scope, and the generic outcomes and attributes expected for the award of each qualification, as well as the minimum admission requirements along with possible progression opportunities (Table 3). For each qualification, the generic outcomes and attributes signify the expected capabilities from qualification holders defined in terms of the four main domains of learning: knowledge; skills; attitudes; and mind-set and paradigm, characterised as the **K-SAM** model.

  Knowledge: *what the qualification holders know*

  Skills: *what the qualification holders can do*

  Attitudes, Values, Professionalism and Vision for life: *how the qualification holders think and behave*

  Mind-set and Paradigm: *how the qualification holders perceive the world*

- The K-SAM model is considered an integrated model. Thus, each learning outcome identified under the attributes of a particular level may not be confined to a single domain within the K-SAM model. For example, communication skills (i.e. a learning outcome) is not considered only as a skill (i.e. a single domain of the K-SAM model). The SLQF recognizes a given learning outcome as a blend of more than one domain (in most cases all the domains) in the K-SAM model.

Level Descriptors

- The level descriptors identify the learning outcomes at each level. In describing each level, the degree of intellectual abilities, cognitive skills and soft skills are considered.
- The purpose of the level descriptors for the SLQF levels 1 to 12 is to guarantee consistency across learning in achieving the expected attributes of qualifications through part-qualification levels, and to help a HEI to evaluate the comparability of qualifications and part-qualifications issued by another HEI (Table 4). The level descriptors may also be used as a guideline to develop course materials of a particular study programme having several course units or modules in order to make sure that the learners' could progressively meet the expected attributes of the relevant qualification type at the end of the course.
- The following twelve learning outcomes identified by the Ministry of Higher Education in Sri Lanka as of national importance have been customized as level descriptors to suit each level of qualification. The categorization of the learning outcomes according to the principal K-SAM components is as follows:

Categories of Learning Outcomes	Core Area
1. Subject / Theoretical Knowledge	Knowledge
2. Practical Knowledge and Application	
3. Communication	Skills
4. Teamwork and Leadership	
5. Creativity and Problem Solving	
6. Managerial and Entrepreneurship	
7. Information Usage and Management	
8. Networking and Social Skills	
9. Adaptability and Flexibility	Attitudes, Values, Professionalism and Vision for life
10. Attitudes, Values and Professionalism	
11. Vision for Life	
12. Updating Self / Lifelong Learning	Mind-set and Paradigm

- Some of the commonly used student-centred teaching and learning methods recommended for the respective learning outcomes are given below:

Categories of Learning outcomes	Student-centred teaching and learning methods
1. Subject / Theoretical Knowledge	Independent learning activities, interactive lectures, team-based learning, and other small group activities
2. Practical Knowledge and Application	Problem-based learning, team-based learning, inquiry-based learning, practical classes, laboratory sessions, role play
3. Communication	Student presentations, role play, debates, dramas
4. Teamwork and Leadership	Group projects, industrial training, small group learning; e.g. problem-based learning, games
5. Creativity and Problem Solving	Assignments, projects, small group learning activities; e.g. problem-based learning
6. Managerial and Entrepreneurship	Group projects, industrial training, small group learning; e.g. problem-based learning, games, simulated training, industrial (workplace-based) training
7. Information Usage and Management	Assignments, presentations, projects, case studies
8. Networking and Social Skills	Student presentations, role-play, debates, dramas
9. Adaptability and Flexibility	Group projects, industrial training, small group learning; e.g. problem-based learning, role plays, portfolios
10. Attitudes, Values and Professionalism	Group projects, industrial training, small group learning; e.g. problem-based learning, role play, portfolios
11. Vision for Life	Portfolios, reflective practice
12. Updating Self / Lifelong Learning	Portfolios, reflective practice

- The learner is expected to meet or demonstrate that certain learning outcomes have been achieved. Therefore, the assessment of the outcomes of learning by effective and appropriate assessment methods is essential in the process of the qualification framework.

Sri Lanka Qualifications Framework

Qualification Descriptors and

Level Descriptors

Table 3

QUALIFICATION DESCRIPTORS – SLQ Levels 1 to 6

SLQF Exit level	SLQF Level 1	SLQF Level 2	SLQF Level 3	SLQF Level 4	SLQF Level 5	SLQF Level 6
Qualification Type	**Certificate**	**Advanced Certificate**	**DIPLOMA**	**HIGHER DIPLOMA**	**BACHELORS DEGREE**	**HONOURS BACHELORS DEGREE**
Purpose and Scope of Qualification			The purpose of this qualification is to produce a person with focused knowledge and skills in a particular field for the requirement of the labour market. This qualification is basically occupational or vocational specific. It combines in-depth knowledge in a particular field with practical experience aimed at acquiring required skills in a work place. These programmes usually include simulated work experience or work integrated learning.	The purpose of this qualification is to offer an intensive, focused education in a particular area of specialization to meet the requirements of the labour market.	The purpose of this qualification is to prepare a graduate with a broad knowledge on theory, practice and methodology of disciplines that enable them to bear responsibility in an academic or professional environment.	Purpose of this qualification is to provide a broad education in a particular discipline in order to equip graduates with knowledge, practice and methodology that enable them to obtain appropriate professional status/qualification or prepare them for research/practice based postgraduate studies. This qualification helps to consolidate and strengthen the student's knowledge in a particular discipline and to develop research capacity and skills in that discipline. This qualification demands a high level of theoretical engagement and intellectual independence. Further, these programmes must include a research component in the field of specialization carried out under the guidance and supervision of a qualification holder of level 10, 11 or 12 and reporting in a manner of a report/dissertation, which will be assessed. The research component should not be less than a total of at least 8 credits of SLQ level 6. In some areas, Bachelors Special degrees are recognized by an appropriate professional body.

Attributes of Qualification Holders	**K**			**The qualification holders:** Should have an understanding of theory, practice, relevant methodology and recent developments in a particular area of study. -Should be able to apply the concepts and principles in the area of study and suggest solutions to problems in an employment context. -Should be able to communicate successfully, the results to specialist and non-specialist audiences and exercise personal responsibilities and leadership in some tasks in the workplace. -Should be capable of carrying out further training and acquire new competencies which will help to enhance their capacity to bear responsibilities. -Should display qualities and transferable skills as well as subject specific skills necessary for employment, carry out further training and manage their own learning.	**The qualification holders:** -Should have a deep understanding of theory, practice, relevant methodology and recent developments in a particular area of study. -Should be able to apply the concepts and principles in the area of study, analyze information and suggest solutions to problems in an employment context. -Should be able to communicate successfully, the results of analysis and arguments to specialist and non-specialist audiences and exercise personal responsibilities and leadership in some tasks in the workplace. -Should be capable of carrying out further training and acquire new competencies which will help to enhance their capacity to bear responsibilities. -Should display qualities and transferable skills as well as subject specific skills necessary for employment, carry out further training and manage their own learning.	**The qualifications holders:** -Should know about the well-established principles and content in their fields of study. -should be information literate; what they can do with what they have acquired from wide learning, use appropriate techniques to initiate and undertake analysis of information, to identify problems and find solutions to them. -Should display qualities and skills necessary for employment or further learning. -Should be able to communicate information effectively to specialist and wider society. -Should be able to acquire additional competencies; pursue further learning; be a change agent; assume responsibility for decision making.	**The qualifications holders:** - Should be able to - construct and sustain arguments -- Should be able to solve problems using appropriate ideas and techniques in a professional context -- Should be able to demonstrate thorough and systematic understanding of core aspects of the subject of study. -- Should be able to accurately use the established techniques of analysis within that discipline - - Should be able to clearly communicate information, ideas, issues, problems and solutions to specialist as well as non-specialist audiences - - Should be able to ready to exercise initiative, identify situations they need support from others -- Should be able to prepared to carry out further training and manage own learning
	S						
	A						
	M						

SLQF Exit level	SLQF Level 1	SLQF Level 2	SLQF Level 3	SLQF Level 4	SLQF Level 5	SLQF Level 6
Qualification Type	**Certificate**	**Advanced Certificate**	**DIPLOMA**	**HIGHER DIPLOMA**	**BACHELORS DEGREE**	**HONOURS BACHELORS DEGREE**
Minimum admission requirement	1. Completion of junior secondary level, which is Grade 9 or an equivalent, or 2. Completion of primary education and certified work experience equivalent to a minimum period of two years in a particular field may also be considered as an equivalent qualification for admission to SLQF level 1 provided that the applicant is at least 16 years of age.	1. General Certificate of Education (Ordinary Level) or an equivalent qualification, or 2. Completion of NVQF level 3.	1. General Certificate of Education (Advanced level) or an equivalent qualification, or 2. A foundation course equivalent to SLQF level 2 followed by passing an aptitude test, or 3. Completion of NVQF level 4 or accredited work experience or accredited prior learning as determined by the academic authority of the HEI concerned may also be considered as equivalent qualification for admission to SLQF level 3 in a particular field of specialization.	1. General Certificate of Education (Advanced level) or an equivalent qualification and completion of a minimum of 30 credits at SLQF Level3, or 2. Completion of NVQF level 5 as determined by the academic authority of the HEI concerned may also be considered as an equivalent qualification in that field of specialization.	1. General Certificate of Education (Advanced level) or an equivalent qualification and completion of at least 60 credits of SLQF levels 3 and 4 with a minimum of 30 credits at SLQF Level 4 or equivalent, or 2. Completion of NVQF level 6 as determined by the academic authority of the HEI concerned may also be considered as an equivalent qualification for admission in that field of specialization.	1. General Certificate of Education (Advanced level) or an equivalent qualification, or 2. Completion of at least one academic year of study in a Bachelors degree programme and being selected, or 3. Completion of NVQF level 7 as determined by the academic authority of the HEI concerned may also be considered as an equivalent qualification for admission in that field of specialization.
Volume of Learning			30 credits after SLQL 2.	60 credits after SLQL 2 or 30 credits after SLQL 3.	90 credits after SLQL 2 or 60 credits after SLQL 3 or 30 credits after SLQL 4.	120 credits after SLQL 2 or 90 credits after SLQL 3 or 60 credits after SLQL 4 or 30 credits after SLQL 5.
Designators	Not applicable.	Not applicable.	Not applicable.	Not applicable.	Bachelor's degree designators are limited to broad areas of study and disciplines. Some examples are Bachelor of Arts and Bachelor of Science.	Honours Bachelor's Degree designators are specific and are limited to broad generic areas of discipline or study. Some examples are Bachelor of Arts Honours, Bachelor of Commerce Honours, Bachelor of Business Administration Honours and Bachelor of Science Honours.

Qualifiers	Maximum one Example: Certificate in catering	Maximum two Examples: Advanced Certificate in Hospitality Management Advanced Certificate in Hospitality Management in Professional Cookery	Maximum two Examples: Diploma in Hospitality Management Diploma in Hospitality Management in Professional Cookery	Specific, maximum one Example: Higher Diploma in Accountancy Higher Diploma in Information Technology	Maximum two Examples: Bachelor of Arts in Peace and Conflict Resolution Bachelor of Science in Environmental Management	Maximum two Examples: Bachelor of Science Honours in Engineering in Mechanical Engineering Bachelor of Arts Honours in Sociology, Bachelor of Science Honours in Chemistry.
Abbreviation	Cert Example: Cert (Catering)	AdvCert Examples: AdvCert (Hospitality Management) AdvCert (Hospitality Management-Professional Cookery)	Dip Example: Dip (Hospitality Management), Dip (Hospitality Management-Professional Cookery) Dip (Hospitality Management), Dip (Hospitality Management-Professional Cookery)	HDip Example: HDip (A), HDip (IT).	Examples: BA, BSc, BA (Peace and Conflict Resolution), BSc (Env Mgmt).	Examples: BScHons (Eng) (Mech Eng), BScHons (Chemisty), BAHons (Archaeology), BAHons, BScHons, BComHons, BBAHons.
Progression	Completion of SLQF Level 1 meets the minimum entry requirement for a qualification in SLQF level 2, in a particular area of specialization.	Completion of SLQF level 2 meets the minimum entry requirement for a qualification in SLQF level 3 in that particular area of specialization.	Completion of SLQF level 3 meets the minimum entry requirement for a qualification in SLQF level 4 in that particular field of specialization.	Completion of Higher Diploma meets the minimum requirement for admission to SLQF level 5.	Completion of Bachelor's Degree meets the minimum entry requirement for admission to any SLQF level from 7 to10. If the qualification holder obtains a minimum GPA of 3.0 in the scale of 0-4, he/she may be considered for admission to SLQF level 11 on successful completion of an MPhil Qualifying examination which will be conducted after completion of 30 credits equivalent to those of SLQF level 6 in the same or a related subject. A qualification shall not be awarded for early exit from SLQF level 5. However, a Diploma or a Certificate may be awarded for those completing the requirements equivalent to SLQF Levels 4 or 3 respectively.	Completion of Honours Bachelor's Degree meets the minimum entry requirement for admission to any SLQF level from 7 to 10, or to SLQF level 11 or 12 after successful completion of a qualifying examination. If the qualification holder possesses a minimum GPA of 3.0 in a scale of 0-4, even without a qualifying examination he/she may be admitted to SLQF level 11 or 12. Bachelor's degree of level 5 may be awarded for early exit from Bachelors Honours Degree programme provided that the candidate has completed minimum of 30 credits in levels 5 and/or 6. However, in professional disciplines a qualifications may not be awarded for early exit.

QUALIFICATION DESCRIPTORS – SLQ Levels 7 to 12

SLQF Exit level:	SLQF Level 7	SLQF Level 8	SLQF Level 9	SLQF Level 10	SLQF Level 11	SLQF Level 12
Qualification Type	**POSTGRADUATE CERTIFICATE**	**POSTGRADUATE DIPLOMA**	**MASTERS DEGREE WITH COURSE WORK**	**MASTERS DEGREE**	**MASTER OF PHILOSOPHY DEGREE**	**DOCTORAL DEGREE**
Purpose and Scope of Qualification	**The purpose of this qualification** is to enhance the capacity of graduates / holders of professional qualifications to advance their knowledge in a particular field of study. This qualification demands a high level of theoretical engagement and does not involve conducting a research project or an independent study Any Bachelor's degree with a minimum of 150 credits and a minimum student workload of 7500 notional learning hours, encompassing professional practice spanning over several levels starting from SLQF level 3, and accredited by a recognized Accreditation Agency may be included in SLQF level 7, provided that the final outcome of the qualification meets the descriptors of SLQF level 7.	**The purpose of this qualification** is to enhance the capacity of graduates/holders of professional qualifications to advance their knowledge, and other abilities relevant to areas within a specific field of study or discipline enabling professional advancement. This qualification demands a high level of theoretical engagement. It may not require conducting a research project but require conducting some independent studies	**The purpose of this qualification** is to enhance the capacity of graduates/holders of professional qualifications to advance their knowledge and investigative skills, and other abilities relevant to areas within a specific field of study or discipline enabling conversion into a different discipline/profession, forming the basis for academic advancement or enhancing the managerial, administrative and technological capacity. This qualification demands a high level of theoretical engagement and guided independent study equivalent to a minimum of 5 credits.	**The purpose of this qualification** is to enhance the capacity of graduates/holders of professional qualifications to advance their knowledge and research skills, and other abilities relevant to areas within a specific field of study or discipline preparing graduates for higher degrees and specialized professional employment or enhancing the managerial, administrative and technological capacity. This qualification should be earned by completing course work aggregating to a minimum of 30 credits at SLQF levels 7 to 10 and a research project with notional learning hours totaling to a minimum of 30 credits. The research should be carried out under the guidance of a supervisor holding an equivalent or a higher qualification and should make an original academic contribution to a particular discipline. The candidate should submit a dissertation which is evaluated and accepted.	**The purpose of this qualification** is to develop the capacity of a graduate with an advanced knowledge in a specific field of study or discipline, • to conduct advanced research. • to further embark on higher degrees and specialized professional employment. • to enhance professional, managerial, administrative and technological capacities. For an M. Phil degree, a candidate is required to carry out high level research under guidance of a person holding equal or above qualifications and make a significant contribution to a particular discipline or field. The research may be pure discipline-based or multidisciplinary. The candidate should submit a thesis incorporating research findings, which is assessed and accepted. The research must satisfy peer review and should merit publication. The candidate may also be required to follow some course work as preparatory work or for value addition to research. However, this course work shall not contribute to the credit accumulated towards the qualification.	**The purpose of this qualification** is to develop the capacity of a graduate to generate substantive insights in a particular area of study through • high quality, original and independent research, and contribute to scholarship, i) or • enhancing professional, managerial, administrative, research and technological capacities to enable specialized professional employment at the highest level. For a doctoral degree, a candidate is required to carry out high level research under the guidance of a supervisor holding a qualification of this SLQF Level or equivalent (unless in exceptional circumstances that will have to be justified in writing before being appointed as a supervisor) and make a significant and original academic contribution creating new knowledge. The candidate should submit a thesis incorporating research findings which are assessed and accepted. The candidate may also be required to follow some course work as preparatory work or for value addition to research. However, this course work shall not contribute to the credits accumulated towards the qualifications. The research must satisfy peer review and should merit publication. The research may be purely discipline-based or multidisciplinary.

Attributes of Qualification Holders	**K**	**The qualification holders:** - should be able to demonstrate clear understanding of theoretical knowledge -should display critical awareness of current issues in the subject area. - should also be able to deal with complex issues systematically and make sound judgments and communicate decisions clearly to others. - should demonstrate self-direction in tackling and solving problems and be able to plan and implement tasks in a professional manner.	**The qualification holders:** - should be able to demonstrate clear understanding of theoretical knowledge -should display critical awareness of current issues in the subject area -should apply techniques relevant to their professional practice/ chosen field of study. -should also be able to deal with complex issues systematically and creatively, and make sound judgments and communicate decisions clearly to others. -should demonstrate self-direction and originality in tackling and solving problems and be able to plan and implement tasks independently in a professional manner.	**The qualification holders:** - should be able to demonstrate thorough understanding of theoretical knowledge. -should display critical awareness of current issues in their subject area. -should apply techniques relevant to their professional practice. -should also be able to deal with complex issues systematically and creatively and make sound judgments and communicate decisions clearly to others. -should demonstrate self-direction and originality in tackling and solving problems and be able to plan and implement tasks at professional levels.	**The qualification holders:** - should be able to demonstrate critical awareness of current issues in the subject area and be able to apply techniques relevant to profession/ area of specialization. -should be able to deal with complex issues systematically and creatively and make sound judgments and communicate decisions clearly to specialist and non-specialist groups. - should demonstrate self-direction and originality in tackling and solving problems and be able to plan and implement tasks at professional manner.	**The qualification holders:** - should also be able to demonstrate critical awareness of current issues in the subject area and be able to apply techniques relevant to professional practice. - should be able to carry out independent pure and/or applied research contributing significantly towards the development of knowledge and supervise and evaluate original research carried out by others in the field of specialization leading to qualifications of SLQF levels up to 9. -should be able to make judgment on complex and controversial issues in the area of expertise and communicate his/her ideas and conclusions clearly to specialist and non-specialist audiences. -should demonstrate self-direction and originality in tackling and solving problems and be able to plan and implement tasks at professional levels.	**The qualification holders:** - should be able to provide evidence for generating new knowledge by publications in peer reviewed indexed journals. -should be able to design and carry out independent pure and/or applied research contributing significantly towards the development of new knowledge. -should be able to train graduate students in research methodology, and to supervise and evaluate original research carried out by others in the field of specialization. - should be able to demonstrate critical awareness of and analyse current, complex and controversial issues in the subject area and apply techniques relevant to professional practice - should be able to make judgments on complex issues in specific fields (K) and communicate his/her ideas, views and conclusions clearly and effectively to specialist and non-specialist groups. - should also be able to exercise personal judgment and responsibility even in unpredictable situations in the professional environment.
	S						
	A						
	M						

SLQF Exit level:	SLQF Level 7	SLQF Level 8	SLQF Level 9	SLQF Level 10	SLQF Level 11	SLQF Level 12
Qualification Type	**POSTGRADUATE CERTIFICATE**	**POSTGRADUATE DIPLOMA**	**MASTERS DEGREE WITH COURSE WORK**	**MASTERS DEGREE**	**MASTER OF PHILOSOPHY DEGREE**	**DOCTORAL DEGREE**
Minimum admission requirement	1. A Bachelor's degree, (a) including 30 credits in the relevant subject area* or (b) prior learning/work experience equivalent to 30 credits in the relevant subject area, or 2. A qualification in the relevant subject area equivalent to 1(a) or 1(b), or 3. Completion of NVQ level 7, as determined by the academic authority of HEI, may be considered.	1. A Bachelor's degree, (a) including 30 credits in the relevant subject area* or (b) prior learning/work experience equivalent to 30 credits in the relevant subject area or 2. A qualification in the relevant subject area equivalent to 1(a) or 1(b), or 3. Completion of NVQ level 7, as determined by the academic authority of HEI, may be considered.	1. A Bachelor's degree, (a) including 30 credits in the relevant subject area* or (b) prior learning/work experience equivalent to 30 credits in the relevant subject area or 2. A qualification in the relevant subject area equivalent to 1(a) or 1(b), or 3. Completion of NVQ level 7, as determined by the academic authority of HEI, may be considered.	1. A Bachelor's degree including 30 credits in the relevant subject area*, or 2. A qualification of SLQF level 6 or above in the relevant area* of study, or 3. A professional qualification equivalent to SLQF level 6 or above, or 4. Completion of NVQ level 7 with a minimum GPA of 3.0 on a scale of 0-4, as determined by the academic authority of HEI, may be considered for admission in that field of specialization.	1. A Bachelor's degree of level 6 with a minimum of 30 credits in the relevant field or a related field and a qualifying examination, or 2. A Bachelor's degree of level 5 with a minimum GPA of 3 in the scale of 0-4 and successful completion of a qualifying examination which will be conducted after completion of 30 credits equivalent to SLQF 6 in the same or related field, or 3. A qualification of SLQF levels 7 or above in the relevant field, or 4. Completion of NVQ Level 7 with a minimum GPA of 3.0 in a scale of 0-4 and a qualifying examination equivalent to SLQF level 6 or 7, as determined by the academic authority of HEI, may also be considered for admission to SLQF level 11 in that field of specialization.	1. Master of Philosophy, or 2. Master's Degree, or 3. Honours Bachelor's Degree with a minimum GPA of 3.0 at a scale of 0-4, who has registered to follow MPhil degree may be upgraded to PhD level after a minimum period of one year provided that his/her research competencies are of exceptional merit, or 4. Bachelor's Degree of level 5 with a minimum GPA of 3 in the scale of 0-4 and successful completion of a qualifying examination which will be conducted after completion of 30 credits equivalent to SLQF 6 in the same or related field and register to follow an MPhil degree may be upgraded to PhD level after a minimum period of one year provided that his/her research competencies are of exceptional merit.
Volume of Learning	20 credits after SLQL 5 or SLQL 6	25 credits after SLQL 5 or SLQL 6	30 credits after SLQL 5 or SLQL 6.	60 credits after SLQL 5 or SLQL 6 which include a research component of minimum 15 credits	Minimum 2 years of fulltime or equivalent time of original research after SLQL 5 or above.	Minimum 3 years of fulltime or equivalent time of original research after SLQL 6 or above.

Designators	Not applicable.	Not applicable.	Master's degree designators are limited to specific areas of study. Examples include Master of Information Technology, Master of Linguistics, Master of Library Science etc.	Master's degree designators are specific and limited to broad generic areas of discipline or profession. The examples include Master of Science, Master of Arts, Master of Commerce, Master of Education, Master of Business Administration, etc.	The designator is Philosophy.	The typically used designator for doctoral degrees is Philosophy. Nevertheless, other designators may be used to denote the areas of study or the discipline. E.g. Doctor of Education.
Qualifiers	Maximum two Examples: Postgraduate Certificate in Natural Resources Management, Postgraduate Certificate in Fine Arts in Drama	Maximum two. Examples: Postgraduate Diploma in Education, Postgraduate Diploma in Environmental Science, Postgraduate Diploma in Crop Science, Postgraduate Diploma in Fine Arts in Drama	Not applicable.	Maximum one Examples: Master of Arts in Sinhala. Master of Science in Environmental Science.	Maximum one, if required. E.g.: Master of Philosophy in Environmental Science.	Maximum one E.g.: Doctor of Philosophy in Education.
Abbreviation	PGCert, PGCert (Natural Resources Management), PGCert (Fine Arts) (Drama)	PGDip (Education), PGDip (Env Sc), PGDip (Crop Sc) PGDip (Fine Arts)(Drama)	MIT, MLinguistics, MAgri, MLibSc	Examples: MA, MCom, MEd, MA (Sinhala), MSc, MSc (Environmental Science).	MPhil, MPhil (Env Sc).	PhD, DPhil, DEd, DLitt, DSc, PhD (Education).
Progression	Completion of Postgraduate Certificate meets the entry requirements to Postgraduate Diploma and/or Master's degree of SLQF levels 8 and 9 in the same field of specialization.	Completion of Postgraduate Diploma meets the entry requirements to SLQF level 10. A qualification shall not be awarded for early exit from this level. However, a postgraduate certificate may be awarded for those who are completing 20 credits of theoretical engagement at SLQF Level 7.	Completion of Master's Degree meets the entry requirement to SLQF level 10 or 11 in the same field of specialization. A Postgraduate Diploma or a Postgraduate Certificate may be awarded to those who exit early completing 25 credits or 20 credits respectively.	Completion of SLQF level 10 meets the entry requirement to an MPhil degree in the same field of specialization. Early exit from this level is possible provided that the candidate has completed 25 credits in course work. In such a situation, the qualification awarded shall be Postgraduate Diploma in the relevant field, which is at SLQF level 88.	Completion of an M. Phil degree meets the entry requirement to a Doctoral degree in the same field of specialization. A qualification shall not be awarded for early exit from an MPhil degree.	Doctoral degree is the highest qualification awarded within the SLQF. Early exit from a doctoral degree with research not reaching the standards required for a doctoral degree may be considered for the award of MPhil degree.

*The subject area to be determined by the relevant academic authority of HEI.

Table 4

LEVEL DESCRIPTORS for SLQF Levels 1 - 6

Categories of Learning Outcomes	Senior Secondary Education		Undergraduate Education			
	SLQF Level 1	SLQF Level 2	SLQF Level 3	SLQF Level 4	SLQF Level 5	SLQF Level 6
1. Subject / Theoretical Knowledge			Demonstrate knowledge and understanding of concepts and principles of the areas of study. Present and interpret qualitative and quantitative data.	Demonstrate knowledge and understanding of concepts and principles of the areas of study. Analyse and interpret qualitative and quantitative information.	Demonstrate knowledge and understanding of concepts and principles of the areas of study. Collect, Analyse and interpret quantitative and qualitative data.	Demonstrate an advanced knowledge and understanding of the core aspects of the area of study. Critically Analyse data, make judgments and propose solutions to problems.
2. Practical Knowledge and Application			Develop initial arguments and make some judgments in accordance with basic theories and concepts of the areas of study.	Develop appropriate arguments and make judgments in accordance with basic theories and concepts of the areas of study. Apply knowledge and understanding of concepts and principles of the areas of study.	Develop arguments and make sound judgments in accordance with basic theories and concepts of the areas of study. Apply knowledge and understanding of concepts and principles of the areas of study.	Construct and sustain arguments and use these arguments, ideas and techniques in problem solving. Use practical skills and enquiry efficiently and effectively within the area of study.
3. Communication			Communicate results of studies reliably.	Present information and ideas efficiently and effectively.	Present information, ideas, and concepts efficiently and effectively.	Communicate/present information, ideas, issues and solutions efficiently and effectively. Demonstrate awareness of the current developments in the area of study.
4. Teamwork and Leadership			Exercise personal responsibility and leadership in some tasks in the workplace.	Exercise personal responsibility and leadership in some tasks in the workplace.	Exercise personal/team responsibility, and leadership in the professional environment/work place.	Exercise personal/team responsibility, and leadership in the professional environment/work place.

5. Creativity and Problem Solving			Develop initial arguments and make judgments in accordance with basic theories and concepts of the areas of study.	Develop appropriate arguments and make relevant judgments in accordance with basic theories and concepts of the areas of study.	Develop arguments and make appropriate judgments in accordance with theories and concepts of the areas of study.	Construct and sustain arguments and use these arguments, ideas and techniques in problem solving for a given situation.
6. Managerial and Entrepreneurship			Exercise responsibility in the implementation of routine work and manage limited resources within the work place.	Exercise personal and managerial responsibilities in some tasks in the workplace.	Take initiative, assume personal responsibility and demonstrate accountability.	Take initiative, assume personal responsibility and demonstrate accountability and ability to instill entrepreneurship.
7. Information Usage and Management			Demonstrate transferable skills related to ICT.	Demonstrate application of transferable skills related to ICT.	Demonstrate specialized transferable skills related to ICT skills.	Thorough in transferable skills related to ICT and information literacy.
8. Networking and Social Skills			Develop awareness of positive attitudes and social responsibility.	Demonstrate positive attitudes and social responsibility.	Ability to work in teams and provide leadership.	Ability to work in teams, give leadership and promote social engagement.
9. Adaptability and Flexibility			Recognise the need for adapting to changing environments.	Identify the strategies for adapting to changing environments.	Develop appropriate strategies for adapting to changing environments.	Analyse and devise appropriate strategies for adapting to changing environments.
10. Attitudes, Values and Professionalism			Exercise personal responsibility in tasks performed. Develop positive attitudes.	Exercise personal responsibility in tasks performed. Demonstrate positive attitudes and recognize the need for social responsibility.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility.
11. Vision for Life			Clearly identify where one wants to be and develop long term goals accordingly. Recognise competencies that help to assume predetermined responsibilities.	Clearly identify where one wants to be and develop long term goals accordingly. Acquire competencies that help to assume predetermined responsibilities.	Clearly identify where one wants to be and develop long term goals accordingly. Acquire new competencies that will enable them to assume major responsibilities.	Clearly identify where one wants to be and develop long term goals accordingly Exercise and further develop the new competencies and assume major responsibilities with confidence.
12. Updating Self / Lifelong Learning			Undertake further training and develop new skills within a managed environment. Identify the need to be aware of new developments in the area of study.	Undertake further training and develop new skills within a controlled environment. Identify the new developments in the area of study. Identify the need for independent learning and lifelong learning.	Undertake further training and develop additional skills that will enable them to make sound decisions. Identify ways of independent learning and lifelong learning.	Undertake further training and develop additional skills that will enable them to make sound decisions. Engage in independent learning using scholarly reviews and secondary sources of information.

LEVEL DESCRIPTORS for SLQF Levels 7-12

Categories of Learning Outcomes	Postgraduate Education					
	SLQF Level 7	SLQF Level 8	SLQF Level 9	SLQF Level 10	SLQF Level 11	SLQF Level 12
1. Subject / Theoretical Knowledge	Demonstrate appropriate knowledge and understanding in the specified area of study. Critically Analyse data, make judgments and propose solutions to problems.	Demonstrate an advanced level of knowledge and understanding in the area of study. Critically Analyse data, make judgments and propose solutions to problems.	Demonstrate a comprehensive & substantive level of knowledge and understanding in the area of study. Critically Analyse data, make judgments and propose solutions to problems.	Analyse and evaluate current research in the area of specialization. Demonstrate a critical awareness of current issues and recent developments in the area of specialization and/or area of professional practice.	Enhance knowledge through research of a quality that will satisfy peer review and merit publication. Evaluate and constructively criticize and improve methodologies in the area of specialization. Analyse and critically evaluate past and current research in the area of specialization.	Create new knowledge through original research of a quality that makes a significant contribution to development of the discipline and satisfy peer review and merit publication. Demonstrate critical reading and analytical skills by critically analyzing synthesizing and evaluating data, making judgments and identifying solutions to problems. Demonstrate a systematic acquisition and understanding of substantial amount of knowledge in the area of specialization and/or professional practice. Respond efficiently and effectively to the changing developmental needs of the discipline.
2. Practical Knowledge and Application	Use efficiently and effectively, practical skills and enquiry within the specified area of study.	Use efficiently and effectively, practical skills and enquiry within the area of study. Construct and sustain arguments and use these arguments, ideas and techniques in problem solving.	Use efficiently and effectively, practical skills and enquiry within the area of study. Construct and sustain arguments and use appropriately these arguments, ideas and techniques in problem solving.	Use efficiently and effectively, practical skills and enquiry within the area of study. Construct and sustain arguments and use appropriately these arguments, ideas and techniques in problem solving.	Use practical skills and enquiry efficiently and effectively within the area of study. Construct and sustain arguments and use these arguments, ideas and techniques comprehensively in problem solving.	Demonstrate an in-depth knowledge and understanding of applicable techniques for research and advanced academic enquiry/professional practice.

3. Communication	Demonstrate awareness of the current developments in the specified area of study through written and oral communication.	Demonstrate awareness of the current developments in the area of study through written and oral communication. Demonstrate awareness of the current developments in the area of study through written and oral communication.	Demonstrate awareness of the current developments in the area of study through written and oral communication. Demonstrate awareness of the current developments in the area of study through written and oral communication.	Communicate in oral and written format the findings/conclusions clearly to specialist as well as non-specialist groups.	Disseminate findings of scientific/intellectual enquiry through publication and/or presentation Communicate in oral and written format the findings, ideas and conclusions effectively to specialist and non-specialist audiences.	Disseminate findings of scientific/intellectual enquiry through publications and/or presentation at an internationally accepted level. Communicate in oral and written format the findings, ideas and conclusions effectively to specialist and non-specialist audiences. Communicate in oral and written format the findings/conclusions clearly to specialist as well as non-specialist groups.
4. Teamwork and Leadership	Demonstrate leadership in the professional environment/work place	Exercise leadership in the professional environment/work place	Exercise leadership in the professional environment/work place.	Plan and implement tasks efficiently and effectively in professional, technical and academic settings.	Exercise leadership and originality in tackling and solving problems in professional, technical and academic settings.	Exercise leadership and originality in tackling and solving problems in professional, technical and academic settings.
5. Creativity and Problem Solving	Deal with complex issues in a systematic manner Demonstrate self-direction and confidence in solving problems	Deal with complex issues in a systematic manner and make sound judgments Construct new hypotheses in the area of specialization and test them in a scientific manner. Demonstrate self-direction and confidence in solving problems.	Deal with complex issues in a systematic manner and make sound judgments. Construct new hypotheses in the area of specialization and test them in a scientific manner. Demonstrate self-direction and confidence in solving problems.	Deal with complex issues systematically and make sound judgments even without complete data. Construct new hypotheses in the area of specializations and test them in a scientific manner. Demonstrate self-direction and originality in solving problems Make decisions in complex and unpredictable contexts.	Construct new hypotheses and test them in a scientific manner. Demonstrate self-direction and originality in solving problems in the professional environment.	Conceptualize, design and implement new projects to generate new knowledge and applications. Make judgments on complex issues in the field of specialization even in the absence of complete data. Identify, conceptualize and provide creative insights into complex issues and problems, and demonstrate self-direction and confidence in solving problems.

6. Managerial and Entrepreneurship	Plan and implement tasks at professional and managerial levels.	Plan and implement tasks at professional and managerial levels. Take initiative, assume personal responsibility and demonstrate accountability and ability to instill entrepreneurship.	Plan and implement tasks at professional and managerial levels. Take initiative, assume personal responsibility and demonstrate accountability and ability to instill entrepreneurship.	Plan and implement tasks efficiently and effectively in professional, technical or academic settings. Take initiative, assume personal responsibility and demonstrate accountability and ability to instill entrepreneurship.	Supervise and guide research to generate new knowledge in the discipline. Plan and implement tasks efficiently and effectively in professional, technical or academic settings. Exercise initiative and personal responsibility and make decisions in complex and unpredictable contexts.	Supervise and guide original research to generate substantial insight in the discipline. Exercise high level of autonomy and initiative in professional, administrative and managerial activities. Exercise personal judgment and responsibility in complex and unpredictable situations in professional and/or managerial environments.
7. Information Usage and Management	Thorough in transferable skills including ICT skills and information literacy.	Thorough in transferable skills including ICT skills and information literacy.	Thorough in transferable skills including ICT skills and information literacy with the capability of organizing data.	Thorough in transferable skills including ICT skills and information literacy with the capability of organizing and processing data.	Thorough in transferable skills including ICT skills and information literacy with a higher capability for organizing and processing data.	Thorough in transferable skills including ICT skills and information literacy with a higher capability for organizing and processing data.
8. Networking and Social Skills	Ability to work in teams, give leadership and promote social engagement.	Ability to work in teams, give leadership and promote social engagement.	Ability to work in teams, give leadership, and promote social and professional engagement.	Ability to work in teams, give leadership, and promote social and professional engagement.	• Ability to work in teams, give leadership, promote social and professional engagement, and encourage collaborative research	Ability to work in teams, give leadership, promote social and professional engagement and establish collaborative research
9. Adaptability and Flexibility	Analyse and devise appropriate strategies for adapting to changing environments.	Analyse and devise appropriate strategies for adapting to changing environments.	Plan and execute appropriate strategies for adapting to changing environments.	Plan and execute appropriate strategies for adapting to changing environments. Make decisions in complex and unpredictable contexts.	Plan and execute appropriate strategies for adapting to changing environments. Exercise initiative and personal responsibility and make decisions in complex and unpredictable contexts.	Plan, execute and forecast appropriate strategies for adapting to changing environments. Exercise personal judgment and responsibility in complex and unpredictable situations in professional and/or managerial environments.

10. Attitudes, Values and Professionalism	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility. Exercise autonomy and initiative in professional, administrative and managerial activities.	Exercise initiative, personal responsibility and accountability in tasks performed. Demonstrate positive attitudes and social responsibility. Exercise high level of autonomy and initiative in professional, administrative and managerial activities.
11. Vision for Life	Clearly identify where one wants to be and develop long term goals accordingly.	Clearly identify where one wants to be and develop long term goals accordingly.	Clearly identify where one wants to be, where the society should be and develop long term goals accordingly.	Clearly identify where one wants to be, where the society should be and develop long term goals accordingly.	Clearly identify where one wants to be, where the society should be and develop long term goals accordingly.	Clearly identify where one wants to be, where the society should be and develop long term goals accordingly.
12. Updating Self / Lifelong Learning	Undertake further training and develop additional skills that will enable them to make sound decisions. Advance knowledge and develop additional skills. Engage in independent learning using scholarly reviews and secondary sources of information. Carry out independent studies for professional development.	Undertake further training and develop additional skills that will enable them to make sound decisions. Advance knowledge and develop additional skills. Engage in independent learning using scholarly reviews and secondary sources of information. Carry out independent studies for professional development.	Undertake further training and develop additional skills that will enable them to make sound decisions. Advance knowledge and develop additional skills. Engage in independent learning using scholarly reviews and secondary sources of information. Demonstrate skills in independent learning for continuous professional development.	Undertake further training and develop additional skills that will enable them to make sound decisions. Advance knowledge and understanding, and develop additional skills. Engage in independent learning using scholarly reviews and secondary sources of information. Demonstrate skills in independent learning for continuous professional development.	Undertake further training and develop additional skills using reflective practice that will enable them to make sound decisions. Advance knowledge and understanding, and develop additional skills. Engage in independent learning using scholarly reviews and secondary sources of information. Demonstrate skills in independent learning for continuous professional development.	Undertake further training and develop additional skills using reflective practice that will enable them to make sound decisions. Engage in independent learning using scholarly reviews and secondary sources of information. Continuously demonstrate skills in collective learning with originality for solving problems.

PROGRESSION PATHWAYS

One of the objectives of the SLQF is to show the pathways of obtaining different qualifications. The qualifications at different levels are identified considering the learning outcomes required to obtain that qualification and expected learning outcomes of the qualification holders. The vertical progression between qualifications is straight forward provided that the minimum stipulated requirements are met. Lateral progression is also possible at certain levels if the candidate meets the minimum requirements for admission to the target qualification. The possible routes of getting target qualifications that are stated under different qualification descriptors in Table 4 graphically shown in Figures 2 & 3.

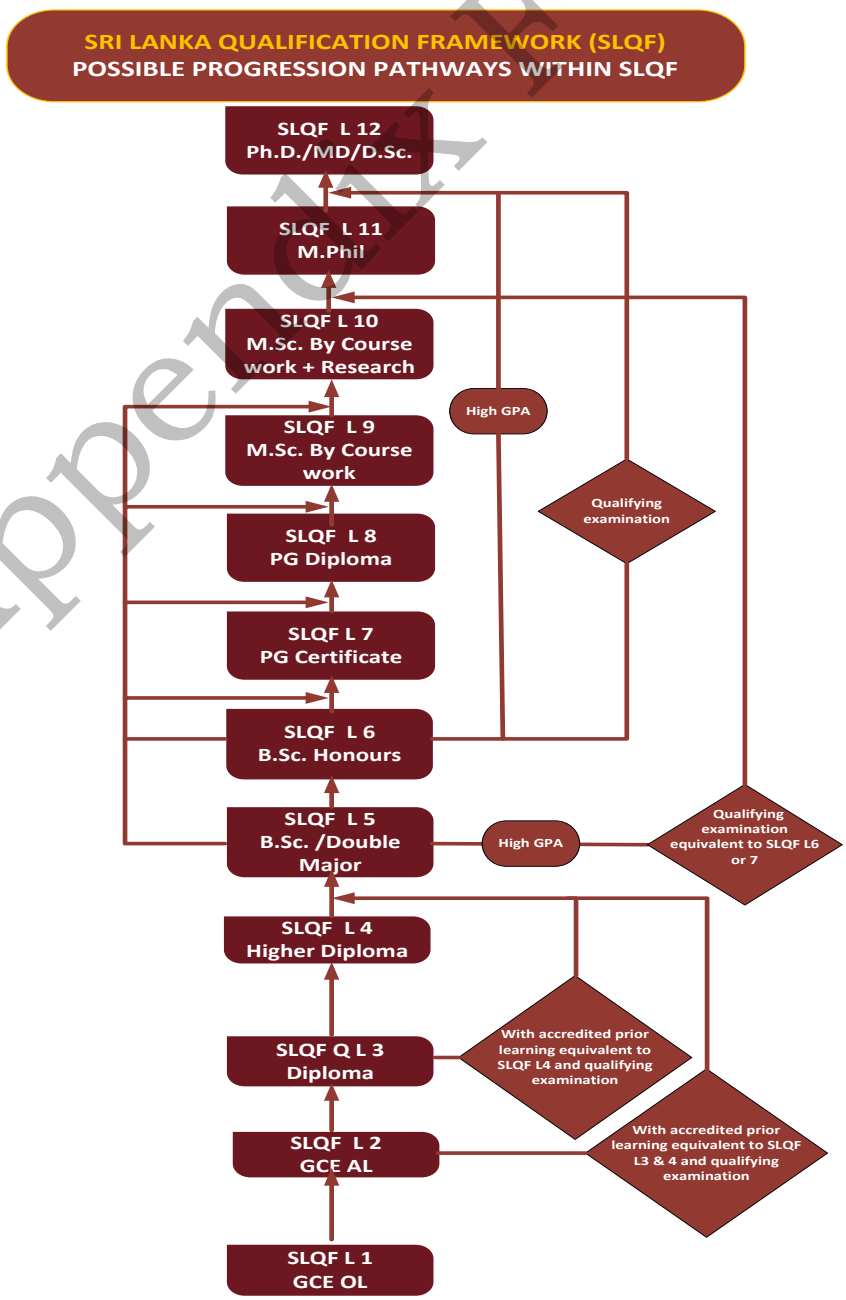


Figure 2

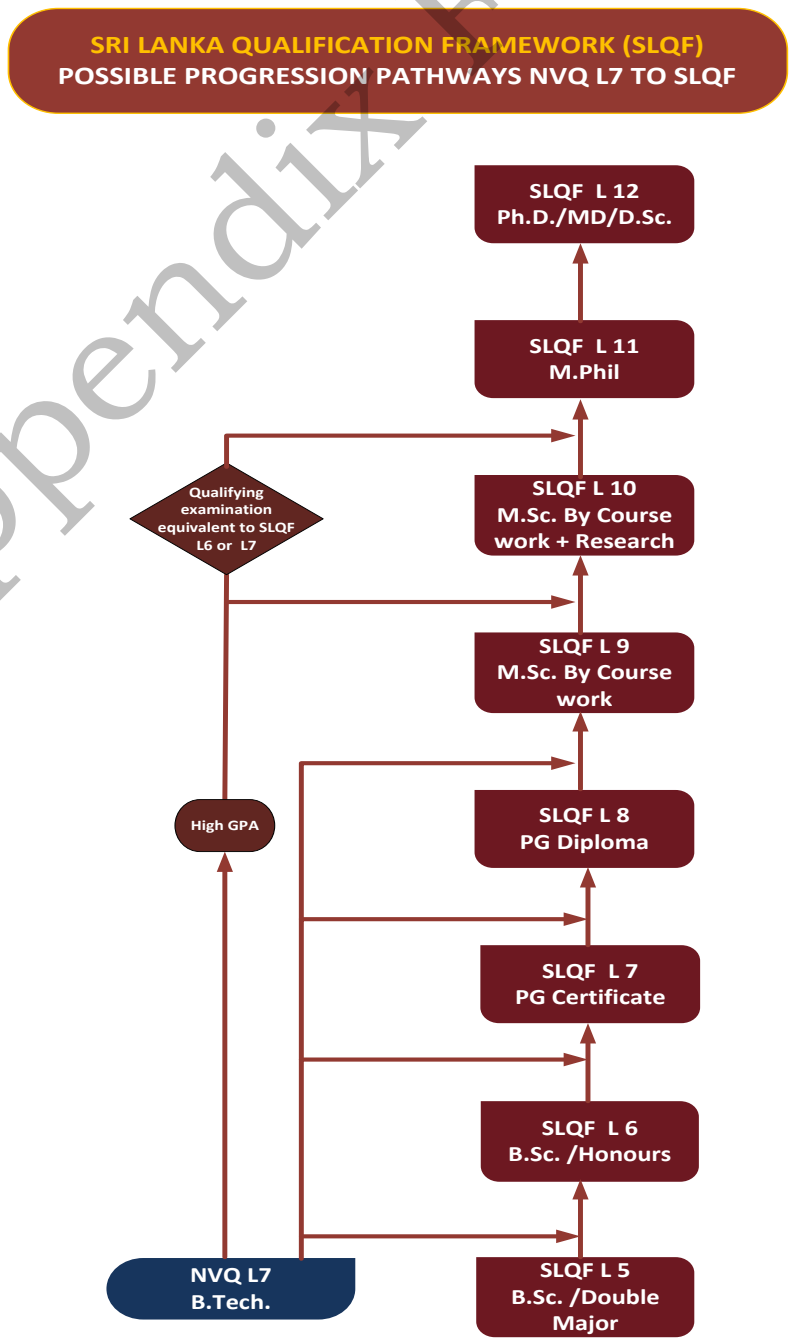


Figure 3

ABBREVIATIONS AND ACRONYMS

A	Accountancy
Agri	Agriculture
AdvCert	Advanced Certificate
BA	Bachelor of Arts
BAHons	Bachelor of Arts Honours
BBAHons	Bachelor of Business Administration Honours
BComHons	Bachelor of Commerce Honours
BSc	Bachelor of Science
BScHons	Bachelor of Science Honours
Cert	Certificate
DEd	Doctor of Education
Dip	Diploma
DLitt	Doctor of Letters
DPhil	Doctor of Philosophy
DSc	Doctor of Science
EnvMgmt	Environmental Management
Eng	Engineering
EnvSc	Environmental Science
GPA	Grade Point Average
HDip	Higher Diploma
HETC	Higher Education for Twenty First Century
HND	Higher National Diploma
ICT	Information and Communication Technology
IRQUE	Improving Relevance and Quality of Undergraduate Education
IT	Information Technology
MA	Master of Arts
MAgri	Master of Agriculture
MBBS	Bachelor of Medicine/ Bachelor of Surgery
MCom	Master of Commerce
MechEng	Mechanical Engineering
Med	Master of Education
MIT	Master of Information Technology
MLibSc	Master of Library Science
MPhil	Master of Philosophy
MSc	Master of Science
NQF	National Qualifications Framework
NVQF	National Vocational Qualifications Framework

NVQL	National Vocational Qualifications Framework Level
PGCert	Postgraduate Certificate
PGDip	Postgraduate Diploma
PhD	Doctor of Philosophy
QA	Quality Assurance
QAA	Quality Assurance and Accreditation
QAAC	Quality Assurance and Accreditation Council
Sc	Science
SLIATE	Sri Lanka Institute of Advanced Technological Education
SLQF	Sri Lanka Qualifications Framework
SLQL	Sri Lanka Qualifications Framework Level
SWOC	Strengths, Weaknesses, Opportunities and Challenges
TVEC	Tertiary and Vocational Education Commission of Sri Lanka
UGC	University Grants Commission

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Appendix G

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Requirement of a Lifelong Social Security System for Operational Workforce of Construction Industry in Sri Lanka

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Abstract

Behaviors of Operational Workforce have been one of the challenges in the construction industry and construction sector is suffering from shortage of required human resources for its physical operations even though unemployment rate in Sri Lanka is about 4.2%. Despite all the other resources, management of Operational Workforce still determines the success or failure of construction projects. Operational workers represent a member of the working class who in generally performs manual labour and earns an hourly or output based remuneration. The main focus of this study was to explore what would happen to the industry, if it keeps neglecting the people who bring the desires of employers, blended with innovativeness of architects, strengthened by engineers, enumerated by quantity surveyors, documented by contract administrators into reality according to the sequence of planning engineers by builders and contractors, if no proper Operational Workforce is available. This paper is aimed towards identifying the barriers to attract workforce to construction industry and underline the steps to be taken for developing a responsible Operational Workforce.

Key words

Operational Workforce, Construction Industry, Behavior, Retirement Benefits, Sri Lanka

1 Background

Construction is a project initiative industry. Project Management approach means having a temporary and systematic framework from inception to completion to procure 'a unique product, service or a result which has defined start and end date' (PMBOK, 2008). In the recent past many construction projects faced time and cost overruns due to unavailability of operational workforce. Many researchers identified scarcity of labour (Operational Workforce) as one of the key factors of project delays (Gaminiratne, 2004; Pathirage, 2008; Samarakoon, 2009 and Chandradasa & Ekanayake, 2011). Delay is one corner of the iron triangle as depicted in Figure 1, i.e. time. Another corner is 'quality', which again has considerable impact from workmanship (Atkinson, 1999). Therefore, it is obvious that the third corner 'cost' is affected by the performance of operational workforce.

Figure 1: Iron Triangle

If cost overruns could be minimised and the salvaged finances could be reinvested to improve the operational workforce, then more productive and efficient workforce can be expected.

The Rethinking Construction report produced by Sir John Egan (Egan, 1998) to the Prime Minister of United Kingdom identified seven areas where attention should be given in the construction industry during the 21st century. Following recommendations were made therein by Sir John Egan:

A. Capital cost to be reduced by 10%
B. Construction time to be reduced by 10%
C. Predictability to be increased by 20%
D. Defects to be reduced by 20%
E. Accidents to be reduced by 20%
F. Productivity to be increased by 10%
G. Turnover and profits to be increased by 10%

Four of the seven significant areas identified through Sir Egan's report (B, D, E and F) have direct correlations to the behavior of the operational workforce in the construction industry. Thereby, this paper attempts to explore and identify barriers to attract construction operational workforce with the intention of addressing any perceived issues. In doing so, this research focuses on the Sri Lankan construction industry due to apparent behavioral challenges (Wijewickreme and Ekanayake, 2010). Next section defines and introduces operational workforce.

2 Operational Workforce

General labour, skilled worker, physical production worker, blue collar worker, artesian, craftsperson, tradesman, operational level worker and the like are used to identify the Operational Workforce in construction industry. According to the findings of Equality and Human Rights Commission through their researches, 8% of the total workforce in UK or three million people are belongs to the construction sector (EHRC, 2010). Researches related to construction labour productivity are of at great interests to the academics and professional practitioners (Kadir, et al., 2005). Construction can be considered as a human driven industry. There are 300,000 firms working in construction industry as Small and Medium Scale Enterprises (SME) in UK itself. Sri Lankan Construction sector employs 8.2% of the total workforce or 682,000 people inclusive of Mining, Quarrying, Electricity, Gas and Water supply according to the reports produced by Central Bank of Sri Lanka (CBSL, 2012). There are over 2,000 registered contractors (ICTAD, 2013) in Sri Lanka as at present.

Construction is a male dominant industry. In USA, female contribution for construction sector is 4.3% (Swinney, 2005). The same is 3% in Sri Lankan context (Pathirage, 2008). Males generally enjoy responsibilities, which includes sourcing the requirements of their dependents. Majority of the Operational Workforce in construction industry of Sri Lanka is local migrants moved from villages to urban areas. They often work at remote locations and usually meet their dependents once a month. There are around 30 various trades directly related to construction activities excluding the trades of other major supportive trades such as; communication, mechatronics, electromechanical, building management and air conditioning. Having discussed operational workforce, next section briefs challenges within Sri Lankan industry context.

3 Challenges of Operational Workforce

Total unemployment in Sri Lanka is accounted around 4.2% (CBSL, 2012). According to the recent statistics, it appears that construction is not among the popular industries for the youths of Sri Lanka. Suitably educated but unemployed male population (up to GCE A/L) in Sri Lanka is about 4.7%, but it appears they are reluctant to join the construction industry (DCSL, 2012, p. 20; Table 5.4).

Youngsters prefer joining armed forces than construction industry after the school education even to scarify their lives at frontline operations and prepare the living path for their dependents even if they are not in existence. If lucky to survive, then they will become eligible for a lifelong pension scheme after completing 22 years of military services. If not their dependents will receive the benefit of the government pension scheme. Hence, military operatives are free from mental stress of their dependents as soon as he or she joined.

Physiological Contract (Chandradasa & Ekanayake, 2011) is a study that introduced an "Iceberg" model. According to the model, most of the human problems cannot be seen from the surface view. In many cases what is possible to see is "Work" and "Pay" only. Hidden part of the iceberg contains many other negative effects as depicted in Figure 2, which may larger, heavier and danger to the construction industry and to the general society at large.

Figure 2: Iceberg model of physiological contracts (Businessballs, 2013)

A study carried out by Wijewickreme & Ekanayake (2010), identified a number of behavioral problems of Operational Workforce in Sri Lanka as illustrated in Table 1 below.

Table 1: Ranking of Behavioral Problems of Operational Workforce

Rank	Description	%	RII
1	High labour turnover	11.43%	0.63
2	Poor quality of workmanship	11.34%	0.62
3	Temporary or irregular attendance	11.29%	0.62
4	Lack of trade knowledge and skill	11.24%	0.62
5	Lack of cost concerns	10.34%	0.57
6	Irresponsibility & lack of reliability	10.29%	0.56
7	Unfair demanding of wages or rates	9.96%	0.55
8	Adamant behavior & lack of loyalty	9.58%	0.52
9	Reluctant to learning & training	9.20%	0.50
10	Carelessness & safety concerns	9.06%	0.50
11	Unethical sudden demanding	7.59%	0.42

From the results, it was apparent that almost all the identified negative effects were giving considerable impact to the construction industry in relation to the requirements of managing the iron triangle (Atkinson, 1999). According to the recent growth of construction industry, demand for labour has risen while the supply seems to be insufficient. This situation is highlighted in the following statement.

> *"It is observed that the Labour Productivity has come down in almost all the sectors as a result of increased number of employees engaged, without a substantial or no increase in Value Addition. This may have been caused by the volatile nature of employment in the construction industry, where labour migration and shifting takes place, especially in the informal sector."*
>
> (Pathirage, 2008, p. 11)

Due to the insufficiency of labour, prices of labour have commenced increasing over the time, which ultimately increases the cost of overall construction. Labour costs itself captures almost 12% of total construction cost when it comes to infrastructure projects and the same becomes almost double or 20% to 25% when it comes to building projects depending on the quality and complexity of finishes according to the calculations based on Building Schedule of Rates (BSR) issued by ICTAD. Following statement explains the current status.

> *"The national working poverty incidence (13.7%) has been exceeded by the production industries of Agricultural, Construction and Mining workers who hold 21.1%, 18.1 % and 21.8% poor workers in respective categories when studying the poverty across the main industry categories of the workers occupied".*
>
> (Rasseedin, 2011a, p. 67).

It is said that tacit knowledge is much centered to the construction industry, developed through generations in Sri Lanka (Pathirage, 2007, p. 21) and at a risk of diluting it strengths whereas de Silva, et al., (2010) argued behavioral complications has become usual to the construction industry in Sri Lanka according to the recent studies. The situation is not necessarily limited to the construction industry, but there are many other industries which indicate similar negative effects as per the following statement.

> *"Conventional solutions for improving labour productivity concentrated on giving wage incentive to motivate the workers to work harder. But these alone are not expected to address, the root causes of low labour productivity, relating to health, worker attitudes, education, and the like".*
>
> (Rasseedin, 2011a, p. 93).

Victoroff (2005) argued that unavailability of a functioning social security system could lead to an increase in the criminal and terrorist activities due to lack of confidence because human nature has not changed. In Sri Lanka, a former Journalist of *'Agence France Presse'* (AFP) was murdered in February 2014 by a Paint bass that did pre charismas renovations to her residence (The Island, 2014). This murder is an only a single example of many similar situations of burglary related murders by a casual operational workers of floating nature whom do not have any secured source of regular income.

4 Research Methodology

The research was primarily based on inductive approach which moved from specific observations to a broader generalisations and theories. Research means different things to different people (Amaratunga, et al., 2002). Research is an organised process of combining and exploring range of approaches, strategies, techniques and procedures building towards the aim and objectives (Kumar, 2011). Researches are commencing from two types of approaches called deductive and inductive. When using the deductive approach, the researcher narrow

downs a broad picture (more general) of an object towards a more specific focal point. Inductive researching is the opposite path of deductive approach (Saunders, et al., 2012).

This paper presents the results of a research that was carried out to find the barriers for attracting Operational Workforce in to the construction industry. A questionnaire was administered (Please refer to the copy of questionnaire at the end) among a sample of the Operational Workforce of the Sri Lankan construction industry, their immediate supervisors, project managers and directors of construction contractors. Following section provides more details on the questionnaire, analysis and its outcomes.

5 Questionnaire Survey and Research Outcomes

A questionnaire was prepared with two-point perspective format (Wijewickreme & Ekanayake, 2010) to obtain different viewpoints of both Operational Workforce and their Managers on the same objectives. Managerial team was selected from directors, site managers and immediate supervisors through a structured cross section containing 55 members as given in Table 2. The team representing the managerial perspective was requested to assess negative impacts of the Operational Workers from the management point of view according to a Degree of Importance from 1 to 7 Likert scale (Likert, 1932). Relative Importance Index (RII) (Enshassi, et al., 2012) was used to help further analysis. The questionnaire designed for management had two separate sections that assessed the negative behavioral affect they experienced from the operational workforce.

Table 2: Questionnaire Distribution

A.	Company Directors	5	Managerial Team (Total 55)
B.	Site Managers	10	
C.	Middle Managers - Technical	40	
D.	Operational Workers	400	
	Total	455	

All the questions in the questionnaire were based on the findings of pilot survey carried out with selected industry professionals. Additional spaces were provided within the questionnaire to add new negative affects based on their personal experiences. Operational Workforce represented randomly selected 400 participants from different independent projects. The questionnaires for the Operational Workforce were available in all 3 recognised languages (Sinhala, Tamil and English) in Sri Lanka.

5.1 Data Analysis

To determine the relative ranking of the assessment methods, the scores entered in the survey were transformed to RII values using the following equation where '*w*' is the weighting given to each factor by the respondents, ranging from 1 to 7.

$$RII = \frac{\sum w}{AN}$$

In the formula, '*A*' is considered as the highest weight (i.e. 7 for this research) and '*N*' is the total number of samples. Accordingly, RII is the relative important index, where the answer is between '0' and '1'.

5.1.1 Recruitment modes of Operational Workforce

Five different modes of recruiting were identified and analysed according to the relative importance of findings. Most common mode of fulfilling the required number of Operational Workforce has been the 'output based subcontracting' as indicated in Figure 3.

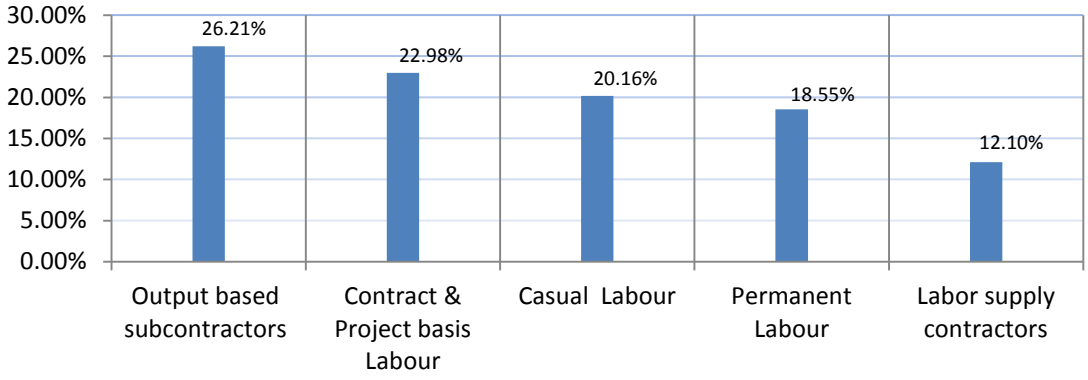

Figure 3: Recruitment Modes of Operational Workforce (Wijewickreme & Ekanayake, 2010)

5.1.2 Difficulties Experienced by Operational Workforce

Data received from both Managerial team and Operational Workforce were analysed with the use of RII. Relative and comparative importances of the identified negative effects are presented in Table 3 below. Ranking of relationships between the findings from the viewpoint of Operational Workforce was compared against the viewpoint of Managers. From both viewpoints, most important reason was identified as 'Poor Retirement Benefits'. There wasn't any significant difference between management and operational workforce viewpoints on the 'Top 6' negative effects.

Table 3: Comparative analysis of the negative effects of Operational Workforce

	Description	%	RII of Operational Workforce	Ranking (By Workmen)	Variance	Ranking (By Management)	RII of Management Team	%
a	Poor retirement benefits	9.60	0.91	1	**0**	1	0.91	10.5
b	Dissimilarities in salary scales	9.50	0.90	2	**+3**	5	0.80	9.20
c	Gray areas in the career development	9.10	0.87	3	**+1**	4	0.82	9.50
d	Temporary nature of the occupation	8.90	0.84	4	**+2**	2	0.87	10.10
e	Lack of social recognition	8.80	0.83	5	**-2**	3	0.82	9.50
f	Non availability of recreation facilities	7.00	0.67	6	**0**	6	0.60	6.90
g	Being away from family and relatives	6.30	0.60	7	**+5**	12	0.46	5.30
h	Political & social influences	6.20	0.59	8	**+2**	10	0.48	5.60
i	Safety & sanitary facilities	6.20	0.59	9	**-1**	8	0.55	6.30
j	Interpersonal relationships	6.20	0.59	10	**-1**	9	0.52	6.00
k	Lack of trouble free communication	6.00	0.57	11	**+3**	14	0.38	4.40
l	Influence from the dependents	5.50	0.52	12	**-1**	11	0.48	5.50
m	Improper gender balance	5.40	0.51	13	**-6**	7	0.55	6.30
n	Behaviors of the immediate supervisor	5.30	0.50	14	**-1**	13	0.41	4.80

Poor retirement benefit is considered as the most significant barrier for attracting Operational Workforce in to the construction industry, particularly within the Sri Lankan context. Thereby, introducing a social security system for operational workforce of Sri Lankan construction industry is considered as critical for attracting and maintain efficient, and productive construction workforce. Succeeding section discusses about social security system.

6 Social Security

Social security is a fundamental right according to the Article 22 of the Universal Declaration of Human Rights (United Nations, 1948, p. 5).

'Everyone as a member of the society has a right for a social security and is entitled to realisation, through national effort and international cooperation in accordance with the organisation and resources of each State, of the economic, social and cultural rights indispensable for people's dignity and the free development of the personality'.

International labour Organisation (ILO) considers social security as a universal need. Social security is recognised as a basic human right by the ILO Conventions and United Nations charters such as International Covenant on Economic, Social and Cultural Rights as well (Ginneken, 2003). The objective of a social security is to protect the poor and vulnerable and to ensure that they have an acceptable standard of living. Social security may also involve smoothing consumption and reducing risk or spreading income over the life cycle. Often there is a redistribution of income among groups with differing needs (Ahmad, 1991). Majority of the public consider social security as the most important form of household wealth (Fedlstein, 1974). Neither the theoretical nor the empirical analyses were given due consideration or adequate attention to the existence and growth of social security.

6.1 Social Security in Construction Industry in Sri Lanka

Poor retirement benefits could be considered as the major barrier to attract the current youth as their future sector of careers as illustrated in Table 3. According to the findings of Wijewickreme & Ekanayake (2010), 6.25% of the operational workforces in construction industry are above their retirement age but still working due to absence of an effective and lifelong social security system. As per the 'A Theory of Human Motivation' (Marslow, 1943), 6.25% of the over aged Operational Workforce in construction industry should be in the level of Self Actualisation. However, in Sri Lankan construction industry context, the same is still fighting for their basic 'Physiological Needs' such as Air, Water, Food and Sleep. Sometime they were forced to work to fulfill their day-to-day requirements including their dependents such as grand children or their parents.

As stated in the iceberg model in Figure 2, what could be observable were 'Pay' and 'Work'. Based on the findings in Table 3, there were 14 other negative effects which could not resolve only with a 'Pay' to the Operational Workforce. Their requirements of workforces needed more and broad attention from the Management perspective. Demands of the Operational Workforce were not merely limited to a settlement through payment. Similarly, in the reverse version 'Just Work' for the 'Pay' could not settle the requirements of the Employee. Some of

the requirements of operational workforce cannot be resolved without the intervention from the statutory organisations.

Professionals such as Client Advisors, Architects, Engineers, Quantity Surveyors, Planning Engineers, Contract Administrators, Builders, Contractors, etc. are working towards the future of the industry. Series of professional bodies are supporting them to develop their career status with CPD's, Seminars, Exhibitions, Award Ceremonies, AGMs, and Conferences but haven't seen an event organised for the Operational Workforce of the construction industry.

7 Conclusion

According to the findings of the research, it can be concluded that Operational Workforce will not be a commodity anymore. Human resources shall not be treated similar to the other commodities which can mobilise and demobilise similar to a Just in Time (JIT) activity sequencing of Supply Chain Management process.

They have to be considered as partners of the industry. As partners of the industry, they will become eligible to share profits. Suggested partnership arrangement is in line with the Goal 8 (Develop a global partnership for development) of the Millennium Development Goals (UN Millennium Project, 2000). The best profit that Operational Workforce looking for at present as partners of the construction industry is a retirement benefit. National level planning and resources management structure is an essential need to fulfill their requirements. Hence, industry needs to pay more attention to resolve the issues related to operational workforce in construction industry.

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9 Appendix A

Research Project on
Motivating Blue Collar Workforce Towards Construction Industry
Conducted By

Master of Science in Construction Project Management
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Questionnaire Form 'D'

1. General Information

Name
Age Years Experience Years
Trade Mobile
Address

2. What are the difficulties that you are experiencing as at present as a construction worker? (Weigh the range by giving **"1 for low"** importance and **"7 for high"** importance)

		Degree of importance						
		Low			Mid			High
		1	2	3	4	5	6	7
a.	Lack of social recognition	☐	☐	☐	☐	☐	☐	☐
b.	Temporary nature of the occupation	☐	☐	☐	☐	☐	☐	☐
c.	Behaviors of the immediate supervisor	☐	☐	☐	☐	☐	☐	☐
d.	Gray areas in the career development	☐	☐	☐	☐	☐	☐	☐
e.	Interpersonal relationships	☐	☐	☐	☐	☐	☐	☐
f.	Insufficient income	☐	☐	☐	☐	☐	☐	☐
g.	Dissimilarities in salary scales	☐	☐	☐	☐	☐	☐	☐
h.	Political & social influences	☐	☐	☐	☐	☐	☐	☐
i.	Influence from the dependents	☐	☐	☐	☐	☐	☐	☐
j.	Improper gender balance	☐	☐	☐	☐	☐	☐	☐
k.	Safety & sanitary facilities	☐	☐	☐	☐	☐	☐	☐
l.	Poor retirement benefits	☐	☐	☐	☐	☐	☐	☐
m.	Non availability of recreation facilities	☐	☐	☐	☐	☐	☐	☐
n.	Being away from family and relatives	☐	☐	☐	☐	☐	☐	☐
o.	Lack of troublefree communication	☐	☐	☐	☐	☐	☐	☐
p.	Other 1	☐	☐	☐	☐	☐	☐	☐
q.	Other 2	☐	☐	☐	☐	☐	☐	☐

August 2009

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