



# **Conceptual models for selecting and managing Early Contractor Involvement (ECI) delivery system by clients**

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Doctor of Philosophy

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## **DECLARATION**

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

Farshid Rahmani

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## **Abstract**

The traditional procurement methods and contractual models, in which the main contractor and its subcontractors are appointed only for the construction phase, remains the common approach within the construction industry. The use of a traditional procurement method may offer some benefits to the clients such as time and cost certainty, control over the project outcomes, and ability to demonstrate value for money. Nevertheless, it is unlikely to obtain the best contributions of all parties to a successful project due to exclusion of the main contractor and subcontractors from the early design and project planning. Acknowledged by the industry, the emerging project delivery methods increasingly rely on collaboration between the client (owner), designer and contractor. These methods aim to develop longer-term positive relationships.

Early Contractor Involvement (ECI) procurement system is one of the new delivery methods. Originated in the UK in 1998 and adopted later in Australia in 2005, ECI strives to involve the contractor at the early stage of the project before the statutory procedures have been implemented and when the proposed project may be little more than a line on a plan. Given the growing use of ECI in public project in Australia, it is necessary to conduct more studies about different aspects of this novel procurement option in order to enhance the public sector ability to deliver high-quality capital projects.

This research aims to develop a theoretical methodology for clients to select and manage ECI procurement method for a project. The main objectives of the research are to explore the circumstances when an ECI is suitable for a project and develop strategies to manage the client-contractor relationship effectively once ECI is adopted. The research employs a Grounded Theory methodology to facilitate the generation of theory. In particular, from the epistemological and ontological stance, this study deviated from the classic grounded theory principles into a process-driven theory. The analytical procedure of the study,

however, follows the original tenets of the Straussian interpretation of Grounded Theory.

Four Australian local government organisations and one Australian leading private professional consultant organisation are selected for the purpose of this research. Fourteen professional practitioners at the senior management level who have been involved in ECI projects and played significant roles in the project process in the selected organisation are interviewed.

This results in the development of two models. The first model identifies the ECI selection criteria as well as ECI selection approaches, and the second model formulates a cyclical client-contractor relationship managing process in the ECI.

The outcomes of this research are twofold. The first outcome is to assist the decision making process within the client's organisations about whether to adopt an ECI method for a specific project by assessing the project conditions and evaluating internal capabilities. The second outcome is to develop a process model for effectively managing the client-contractor relationship in an ECI project. The model also assists the clients to advance their awareness of their strengths and weaknesses from the outset to ensure that the relationship with the contractor is not contaminated by misjudgement of the contractor's performance.

## **ABBREVIATION**

AIA	American Institute of Architectures
AHP	Analytical Hierarchy Process
ALT	Alliance Leadership Team
AMT	Alliance Management Team
ASCE	American Society of Civil Engineers
BAA	British Airports Authority
BOOT	Build-Own-Operate-Transfer
BPF	British Property Federation
CII	Construction Industry Institute
CIIA	Construction Industry Institute of Australia
CIRA	Construction Industry Research and Information Association
CM	Construction Manager
CMR	Construction Management at Risk
C Only	Construct Only
CSNP	Construction Supply Network Project
dECI	Dual ECI
D&C	Design and Construct
DB	Design and Built
DBB	Design-Bid-Build
DBFO	Design-Build-Finance-Operate
DOT	Department of Transportation
ECI	Early Contractor Involvement
EPC	Engineering-Procurement-Construction
ETI	Early Tender Involvement

ICE	Institution of Civil Engineering
ICT	Information Communication Technology
IPD	Integrated Project Delivery
JLT	Joint Leadership Team
KPI	Key Performance Indicator
KRA	Key Result Area
KSAE	Knowledge-Skills-Attributes-Experience
MADA	Multi-Attribute Decision Analysis
MCDM	Multi-Criteria Decision Making
MOD	Ministry of Defence
NAO	National Audit Office
NEC	New Engineering Contract
NEDO	National Economic Development Office
NZTA	New Zealand Transport Agency
OGC	Office of Government Commence
PFI	Private Finance Initiative
PMBOK	Project Management Body Of Knowledge
PMI	Project Management Institute
PPP	Public Private Partnership
QGCP0	Queensland Government Chief Procurement Office
RAP	Risk-adjusted Price
RBP	Relationship-Based Procurement
RFP	Request For Proposals
RIBA	Royal Institute of British Architects
RICS	Royal Institute of Charter Surveyors
TOC	Target Outturn Price

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# **Chapter 1: Introduction**

This research is exploratory and qualitative in nature. It develops a theoretical methodology for clients to select and manage the Early Contractor Involvement (ECI) procurement method for a project. The main objectives of the research are to explore the circumstances when an ECI is suitable for a project and develop strategies to manage the client-contractor relationship effectively once ECI is adopted in an appropriate situation to ensure the achievement of best value.

This research also focused on the clients' side to explore the knowledge, skills, attributes and experience (KSAE) required for managing an ECI when ECI is utilised. It is essential for the clients to ensure that their internal capabilities have reached an adequate level of maturity to support an ECI approach. Understanding internal capabilities before adopting an ECI also helps clients define the expectation of any external party that facilitates the process for identifying and selecting a contractor. The theme of the research is qualitative, involving in-depth investigation of ECI utilisation practices in Australia by public sector clients.

The aim of the research is to assist decision makers in public sector organisations to better understand the importance of selecting ECI where it is essential and managing the ECI working relationship once it is selected. This is achieved through developing two models to select ECI for a project and manage the relationship.

This chapter provides an introduction to the subject of this thesis, the background of the research, the rationale for the research, research objectives, a statement of the research question that was addressed, a description of the methodology adopted, description of the scope and limitation, and finally, a brief description of the content of each of the chapters that comprise the thesis.

## **1.1. Background of the Research**

Various building procurement methods are adopted for different construction projects, such as Design-Bid-Build (DBB), Design and Build (D&B), Management

Contracting, and Public Private Partnering (PPP). However, the Single-stage procurement and contractual model, in which the main contractor and its subcontractors are appointed only for the construction phase, remains the common approach within the construction industry. Its widespread use is perhaps due to its familiarity, simplicity, economic and procedural factors, and the culture of uncertainty avoidance (Love et al. 2008; Mosey 2009).

Using single stage procurement offers some benefits to the clients, including cost certainty, control over the project outcomes, and ability to demonstrate value for money and accountability for public projects (Love et al. 2008). However, this model is unlikely to obtain the best contributions of all parties to a successful project. Its great limitation is that it excludes the main contractor and subcontractors from the early design and project planning which inhibits opportunities for innovative solutions, and consideration of building constructability into design (Edwards 2009; Mosey 2009).

In response to this issue, a number of initiatives and radically different approaches to the project delivery methods and management of construction projects have emerged that increasingly rely on collaboration between the client (owner), designer and builder. These methods aim to develop longer-term positive relationships. Early Contractor Involvement (ECI) procurement system is one of these new delivery methods (Scheepbouwer & Humphries 2011a). The development of ECI was based on the premise that traditional methods create the team much too late in the project development and there is little scope for innovation and consideration of constructability (Edwards 2009).

There is a wealth of evidence to suggest that involvement of the main contractor at the early stage of the project can bring significant benefits to all parties engaged in the project (Edwards 2009; Laursen & Myers 2009).

## **1.2. Rationale for the research**

The Australian economy is significantly impacted by the construction industry (Hampson & Kwok 1997). The Australian Bureau Statistics (2010) estimates that the construction industry as a whole is the fourth largest contributor to

economic growth. The construction industry accounted for 6.8% of GDP in 2008-09. As at May quarter 2009 the construction industry employed 9.1% of the Australian workforce, making it Australia's fourth largest industry. Employment figures can fluctuate due to the cyclical nature of the industry characterised by upturn, boom, bust and stagnation (Harvey & Ashworth 1993).

There are also a number of other industries indirectly linked to the construction sector such as building materials supply, components manufacturing and a range of related finance industries (Statistics 2010). Since the value of construction works in both the public and private sectors in Australia has escalated rapidly in recent years, the level of construction works is currently far greater than previously performed in Australia (Whitehead 2009). However, the increase in construction works creates some challenges for both owners and contractors. Owners should become innovative to ensure they can attract the best contractors and engineering resources available. Contractors face the challenge of staff retention to deliver (and win) projects, in circumstances where the skills shortage makes staff very mobile (Whitehead 2009).

In Australia, properly delivered and resourced infrastructure projects underpin the nation's economic prosperity, providing both primary and secondary benefits to the industry and the wider Australian public. The Commonwealth government, alongside state and territory governments, are committed to delivering effective and efficient infrastructure projects and to driving continuous improvement in this area. They have constantly strived to identify the best practice processes and behaviour in planning, procuring and delivering infrastructure projects (Department of Infrastructure and Transport 2012; Wilson & Abson 2010). Among different aspects of a capital construction project, procurement is found to be the most important area and represents over 80% of the contract value (Lester 2006). Therefore, it has become evident that the way procurement is managed determines the success of a project. Moreover, at a higher level, studies show that procurement strategies impact on the overall performance of the building industry (Mohsini & Davidson 1991).

In an attempt to adopt more effective procurement routes, the use of early

contractor involvement is becoming more popular for infrastructure projects across Australia (Department of Infrastructure and Edwards 2009; Swainston 2006; Transport 2012). It is generally agreed that to effectively implement new procurement procedures clients must have a high level of confidence in, and hold positive attitudes about, the impact those procedures will have on project outcomes (TysseLand 2008). Hence, clients should have a good understanding of novel procurement methods such as ECI and how using such a method actually affects project performance (Eriksson & Westerberg 2011; Walker & Lloyd-Walker 2011). However, it appears that ECI has been adopted as a preferred procurement option with little research or piloting. This results in the client lacking the ability to set sensible budgets, challenge Target Prices and manage the process effectively (Eadie et al. 2012).

From the above discussion it is clear that construction is of great importance in economic development and in order to enhance the nation's ability to deliver high-quality capital projects, it is necessary to conduct more studies in emerging procurement methods such as ECI, which are widely utilised for public infrastructure projects.

In addition, the few authors who have conducted research on evolving modern project procurement paths have advocated for more empirical and academic studies on the topic to better understand different aspects of this relatively new procurement method (Gil 2001; Rahman & Alhassan 2012; Scheepbouwer & Humphries 2011b; Song, Mohamed & AbouRizk 2009; Walker & Lloyd-Walker 2011). Based on the above rationale, this research aimed to contribute to this underdeveloped area.

### **1.3. Research Proposition**

Scientific research is formed and evaluated based upon the criteria of its propositions. According to Avan and White (2001, P.49) a research proposition is

... a narration of a concept, which requires the same level of caution and precision that is expected of scientific research. The identification of a proposition requires a careful review of the

excerpt. It is always useful to identify propositions before labelling or categorising them. This will broaden the vision for identification without the narrowness of the pigeonhole attitude.

This research develops a basic proposition as below:

- The best value is promoted throughout the delivery of project when,  
a) ECI is used in an appropriate situation, b) a competent team is appointed to work on an ECI project, c) an effective strategy for relationship management is developed as a result of the ECI process.

#### **1.4. Research Objectives**

As influenced by the research rationale and proposition, the following set of research objectives is developed:

- 1- To define and establish ECI concept and term from the client organisations' perspective;
- 2- To gain a consensus on when ECI is appropriate;
- 3- To provide better understanding of the clients' capabilities needed to adopt and manage an ECI;
- 4- To provide an effective decision making strategy for relationship management when ECI is selected and utilised.

#### **1.5. Research Questions**

Research questions formulated for this study had to be sufficiently deep and wide to justify a doctoral thesis. Flick (2009) emphasised that research questions should not be 'too narrow and thereby miss the target of investigation or block rather than promote new discoveries' (p. 129).

The main objectives of this research were encapsulated by a number of research questions. The four key research questions listed below needed to be addressed to complete the research.

- 1- What is ECI and what are its characteristics?
- 2- How, and under which circumstances, should an ECI be adopted for a project?

- 3- How can an effective strategy for relationship management be developed as a result of an ECI process?
- 4- What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?

## 1.6. Research Methodology

This section aims to identify the appropriate methodology for the research. Selecting an appropriate methodology is vital in order to achieve valid and reliable results. However, a plethora of existing approaches challenges research students to make an informed choice of an option for research (Fellows & Liu 2009). According to Fellows and Liu (2009) consideration of the scope and depth of the problem affects the choice of methodology employed for a research.

The objective of this research is to investigate how best value is achieved through the right selection of ECI for a project and managing the working relationship effectively once ECI is utilised. Therefore, this study can be considered as an exploratory study. Exploratory study is advocated when not much is known about the situation or information is not available on the way that the past studies have addressed similar problems or research issues (Sekaran 2006).

The research strategy and techniques employed to achieve the optimal results are tabulated in Table 1.1 below.

**Table 1.1 Research questions and selected strategy**

	Primary Research Question	Research Strategy	Research Technique
Q1.	What is ECI and what are its characteristics?	Literature Review/Semi-structured Interviews	Critical Review/Content Analysis

	Primary Research Question	Research Strategy	Research Technique
Q2.	How and under which circumstances, should an ECI be adopted for a project?	Literature Review/Semi-structured Interviews	Critical Review/Content Analysis
Q3.	How can an effective strategy for relationship management be developed as a result of an ECI process?	Semi-structured Interviews	Content Analysis
Q4.	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	Semi structured Interviews	Content Analysis

An extensive cross-disciplinary literature review was conducted to understand the current state of knowledge to partly address the first two objectives and incorporated research questions. The first two research objectives, along with the other two objectives, were completely addressed through developing two process models. The first model identifies the ECI selection criteria as well as ECI selection approaches, and the second model explicates a cyclical relationship managing process.

Data was collected from the perspectives of four leading Australian public organisations and one professional consultant. A Grounded Theory approach was employed in this part of the research that facilitated the generation of categories and theory.

The data gathered through individual interviews was analysed by using the content analysis technique. The use of content analysis is advised to identify patterns, themes, biases and meanings through a careful, detailed, systematic examination and interpretation of a particular body of material (Neuendorf 2002).

## **1.7. Significance of Research**

Selection of an appropriate procurement method is critical as it determines whether it will deliver the best value for money. Similarly, ECI as one of the procurement options should be used where it is essential and other models should be opted when ECI is unnecessary. If, on balance, principles that underlie ECI contracting are of minimal benefit to the project, the use of an alternative contracting strategy is essential. The role of government is to provide services and infrastructure for the good of the nation, and to expend taxpayers' money to secure best value for money through the proper management of public money and public property (ComLaw 1997). Consequently, it is crucial for clients to evaluate under which circumstances a project is better suited to an ECI contract or another form of contract.

As ECI is a relatively new procurement strategy, decisions to select this method for a project have been mostly judgmental, and subject to biases of the decision-makers. Measuring value for money is another challenging task for clients as federal, state and local governments are generally silent on how it should be measured and evaluated (Davies 2008). There is, therefore, a need for a system to define a process to facilitate the selection and management of ECI in order to ensure that value for money is delivered as a result of ECI process.

The outcomes of this research are twofold. The first outcome is to assist the decision making process within the client's organisations about whether to adopt an ECI method for a specific project by assessing the project conditions and evaluating internal capabilities. The second outcome is to develop a process model for effectively managing the client-contractor relationship in an ECI project. The model also assists the clients to advance their awareness of their strengths and weaknesses from the outset to ensure that the relationship with the contractor is not contaminated by misjudgement of the contractor's performance.



## **1.8. Research Scope and Limitation**

The main research objective of the research is to provide a detailed explanation of the factors required for clients selecting an ECI and the strategies for ECI relationship management that have been developed as a result of an ECI process when it is essential to achieve best value.

A quantitative study approach was believed unsuitable for this research for the reason that ECI is a relatively new procurement method in the construction industry and not many projects have been procured under this model compared to more established procurement models, such as traditional design, bid and build (DBB) and design and build (D&B). Hence, little information is available at either project or organisational levels to develop the client's understanding of its underlying philosophy.

For the purpose of this research, construction client organisations were only selected as the context of this study as the clients constitute boundary of this research. Clients are recognised as having great influence on the project outcomes given that their financial status, characteristics, management competency and construction experience make significant contributions to project success (Lim & Ling 2002).

This could also be perceived as a limitation of the research as the ECI model involves the contractor at the early stage to create an integrated team that includes client, consultant and contractor. The implications of this omission is not very concerning as the focus of the study is to develop a model clients can use to guide selection of ECI as a procurement alternative before engaging a contractor and developing strategies to manage the client-contractor relationship involved in an ECI project.

## **1.9. Structure of the Thesis**

This thesis comprises 7 chapters. Chapter 1 provides an introduction to the subject of this thesis, the background of the research, the rationale for the research, research objectives, a statement of the research questions

addressed, a description of the methodology adopted, description of the scope and limitation, and finally, a brief description of the content of each of the chapters that comprise the thesis.

**Chapter 2** reviews the literature in diverse fields such as construction clients, construction project life cycle, procurement selection process, Early Contractor Involvement (ECI), constructability, innovation and relationships in construction (including working relationship, trust, communication and commitments).

**Chapter 3** explains the research methodology and design that was used to carry out this research.

**Chapter 4** explains the grounded theory used in this study and describes the theoretical coding procedure for the open coding, axial coding and selective coding used in this study.

**Chapter 5** presents the analysis and results based on the open coding.

**Chapter 6** describes theory development and how the integration of categories forms the two process models of ECI selection and client-contractor relationship management.

**Chapter 7** summarises the findings of this research thesis against the research objectives and questions envisaged at the start of the research. The chapter discusses the recommendations proposed by this research, followed by the contribution to knowledge and the limitations of this research. The chapter concludes with the recommendations for future research.

## **1.10. Summary**

This chapter seeks to introduce this doctoral study by describing its purpose and goals. The main premise of this research is that there is a need to achieve value for money or best value from Early Contractor Involvement. These objectives are best served through effective processes

for selecting this model, and for managing client-contractor relationships if an ECI is adopted as the delivery approach.

The chapter sets up the background of the research followed by the justification of the rationale for the research. It presents the research proposition and research objectives. Guided by the research proposition and objectives, the research questions are articulated. A discussion about the research methodology is provided to facilitate the reader to understand the philosophical stance of this research. In addition, the significance of the research is described and the scope and limitations of the study are explained. Finally the structure of the thesis and the content of the following chapters are presented. Next Chapter reviews the salient literature which is generally and specifically related to the research objectives.

## Chapter 2: Literature Review

The purpose of this chapter is to provide an understanding of the concept of Early Contractor Involvement (ECI), how it differs from other procurement methods and when and how clients adopt this method for their projects. Boote and Beile (2005) suggest that in order to advance the collective understanding of a phenomenon, the researcher needs to understand what has been done before and the strengths and weaknesses of existing studies on that phenomenon. The purpose of literature review, therefore, is to familiarise the researcher with the previous studies, set the general context of the study, and define clearly the inclusive and exclusive within the scope of the investigation (Boote & Beile 2005; Creswell 2008).

This study focuses on clients' adoption and management of the early involvement of a contractor for a project. The first step to gain knowledge for the study is to understand the construction clients and their characteristics. Since the ECI aims to involve the primary contractor in the early stage of a project it is important to look at the project life cycle to realise what the 'early stage' of project implies. Exploring the selection and management of ECI as a procurement method is the core theme of this study. Therefore, predominantly, the literature in the field of ECI and its different dimensions is reviewed to obtain adequate information about the status quo and main issues regarding the topic.

The literature on the following topics was reviewed in this study:

- The construction client
- Early Contractor Involvement (ECI)
- Innovation
- Commitments
- Trust
- Procurement selection
- Project lifecycle in construction
- Constructability
- Working relationship
- Communication in construction
- Procurement in construction

## **2.1. The Construction Client**

### **2.1.1. Who is the client in construction**

As a prelude to understanding the use of ECI as a project delivery framework by construction clients, it is pertinent that we understand who they really are and what their role is in the construction industry. The literature defines construction clients as the initiators of projects who contract with other parties for the supply of construction goods or services (Atkin & Flanagan 1995). The definition provided by Bryant, Mackenzie and Amos (1969) probably best describes the nature of the client in the construction industry:

... the client is the party who commissions the building, and may be a private individual in need of a building for his own or his family's personal use, an enterprise requiring premises for commercial or industrial purposes, or an institution or agency of government – local, regional, or central for some public purpose.

(p.89)

The above definition implies that a construction client is an individual or organisation who commissions a building project to satisfy their needs. Masterman (2002) complements this definition by associating activities a client undertakes to fulfil these needs in the construction process. He describes the client in construction as the individual or organisation who commissions the activities to complete and implement the necessitated project and then enters into a contract with the commissioning parties.

The importance of clients to the construction industry cannot be overemphasised. Achievement of the project objectives from the points of view of all the parties involved in the project depends on project performance, which is significantly affected by the clients (Friend, Power & Yewlett 2013; NEDO 1983). Given the importance of the clients' roles in construction projects, especially large and complex projects (Halpin 1993), the construction industry should seek to fully understand the needs and requirements of its clients (Kometa 1995).

### **2.1.2. Clients categorisation**

Since the construction clients are heterogeneous, they have been classified into different categories in a variety of ways (Gunning & Courtney 1994). RIBA (1980) classifies clients based on their social authority and categorised them as local government, central government, industry and commerce, nationalised industry and housing association.

Naoum and Mustapha (1994) divide clients according to the frequency of construction projects they undertake and categorise them as one-off, on-off and on-going clients.

Atkin and Flanagan (1995) classify clients based on their identity as public and private clients. Austen (1984) classifies construction clients in two main categories according to the type of projects, namely building projects and civil engineering projects. He asserts that despite the difficulty in distinguishing these two categories, the general understanding of the difference is that buildings are construction works where people work or dwell whereas civil engineering works deal with controlling the natural environment to provide infrastructures such as roads and railways.

Chinyio et al. (1998) argue that although clients' needs and preferences are diverse, they can be generalised regardless of the client's identity (public, private, or developer). Based on their suggested approach, they reclassify clients by their needs rather than by the traditional public-private-developer approach into five needs-based groups. Skitmore and Mills (1999) criticise some aspects of the Chinyio's needs-based classification for the lack of the support of the analysis.

Morledge (1987) looks at the reason for the clients' need to implement the project and categorises clients in to primary and secondary developers. The categories are extended by Masterman (2002) according to the level of their sophistication into experienced, partially experienced and inexperienced clients.

### **2.1.2.1. *Public versus private clients***

The ownership or source of funding of the establishment defines the difference between public and private clients. Federal government, local governments and government-owned corporations constitute public sector clients. Public sector bodies are publicly financed and hence they ensure conservative policies are adopted to protect the expenditure of taxpayers' money (Masterman 2002). On the other hand private sector clients refer to individuals or corporate bodies, which may be small or large, that are privately owned or financed. In order to maximise the profit and maintain share value, private sector organisations normally adopt more aggressive policies and take commercial risk required for achieving their end (Masterman 2002).

### **2.1.2.2. *Experienced versus inexperienced clients***

Experienced clients are continuously, or regularly, engaged in various construction projects. They have in-house project management employment enabling them to exhibit overall construction management and control expertise. On the contrary, inexperienced clients have scant knowledge of construction activity resulting from the lack of continuous involvement in construction activity and hence showing very limited, if any, construction management skills.

Morledge (1987) asserts that the level of a client's experience in the construction industry is a critical characteristic in behaviour related to the construction industry. The client's attitude towards all aspects of construction activities is influenced by the extent of experience.

Masterman (2002) describes the main characteristics of experienced and inexperienced clients as listed in Table 2.1.

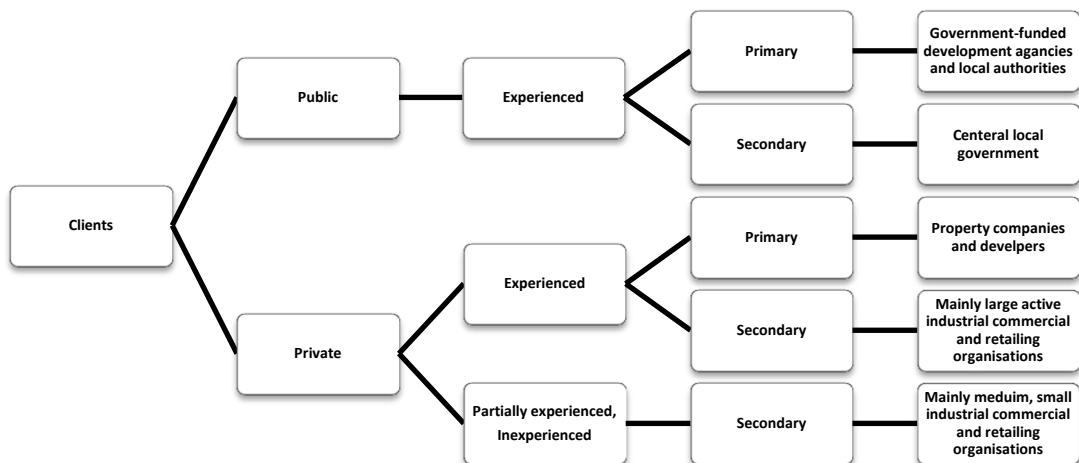
**Table 2.1. Experienced and inexperienced clients' characteristics (source: Masterman (2002))**

Experienced Clients	Inexperienced Clients
Detailed knowledge of construction activities	A lack of knowledge of the working of the construction industry
Continuing involvement with the construction industry	A lack of continuing involvement with the construction industry
Engagement in implementation of large high-value and complex projects	Engagement in some maintenance or minor building works
Expertise in overall construction management	A shortage of skills in overall construction management
Driven by in-house expertise	Influenced by external resources
A desire to be involved during the life of the project	A desire to be involved randomly, inconsistently
The ability to produce a complete brief including objectives of time, cost and quality	A need to make changes throughout the life of project

**2.1.2.3. Primary versus secondary clients**

Primary clients, according to Nahapiet and Nahapiet (1985), are involved in the construction industry because their main business and primary income derive from constructing buildings. Primary clients, by nature are normally experienced and engaged in big public and private developments. Secondary clients, on the other hand, require building only to undertake some other business activity such as manufacturing. The expenditure on constructing buildings is a small percentage of secondary clients' total turnover (Nahapiet & Nahapiet 1985). Figure 2.1 demonstrates the categories of clients in the construction industry as described above.





**Figure 2.1. Construction client categorisation (Source: Masterman (2002))**

### 2.1.3. Client's responsibilities

In order that clients achieve their needs and objectives, they should be involved in the construction process (NEDO 1983). Bennett (1985) identifies five major duties in which the involvement of the client is essential to ensure project success. These duties address the client involvement in construction projects under five main headings, namely Project objectives, Outline of project organisation, Selection of project team, Establish method of control over project team and Establish the project culture. Kometa (1995) translates these duties to the client's five most important roles:

- Defining project primary objectives.
- Exercising authority over the organisation.
- Establishing project culture.
- Selection of occupants for the main roles.
- Defining the main outlines of project organisation.

Each role is examined below.

### **2.1.3.1. *Defining project primary objectives***

Since clients are the best judges of the time, cost and quality they require, defining and articulating the primary objectives is an important duty of the client as this establishes better understanding of these requirements by all project participants. Barrett and Stanley (1999) refer to this as the preparation of the project brief. They point out that project brief is a process that starts when the idea of a project is first conceived by the client and run throughout the project, by which means the client's requirements are progressively captured and translated into effect. The implication of the briefing must be seen as a process, not an event, and this process does not only start early, but continues to inform all the technical work throughout the project.

### **2.1.3.2. *Exercising authority over the organisation***

The client is to define the hierarchy of authority within the organisation, which identifies organisation units responsible for the different aspects of the project. A clearly defined authority hierarchy helps to prevent conflict between the project participants by creating a communication hierarchy (Friebel & Raith 2004).

### **2.1.3.3. *Establishing project culture***

Lack of a unified project culture hinders the attainment of the overall project objectives (Zuo & Zillante 2005). Fellows, Grisham and Tjihuis (2007) refer to project culture as 'project team culture' and define it as the organisational perspective on the notion of integration of participants on the project through invoking goal congruence, common practices, and coordinated, collaborative processes and procedures. Clients need to establish the project culture by identifying 'the dimensions of a team – goal congruence, leadership and followership, commitment, motivation, trust, and power – all operating within the 'technical' context of goal realisation' (Fellows, Grisham & Tjihuis 2007,P.35).

#### **2.1.3.4.        *Selection of occupants for the main roles***

Bresnen and Haslam (1991) in a survey of construction industry clients show that the majority of public clients predominantly use in-house project management and design teams for their projects. Jaselskis and Ashley (1991) emphasise the centrality of project management competency and authority to the performance of projects. However, the Wood Report (1975) indicates that most clients' in-house project managers do not have adequate knowledge of design and construction procedures. Therefore, clients are to strive to ensure the attainment of the essential competence (ability to fulfil the work-related standards) and competency (generic underlying person-related behavioural characteristics) of the management team (Moore, Cheng & Dainty 2002; Woodruffe 1991).

#### **2.1.3.5.        *Defining the main outlines of project organisation***

Standardisation process falls under this duty where standard documentation and procedures at the detailed level is established, including meetings and reporting procedures between separate operations of the project (Gibb & Isack 2001). Formulating such procedures is the client's responsibility (Wood Report 1975).

#### **2.1.4. Client's objectives and needs**

According to Masterman (2002), understanding the client's needs and objectives is essential and success will only be achieved if the client makes a substantial contribution to the identification of his needs and objectives (NEDO 1978). The project team must establish and understand all of the client's requirements as accurately and as quickly as appropriate and possible. A plethora of detailed studies have been carried out over past few decades; and many reports and governmental documents have been published in this regard in an attempt to identify the fundamental needs of the clients in construction.

The most relevant of these include surveys carried out by Rowlinson (1988), Franks (1990), Hewitt (1985), and Masterman (1994), research studies conducted by Bennett and Flanagan (1983) and Kometa (1995), and report

documents including Latham (1994), NEDO (1988), the Wood Report (1975), Building Economic Development Committee (1983), and Centre for Strategic Studies in Construction (1988). Table 2.2 illustrates the main client requirements identified by each mentioned reference. This reflects the needs of majority of clients of the construction industry.

These reports and studies have identified the clients basic needs and objectives, and in some cases examined these requirements in more detail, however, priority of these needs vary from client to client based on their specific project objectives (Masterman 2002) and the category in which they fall (Rowlinson & Newcombe 1986).

**Table 2.2. List of client needs and objectives identified by different authors**

Author/Report	Client's needs and objectives
Wood Report (1975)	<ul style="list-style-type: none"> <li>• cost</li> <li>• low maintenance charges</li> <li>• functionality</li> <li>• time</li> <li>• quality</li> <li>• aesthetic</li> </ul>
Bennett and Flanagan (1983)	<ul style="list-style-type: none"> <li>• functional building, at the right price</li> <li>• quality, at the right price</li> <li>• speedy construction</li> <li>• a balance between capital expenditure and long term ownership costs</li> <li>• identification of risks and uncertainties</li> <li>• accountability (in the public sector)</li> <li>• innovative design/high technology building</li> <li>• maximisation of taxation benefits</li> <li>• flexibility to enable design to be changed</li> <li>• a building which reflects the client activities and image</li> <li>• an involvement in, and a need to be kept informed about, the project throughout its life</li> </ul>
Building Economic Development Committee (1983)	<ul style="list-style-type: none"> <li>• interrelation between time and cost</li> </ul>

Author/Report	Client's needs and objectives
Hewitt (1985)	<ul style="list-style-type: none"> <li>• certainty of cost and time, a reduction in unanticipated extra costs and time overruns</li> <li>• the flexibility to change the design during the construction period</li> <li>• a strong desire to be actively involved, and to be kept informed, throughout the whole of the design and construction process</li> <li>• a wish that consultants would be more forthcoming with positive and constructive advice and be more prepared to recommend new procurement methods</li> </ul>
Centre for Strategic Studies in Construction (1988)	<ul style="list-style-type: none"> <li>• time</li> <li>• cost</li> <li>• quality</li> </ul>
NEDO (1988)	<ul style="list-style-type: none"> <li>• minimised commercial risks</li> <li>• functionality of building</li> <li>• fast and punctual construction period</li> <li>• high quality standards</li> <li>• a need for value engineering</li> </ul>
Rowlinson (1988)	<ul style="list-style-type: none"> <li>• functional building</li> <li>• client awareness of risk and uncertainties associated with the project</li> <li>• accountability of design team</li> <li>• hi-tech or innovative design</li> <li>• maximisation of usable floor area</li> <li>• status, image, and activity of building reflected in design</li> <li>• flexibility to change design at any time</li> <li>• taxation incentives</li> <li>• low maintenance and running costs</li> <li>• use of existing premises during construction</li> </ul>

Author/Report	Client's needs and objectives
	<ul style="list-style-type: none"> <li>• high/low level of involvement in project</li> <li>• desire to be informed of progress at stages</li> <li>• balance between capital and long term ownership costs</li> </ul>
Franks (1990)	<ul style="list-style-type: none"> <li>• technical complexity</li> <li>• aesthetics/prestige</li> <li>• economy</li> <li>• time of essence</li> <li>• price certainty</li> <li>• facility for variation</li> <li>• exceptional size</li> <li>• low maintenance cost</li> </ul>
Latham (1994)	<ul style="list-style-type: none"> <li>• obtaining value for money</li> <li>• ensuring the project is delivered on time</li> <li>• having satisfactory durability</li> <li>• incurring reasonable running cost</li> <li>• being fit for its purpose</li> <li>• having an aesthetically pleasing appearance</li> <li>• being supported by meaningful guarantees</li> </ul>
Masterman (1994)	<ul style="list-style-type: none"> <li>• a desire to be actively involved and informed at all stages of the project</li> <li>• certainty of final cost</li> <li>• certainty of completion date</li> <li>• value for money</li> <li>• lowest possible tender</li> </ul>
Kometa (1995)	<ul style="list-style-type: none"> <li>• fulfilling the intended project functionality</li> </ul>

Author/Report	Client's needs and objectives
	<ul style="list-style-type: none"><li>• considering construction and operation safety</li><li>• economy of the project</li><li>• minimum running and maintenance cost</li><li>• being flexible to uses</li><li>• early completion of the project</li><li>• achieving at least minimum quality standards</li></ul>



## **2.2. Construction Project Lifecycle**

### **2.2.1. Overview of the construction project lifecycle**

The involvement of the contractor at the early stage of a project is the main characteristic of the ECI that distinguishes this model from the other frameworks. However, a question may arise about what the early stage of a construction project means. Every project, regardless of its type and nature, goes through a certain process consisting of a series of identifiable phases (Bennett 2003).

Davenport and Short (2003) define process as a structured, measured set of activities designed to produce a specified output for a particular customer or market. This set of activities forms phases throughout the lifecycle of a project. A construction project also goes through various phases from the time it is born throughout its whole lifetime to the point when it expires. A vast number of methods have been developed to model the process and define the phases through the construction project lifecycle in an attempt to enhance the effectiveness and efficiency of the design and construction activity (Tzortzopoulos, Sexton & Cooper 2005).

Walker and Lloyd-Walker (2014) define taxonomy of project lifecycle and categorise the project lifecycle as 'linear' and 'recursive' perspectives. The linear perspective sees a project as the transformation process in which it moves through various steps and phases in a sequential order. On the other hand, recursive observes a highly recursive element involved in most projects due to the constant changes in context and circumstances in projects as time moves on (Walker & Lloyd-Walker 2014).

The sections below provide an understanding of some frameworks that are widely used in the construction industry.

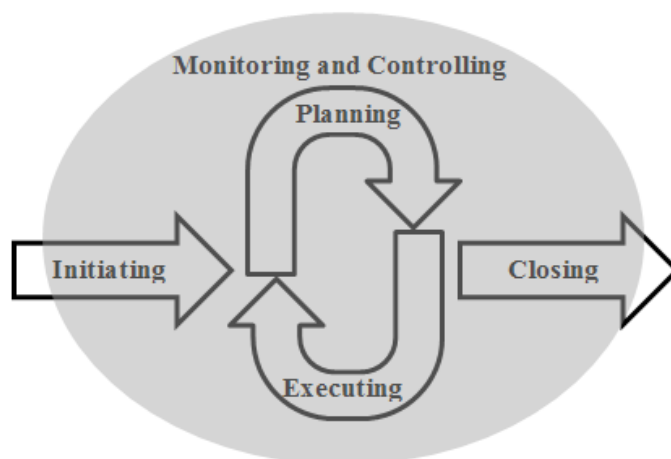
#### **2.2.1.1. *Project Management Institute (PMI) PMBOK®***

PMI (2013) in their 5th edition of Project Management Body of Knowledge (PMBOK®) identifies four main phases and one overarching phase for the

project lifecycle. The first phase is *initiating* where a new project or a new phase in an existing project is defined. The key purpose of this phase is to help to set the vision of the project and to realise what needs to be accomplished. The second phase, *planning*, consists of those activities performed to establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives. *Executing* is the third phase where the work defined in the project management plan is carried out to fulfil the project specifications. The final phase is *closing*, consisting of those activities performed to conclude all activities across all Project Management Process Groups to formally complete the project, phase, or contractual obligations.

PMBOK also identifies monitoring and controlling process as an overarching process covering the whole project process from the initiating phase throughout the closing phase. Walker and Lloyd-Walker (2014) argue that although PMBOK illustrates the planning and executing phase processes, which exhibit some iteration, it sees the project life cycle process as mainly linear.

A typical one phase project process based on PMBOK® is depicted in Figure 2.2.



**Figure 2.2. A typical one phase project lifecycle process (Source: PMI 2013)**

#### **2.2.1.2. The Royal Institute of British Architects (RIBA) Plan of Work**

First developed in 1963, the Royal Institute of British Architects (RIBA) Plan of

Work is a standard method of the building design and construction process that has become widely accepted as an operational model throughout the building industry. The Plan of Work offers a procedure suitable for traditional procurement methods, where the construction begins after the completion of design. The latest version of RIBA Plan of Work (2013) consists of eight stages identified by the numbers 0–7 and each stage includes 8 task bars required to deliver that stage. The stages and sequence of which are defined as following:

- *Stage 0 - Strategic Definition:* In this stage the client's business case and the strategic brief are defined.
- *Stage 1 - Preparation and Brief:* This stage relates to carrying out preparation activities and briefing in tandem.
- *Stage 2 - Concept Design:* The initial Concept Design is produced in accordance with the objectives outlined in the initial project brief.
- *Stage 3 - Developed Design:* During this stage, the main designer develops the Concept Design until the spatial coordination exercises have been completed.
- *Stage 4 - Technical design:* During this stage, technical definition of the project and the design work of specialist subcontractors is developed and finalised.
- *Stage 5 - Construction:* the building is constructed on site in line with the Construction Programme.
- *Stage 6 - Handover and Close out:* in this stage, project is handed over and, in the period immediately following, the building contract obligations in regards to the defects and the certification are implemented.
- *Stage 7 - In Use:* During this stage, project design information is used to ensure the successful operation and use of the building.

The Plan of Work represents a logical sequence of events that should ensure that sound and timely decisions are made, however depending upon the size and complexity of the project, the model needs slight adjustments.

### **2.2.1.3. British Property Federation (BPF) Manual**

This model was produced by the members of the British Property Federation (BPF) in 1983 in an attempt to devise a more efficient and co-operative method of organising the whole building process in a response to concern about the increasing problems within the construction industry such as poor design, inadequate choice of materials and poor supervision of the works. BPF (1983) claims that this model, compared with a normal traditional model, delivers a number of advantages including quicker building at lower cost; removing the overlaps between design teams; and less need for variations on site during the construction stage.

This model consists of 5 stages throughout the project lifecycle:

- *Stage 1 - Concept:* development of the concept by the client is made in this stage. The client prepares an outline plan after undertaking a feasibility study. If the project is feasible and the client wants to carry on, a Client Representative is appointed to take care of the client's objectives, i.e. time, cost and quality throughout the project. The Client Representative examines different options for the building followed by preparation of an outline brief. Upon the client's approval, a specification for the full brief in stage 2 is produced.
- *Stage 2 - Preparation of the brief:* during this stage, the client appoints the design leader only for the stage 2 works and Client's Representative if not already appointed at stage 1. The client's requirements including cost limits, time limits and building functionality are studied and analysed by the design leader and client's representative resulting in development of the brief. The brief consists of a master program for the design and construction phases; and cost plan covering the expenditure through the design and construction phases.
- *Stage 3 - Design development:* The design leader and other potential consultants submit their price proposal for the works in stages 3 to 5 upon the client request. In a competitive environment, the client appoints

the design leader and other required consultants. The design leader alongside the other consultants translates the brief into the detailed design leading to production of drawings and specifications. Possible changes in the project cost is reported to the client for further decisions on either changing design to reduce the cost or accepting the increased figure.

- *Stage 4 - Tender documentation and tendering:* During this stage, the design leader develops the tender documents upon obtaining planning permission. The tender documents include drawings and specifications prepared by the design leader, but exclude a bill of quantity. Tenderers are requested to submit a priced schedule and program of activities, a statement of resources and a statement of construction methods to be used. Tenderers are informed of any incomplete design to develop and the specification which they must keep in the design. The contractor is appointed by the lowest tender price.
- *Stage 5 - Construction:* Ensuring the project is constructed in accordance with the contract documentations, the client selects a supervisor to work alongside the design leader and the client's representative. The design leader is responsible for checking and assessing the contractor's design and proposed variations against the contract documents and legislation. The client's representative is also in charge of managing the project in all stages including monitoring the work of the design leader and supervisor. The updated master program and the master cost are reported to the client regularly ensuring he is aware of any changes during the project.

The model was designed to be used by all parties involved in the construction industry including the client, designer, contractors, speciality contractors and suppliers, addressing their relationships both formal and informal.

#### **2.2.1.4. British Airports Authority (BAA) - The Project Process**

The project process protocol was introduced by British Airport Authority (BAA)

in 1995 in an attempt to achieve the best practice across their business by controlling their construction projects in a way that meets their standards. The reason for generating such a protocol was to have all of their construction projects follow the same processes to ensure the consistency of their projects process. The protocol consists of seven major stages to cover all areas of a construction project. These seven major stages are as follows:

- *Inception*: the need for a project is the question in this stage by bringing the customers' needs with the business strategy together.
- *Feasibility*: during this stage, the full range of options is investigated against the identified needs and objectives in order to determine the most appropriate solution for resource allocation.
- *Concept Design*: Here the solutions for the design and engineering systems are studied and developed.
- *Co-Ordinated Design*: the use of specialist advices in developing the various elements of the design is undertaken in this stage to ensure predictability of cost, safety and operational performance.
- *Production Information*: during this stage contractors and suppliers develop the fully detailed design and planning covering all aspects of construction works.
- *Construction*: The project is constructed in compliance with the agreed specifications developed during the design, planning and consultation work.
- *Operation And Maintenance*: The facility is handed over followed by obtaining information for feedback.

Although BAA (1995) promotes the concurrent engineering practices of integrating the design, fabrication and construction, the proposed protocol follows the traditional delivery method where the design work and all planning operations are completed before construction work can start.

#### **2.2.1.5. Ministry of Defence (MOD) – working document**

In 1997 the UK ministry of defence (MOD) set up the Construction Supply Network Project (CSNP) as a learning mechanism to establish the working principals of a prime contracting approach to construction procurement (Holti, Nicolini & Smalley 1999). The aim of project was to identify and develop a specific process and tool to support the prime contracting procurement model and identify the critical success factors. The CSNP Project divides the whole life of a prime contracting construction project into five specific phases. These phases are explained below:

- *Inception - establishing the client needs:* during this phase the client identifies the business requirements and undertakes an option analysis in order to develop a Strategic Brief. Depending on the available in-house technical expertise, the client may decide to appoint an advisor to culminate in the Strategic Brief.
- *Definition and Qualification:* here, the client appoints the Prime Contractor through a formal pre-qualification and invitation to tender. The Prime Contractor develops an outline program including the fee for undertaking works to the end of the Concept Design Phase.
- *Concept Design:* on the basis of the Strategic Brief, the prime contractor carries out a value analysis and examines a range of potential design solutions to ensure the satisfaction of the client’s functional and financial requirements. By the end of this stage, the prime contractor, in consultation with the key supply chain partners, develops the design to a stage where the prime contractor is able to provide the client with an initial guaranteed maximum price.
- *Detailed Design and Construction:* during this phase the design is developed and completed with the help of the supply chain. The prime contractor completes the detailed design and produces the final guaranteed maximum price. Upon the client’s approval, the construction phase starts and the prime contractor undertakes and manages the

construction activities. The completion of this phase is the hand-over of the facility to the client for occupation.

- *Post Hand-over:* the Prime Contractor monitors the operation of the completed building and maintains the facility until the project is transferred to the client.

All the above models do not seem to consider specific stage gate review processes; however it is best to obtain the approvals at the end of each stage to ensure the fulfilment of the business strategic intent (PMI 2008).

This is an important consideration for other authoritative sources in developing decision stage gate approaches such as the OGC gateway™ process, Salford Process Protocol, Victorian ICT investment life cycle, and Decision Stage Gate Reference Model (Department of Treasury and Finance Victoria 2010; Kagioglou et al. 1998; Klakegg et al. 2010; Office of Government Commerce 2007a, 2007b; Victorian Auditor-General's Office 2008; Walker & Lloyd-Walker 2012).

Figure 2.3 compares the construction lifecycle process models In order to demonstrate the similarities and differences of each model.



<b>BPF Manual 1983</b>	Concept			Preparation of the brief	Design development	Tender documentation and Tendering	Construction				
<b>BAA The Project Process 1995</b>	Inception	Feasibility		Concept Design	Co-Ordinated Design	Production Information	Construction	Operation And Maintenance			
<b>MOD Working document 1997</b>	Inception	Definition and Qualification		Concept Design	Detailed Design and Construction			Post Hand-over			
<b>Salford Process Protocol 1998</b>	Demonstrate the need	Conception of need	Outline feasibility	Substantive feasibility & outline financial authority	Outline conceptual design	Full conceptual design	Co-ordinated design, procurement & full financial authority	Production Information	Construction	Operation And Maintenance	
<b>OGC gateway™ process 2007</b>	Business Strategy		Establish business needs	Develop business case	Develop procurement strategy			Competative procurement	Award and implement contract	Manage contract	Closure
<b>PMBOK 2008</b>	Initiating			Planning		Executing			Closing		
<b>Decision Stage Gate Reference Model 2010</b>	Business development	Strategy to feasibility study		Development of concept	Pre engineering	Detailed engineering		Construction and delivery	Completion and hand over	Operation	
<b>Victorian ICT investment life cycle 2008</b>	Understand and explore	Identify and refine options	Decide to invest	Procure a solution				Manage delivery	Review and learn		
<b>RIBA PoW 2013</b>	Strategic Definition				Preparation and Brief	Concept Design	Developed Design	Technical design	Construction	In Use	

**Figure 2.3. Comparison of full models of the lifecycle of a construction project**

## **2.3. Early Contractor Involvement**

Early Contractor Involvement (ECI) is an evolving concept that strives to involve the contractor at the early stage of the project normally soon after the feasibility planning approval process is completed. The concept of early involvement of contractors is not new and can be traced back to the pre-industrial revolution times when master artisans worked with a client commissioned agent to build large-scale structures. The term however was formally acknowledged in the industry during the 1990s when the concept of buildability has drawn academics and practitioners interests including the Construction Industry Institute in the US (CII) and its counterpart in Australia (CIIA) (Walker & Lloyd-Walker 2014).

According to the Alliancing Association of Australasia (2009), ECI is a process where the designer and constructor work together in a contractual relationship with the client, firstly to scope and price a project and then to design and construct a project. The term is used by many scholars as well as widely in the industry. Nevertheless, the Early Contractor Involvement in some documents refers to a specific contractual model practiced in the industry whereas in some others it refers to the exploitation of a contractor's expertise at the pre-construction stage. It therefore can conceptually appear in different delivery systems as an effort to ensure the practicability of the design and accuracy of the project risks and cost.

### **2.3.1. ECI as a contractual model**

ECI contract first originated from the engineering and construction contract published by the British Institution of Civil Engineering in 1998 and adopted by the British Highways Agency for their infrastructure projects. In this two-stage procurement and contractual model, the client appoints design and construction professionals early in the project development process through a non-price based selection. The criteria for selection of the contractor are the contractor's track record, availability, understanding of the project and quality of new ideas (Laursen & Myers 2009). The appointed contractor then assist in planning,

assessing buildability and developing an 'open book' target cost in conjunction with client. The target cost is agreed before construction, and detailed arrangements for the distribution of potential extra costs or savings are determined (Mosey 2009). The basis of the contract is described in the 'Early Contractor Involvement contract guidance manual' published by the British Highways Agency in 2004. The manual explains that under ECI the contractor is selected before the statutory procedures have been implemented and when the proposed project may be little more than a line on a plan.

Before appointing the contractor the employer will have appointed a consultant to help the client identify the need and objectives for a project, prepare procurement documents and assist clients with the process of selecting a contractor. The consultant will be retained by the employer, throughout the contract, to act as client advisor and supervisor (British Highways Agency 2004).

#### **2.3.1.1. *ECI contracts in different countries***

In recent years, many countries have employed ECI contracts mostly for big, complex projects with a relatively high risk profile; however the adopted model might vary from country to country based the prevailing situation in the industry.

Some countries, such as the UK, adopt a relationship-based approach throughout the whole life of the project whereas, the ECI being used in some other countries, such as Australia, is distinctly different from its UK version. The later version adopts a hybrid model where the contract starts with a collaborative approach and moves on to a more conventional type of contract such as Design and Construct (D&C). In the following sections, the different versions of ECI contracts as implemented in different countries are explained.

##### *British version*

In the UK, some of the principles of ECI contracting are commonly used in the water industry and other sectors, as well as in Highway Maintenance

Framework contracts, however ECI is mainly utilised by the Highways Agency and Network Rail for their infrastructure projects (British Highways Agency 2004). After some bad experiences with traditional methods, such as Institution of Civil Engineering (ICE) contracts, the Highways Agency decided to take the Latham (1994) and Egan (1998) recommendations on board and embrace best practice partnering principles included in the New Engineering Contract (NEC).

They increasingly used Design, Build, Finance and Operate (DBFO) and Design and Build (D&B) before adopting ECI. Although all three forms of procurement are still used by Highways Agency, ECI is now the preferred method to procure the road projects. The National Audit Office (NAO) and Office for Government Commerce (OGC) also encourage the use of ECI as it potentially reduces project duration, promotes innovation, facilitates value management and value engineering, and minimises claims (Nichols 2007). Under this form of ECI, tenders are invited based on an outline design, but without any pricing requirements. The invited bidding contractors are to demonstrate the attributes required entering into a contract on the basis of a joint development with the client of the design and its implementation, in exchange for payments made to cover costs on the basis of fully open book accounting (Laursen & Myers 2009).

When contractor and consultant, through a purely qualification-based selection process, are appointed as the project delivery team, the project has an approved budget price. The delivery team then develops a more accurate work estimate through additional planning and design that becomes the contract target price. Henceforth the target price is fixed as the baseline price for the project and a pain/gain share mechanism is created to motivate the contractor to assist with the most economical delivery option for the advance works that are not included in the contract target price (Molenaar et al. 2007).

The typical ECI delivery approach generally consists of two main phases. In Phase 1 the contractor develops the design for the project following the submission procedure to secure the necessary approvals. The submission procedure will gradually allow the principal and the contractor to agree on the various activities that are required to deliver the project and these activities will

be priced in an activity schedule. In Phase 2 the contractor is paid or pays a share of any cost savings or cost overruns against the target cost which is the total of the costs for Phase 2 (British Highways Agency 2004).

The key characteristics of the ECI adopted in the United Kingdom are:

- The target pricing structure has been institutionalised in the contract (Molenaar et al. 2007).
- The premise of the contract generally lies in an agreed target price for the entire project.
- The contract consists of two main phases: conditional preconstruction phase and unconditional construction phase.
- Preconstruction phase is linked to construction phase establishing commercial justification for the contractor's contributions to preconstruction phase activities and also ensuring the contractor that the benefit of their preconstruction contribution will not be transferred to a competitor who would secure the construction phase by undercutting their tender price (Mosey 2009).
- A pain/gain share mechanism is included in the target pricing process to motivate the contractor to be innovative and design or construct the project on budget (Molenaar et al. 2007).

#### *Australian version*

The ECI contract in Australia was first introduced by Queensland Mains Roads in 2005. Although the method is categorised as the Early Contractor Involvement, it is genuinely an innovative approach, which is not similar to any form of contract used before. The reason for this innovation was that all government authorities were not ready to embrace a fully open collaborative approach such as an alliance, concern over demonstrating value for money and having a Target Outturn Price (TOC) instead of a lump sum contract price. However, the industry acknowledged the benefits would be obtained out of strategies that follow a collaborative approach. The Australian version of ECI features a two phase strategy and can be regarded as a hybrid version of the

original British version.

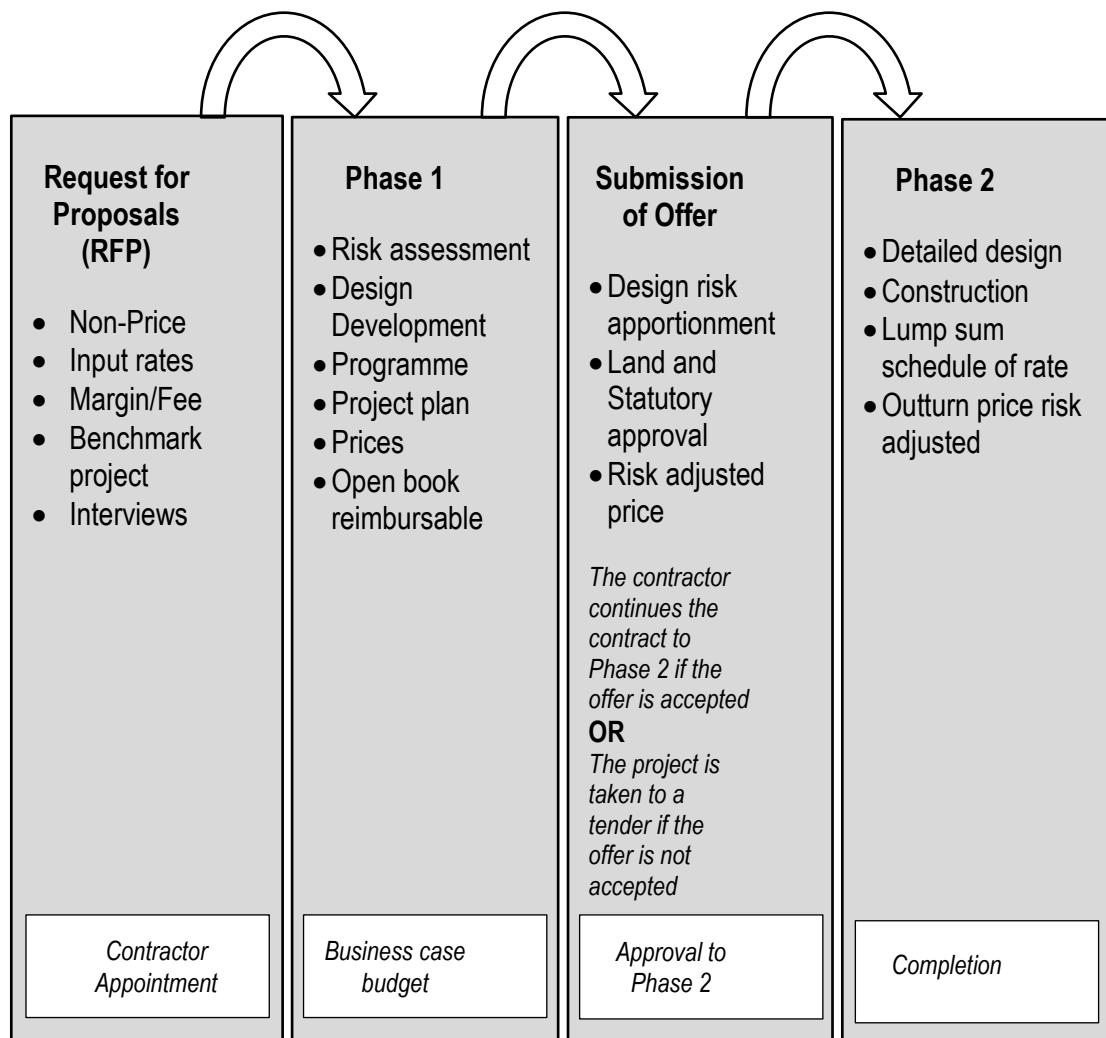
The first phase is generally similar to design alliancing where a 'no blame' environment typically governs the contract, making all project participants responsible for resolving any disputes that arise. The second phase is essentially a conventional design and constructs (D&C) with a lump sum maximum guaranteed price and traditional risk transfer mechanism. The main reason for adopting two different approaches is to obtain the benefits of each strategy. However, Edwards (2009) argues that the process might be compromised to the point where it was the worst of both strategies by transitioning from a collaborative form of contract to a conventional one.

The ECI model commonly used in Australia is comprised of two phases with a separate contract for each phase. Phase 1, Design Development, involves a typical professional consultancy agreement between the engaged parties and includes the design progress from a concept to a preliminary design embracing approximately 70% of the entire design process.

Phase 2, Design and Construction is completion of the detailed design and construction, and employs a typical traditional design and construct contract. Prior to commencement of phase 1 a business case has already been prepared by the client as well as some work on preliminary planning and detailed design report, and a contractor is selected on the basis of a non-price, qualification-based process similar to the consultancy selection process. The selection process involves several interviews with a proposed project's onsite staff, designers and management team in the contractor's or contractor-designer's workplace (Swainston 2006).

Once the contractor has been appointed, price, risks and design are negotiated and fixed and a contract based on an open book reimbursement is signed at the rates contained in the contractor's tender including margins and overhead. During phase 1, the contractor, the client and the designers work together towards achieving certain deliverables which are likely to include identifying and assessing risks associated with the project and developing an appropriate risk management mechanism.

The project team jointly plan, design, document and price the project; and the contractor then submits a 'risk-adjusted price (RAP)' offer for phase 2 which is a lump sum payment covering all aspects of the project from completing the design to the construction of the project. If the offer is accepted by the principal, the contractor develops and completes the detailed design and construction documentation, and carries out construction of the project. If the offer does not meet the project budget or fails to demonstrate value for money, the client has the prerogative to terminate the contract and owns the intellectual property rights to the design enabling him to take the project works to the market as a construction contract (Swainston 2006). The activities constituting the two stages of an ECI contract are illustrated in Figure 2.4.



**Figure 2.4. Details of the two stages of an ECI contract (Source: Swainston (2006))**

There are also some other variations to an original ECI used in the industry such as Dual ECI (dECI), Strategic ECI and Early Tender Involvement (ETI) which are developed in order for different organisations to obtain the most benefits of the model by satisfying their needs and requirements (Edwards 2009; Swainston 2006). These variations will be explained later in this section. The key characteristics of Australian version of ECI contract are: A two-staged approach similar to a project alliance during the first stage and a D&C contract during the second stage which follows a collaborative approach without moving radically from the traditional forms of contract (Edwards 2009; Swainston 2006).

- Bidders do not need to prepare a preliminary design but would often have to invest in teambuilding workshops prior to phase 1.
- The client needs to utilise some of its resources during assessment process and the assistance of external resources may be required.
- Both parties have to involve their senior management extensively during phase 1 and such management involvement will be significantly reduced during phase 2.

#### *New Zealand version*

In New Zealand, the Transport Agency (NZTA) completed several infrastructure projects under an ECI method. NZTA has structured the ECI model with three separate stages: SP1 – Investigation and Research, SP2 – Preparation of a detailed design, negotiation of commercial terms (including price) and contract duration, and SP3 – Completion of the detailed design and physical works. Similar to the Australian model of ECI, a contractor is selected on a non-price basis however a fixed priced for each stage is negotiated before starting work. The relationship between the owner and contractor relies on mutual cooperation in SP1 and SP2, but during the construction stage of the project in SP3, the relationship between them is comparable to that of a Design and Built (DB) project (Scheepbouwer & Humphries 2011b). The main characteristics of the ECI contract practiced in New Zealand are:

- Similar to the Australian model of ECI, contractor is selected on a non-



price basis.

- Fixed price for each stage is negotiated before starting work.
- The relationship between the owner and contractor relies on mutual cooperation in SP1 and SP2.
- The relationship between the owner and contractor is comparable to that of a Design and Built (DB) project in SP3.

### **2.3.1.2. ECI contract variations**

#### *Early Tender Involvement (ETI)*

Early Tender Involvement involves two or three competing contractors to participate in value engineering and refinement of the preliminary design (Wilson & Abson 2010). Unlike the ECI, since the client retains the designer, the tenderer has no design responsibility and the design is at a much more mature state which does not require the same degree of design development as in the ECI model. The agreement clearly describes the services and deliverables to be provided by the supplier and includes a fee for service arrangement for the ETI Phase only. Based on the project requirements, the agreement is customised to ensure the alignment of the commercial interests of both parties that result in achieving the appropriate collaboration and outcome (Bennett 2013).

#### *Double ECI (dECI)*

In Double ECI (dECI), two competing groups are appointed. Each group consists of a contractor and its designer, to develop concept designs and price estimates in parallel; one of these groups is then selected to carry on the detailed design and construction. Wilson and Abson (2010) argue that the competitive tension during the concept design stage associated with this model helps to drive innovation and achieved the best value for money. The submitted tender documents by the competing groups would normally consist of a full suite of design and project management plans including risk management, community management and stakeholder management.

### *Strategic ECI (Umbrella ECI)*

The Strategic ECI or Umbrella ECI is an alternative of ECI largely used by the Queensland government for their rail track upgrade. In this model, the client breaks a big project up into several packages and selects an ECI contractor for each package. Upon the completion of each package they go back and call a separate D&C contract and may or may not appoint the same contractor of the previous package (Department of Main Roads 2009).

#### **2.3.1.3. *Early Contractor Involvement in other countries***

In recent years, many other countries have attempted to employ alternative delivery systems and contractual processes that promote a greater partnership between project participants, effective construction management practices and quality assurance by moving towards integration of project-design, construction, operations and maintenance. New procurement and contracting methods influence project development and provide a source for innovation (Nijsten, Arts & Ridder 2008).

The trends inherent in early contractor involvement include alignment of team goals, integrated use of risk analysis techniques and setting of a payment method that supports alignment and trust. These trends are acknowledged globally and can be seen in some forms of collaborative procurement approaches, mostly under different labels in some other countries, such as the United States, Portugal, The Netherlands and New Zealand (Arts, Faith-Ell & Chisholm 2007; Molenaar et al. 2007; Scheepbouwer & Humphries 2011b). Although different terminologies are used such as Target Pricing (Molenaar et al. 2007), Integrated Project Delivery (Cohen 2007; Smith et al. 2011) in the United States and Early Supplier Involvement in Sweden (Wynstra, Axelsson & Weele 2000), they all seemingly refer to the same mechanism and principles.

In the United States, a panel including federal, state and private sector professionals conducted research into international policies, practices and technologies for potential application in the United States in 2004. They travelled to Canada and Europe, and reviewed different delivery methods. One

of the significant discoveries was the use of target pricing by the Highways Agency in England on its Early Contractor Involvement projects and this method was, hence, proposed to the South Carolina Department of Transportation (DOT). Washington State DOT also adopted a form of target pricing to complete a project that was in critical circumstances in 2005 (Molenaar et al. 2007).

Furthermore, after a number of successful infrastructure projects procured under Project Alliancing in Australia, American Institute of Architectures (AIA) embraced the main principles of alliancing and developed a delivery system to support integrated philosophy such as the automotive industry (Cohen 2007; Smith et al. 2011) called Integrated Project Delivery (IPD).

IPD is a relational legal framework that aligns the interests of project participants with those of the owner by integrating people, systems, business structures and practices into a process that utilises the skills and acumen of all participants (Smith et al. 2011; Wachi 2007) and seeks to bolster project outcomes through aligning the incentives and goals of the team in a collaborative manner (Kent & Becerik-Gerber 2010). Therefore, involvement and integration of cross sectional expertise, systems and practices at the early stage of project for the best of project are the core of IPD (Lahdenperä 2012).

The fundamental principles of IPD as instructed by AIA include mutual respect and trust between project participants; mutual benefit and reward by creating incentives tied to achieving project goals; collaborative innovation and decision making when ideas are easily exchanged; early involvement of key participants leading to improved decision making process; early goal definition and development; increased efficiency during execution as a result of intensified planning ; enhancement in team performance by open communication; maximising functionality by utilising appropriate technology and establishing a competent organisation and leadership (Bongiorni 2011).

To date, three IPD form agreements have been commonly practised including AIA C195 Family (Single Purpose Entity), ConsensusDOC300 and

AIA C191. Although AIA has issued the A195/A295/B195 series that are also denominated integrated agreements, they are not considered as true IPD due to the transitional structure incorporated into these agreements (Dal Gallo et al. 2010).

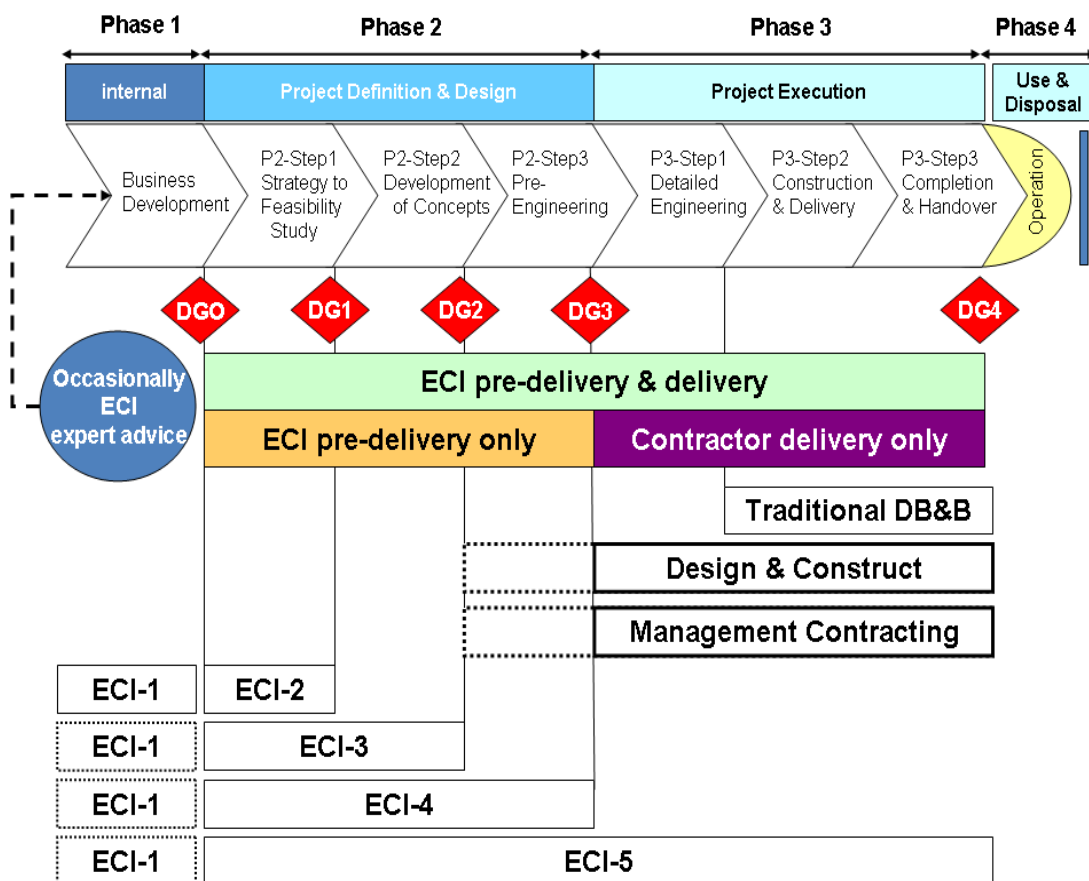
ECI is also mainly employed by the transportation industry in the Netherlands. In 2004, The Dutch Ministry of Transport introduced a number of corporate procurement strategies in the business plan of its operational division (V&W 2004a 2004b; V&W 2005) which has resulted in a substantial change in the request to contractors in tenders. The change was a shift from solely price-based criteria to open and functional questions that dealt with quality and value through an 'interviewing' approach (Van Valkenburg et al. 2008). The main purpose of this method was that the market parties, to whom the construction of the project is contracted out, get involved before the planning consent decision (V&W, MoT & Public Works and Water Management 2005).

### **2.3.2. ECI as a concept**

Despite scholars defining ECI as a form of contract, many academics and practitioners use the term as a concept referring to a process which involves earlier involvement of market parties (contractors) in project development than traditionally has been the case in the construction industry (Nijsten, Arts & Ridder 2008). This concept can be tracked down in a wide range of delivery systems (Caltrans 2007; Mosey 2009; Rahman & Alhassan 2012; Van Valkenburg et al. 2008). Walker and Lloyd-Walker (2012) point out that due to the increasing focus on the front-end of projects in recent years, a number of relationship-based project procurement (RBP) forms have been developed that introduce the project delivery contractor's expertise and advice much earlier in the construction project lifecycle. The underlying idea is to achieve innovative solutions, better project control and savings on time and money by providing more room for contractors in early stages of the project development process (Nijsten, Arts & Ridder 2008).

Even though Walker and Lloyd-Walker (2014) acknowledge ECI as a delivery

system, they view ECI as an alliance-oriented arrangement in that similar alliance principles lie at the core of the relationship. They map various forms of ECI taking place in the project life cycle by adopting the project life cycle model proposed by Williams et al. (2010) and argue that ECI can take place at three of the project lifecycle phases, namely internal, project definition and design, and project execution phase. Figure 2.5 illustrates how ECI can occur in the gateway process and how other project procurement choices link into this model.



**Figure 2.5. Decision stage gate reference model**  
(Source: Walker & Lloyd-Walker 2012, p3)

Walker and Lloyd-Walker (2012) indicate that the ECI1 can take place at any or all of Phases 1 to 3 and is suitable for clients who require specific delivery of subject matter expertise when developing project ideas.

ECI2 is utilised by clients who need to examine the feasibility of the project through specific benchmarking and independent advice during the project definition and designs – step 1.

ECI3 is adopted by the clients who intend to leave convergent decision making about concept options open and independent of the ECI entity.

ECI4 would involve the contractor when the pre-engineering input, value engineering, value analysis and buildability advices are required. The contractor assists the client with making the decision on a range of procurement forms.

ECI5 is used when the project is to be procured under a full alliance arrangement where the contractor will be engaged to the project execution.

### **2.3.3. Comparison of ECI with other models**

This section aims to compare ECI with the different common procurement models.

#### **2.3.3.1. *Design Bid and Build (DBB)***

In traditional Design Bid and Build (DBB), design should be completed before competitive tenders are invited and before the main construction contract is awarded. Clients have privilege to influence the development of the design as they have direct contractual relationships with the design team. However the strategy may fail to some degree if any attempt is made to appoint a contractor for the work before the design is complete due to the likelihood of many post-contract changes which cause delay in the progress of the works and an increase in the costs (Morledge, Smith & Kashiwagi 2006). Therefore, despite the predominance of this system in the Australian market place, particularly with many State Government clients (Love et al. 2008), it excludes the main contractor and subcontractors from the early design and project planning and the contractor comes into play only during the construction phase, after design is completed.

#### **2.3.3.2. *Design and Build***

In Design and Build, a single contractor acts as the sole point of responsibility, normally on a lump sum fixed price basis, for the design and delivery of a construction project in a way that specifically meets the needs of the client

(Masterman 2002; Miller et al. 2009; Morledge, Smith & Kashiwagi 2006). The client in the Design and Build has a contractual relationship for both design and construction with a single contractor. This single contractor can be an integrated firm mechanism, which has an in-house design team as well as a delivery team or a consortium of independent design and construction firms put together for a specific bid (Morris & Pinto 2010). In either situation, the construction teams provide specialised construction expertise and in-depth knowledge of construction materials, methods and local practice to design teams. Their input on design will have a direct impact on the quality of the construction performance (Rahman & Alhassan 2012).

Although Design and Build contract integrate the majority of the project supply chain in an attempt to link design and delivery, the whole integration of the design and delivery teams is not in an integrated team (Walker & Lloyd-Walker 2014). There are several variants on a Design and Build procurement form, the chief among which are Novated Design and Build, Turnkey, Engineering-Procurement and Construction (EPC) and Package Deals.

In a Novated form the client appoints a designer to develop the conceptual design and tender documentation and once the building contractor has been appointed, the *existing* design team is transferred to this builder.

In Turnkey, as the name implies, the responsibility of the single entity is extended to the installation and commissioning phase along with the arrangement of funding for the project (Walker & Hampson 2003). However, this approach has been largely overtaken by other procurement forms under the private finance based forms of project procurement (Walker & Lloyd-Walker 2014).

EPC is mainly used for the industrial projects especially in the oil, gas and petrochemical projects. EPC contract is a design and build contract where a single contractor takes responsibility for all elements of design (engineering), construction and procurement.

Usually the EPC contractor is responsible for: (a) design including producing the

basic engineering and developing the detailed design); (b) procurement of necessary materials and equipment; (c) construction of the project (Loots & Henchie 2007).

The Package Deals system is the predecessor of Design and Build in which the client purchases a 'ready-made' standard design for a complete building and the contractor provides management, design and construction services for an adopted standard product. This method can be attractive for those clients who can compromise their requirements in an effort to satisfy their building needs in a timely manner and at an economic price (Masterman 2002).

### ***2.3.3.3. Private sector finance procurement methods***

The terms Public Private Partnership (PPP), Private Finance Initiative (PFI), Design-Build-Finance-Operate (DBFO) and Build-Own-Operate-Transfer (BOOT) are interchangeably used in different literature, but they all refer to similar, if not identical, forms of project procurement. The overarching principle of all these terms is the use of private sector finance for design, construction and long-term maintenance or operation of public infrastructure projects (Duffield, Raisbeck & Xu 2008).

The process starts with the project initiator by inviting outline bids from selected organisations, normally a consortium made up of funders, contractors and operators. The successful bidder will enter an 'upstream' contract with the owner and 'downstream' contracts with constructors, suppliers and service providers. The deal ultimately concludes when responsibility for the facility is transferred back to the owner after the concession period (Hughes et al. 2006). In Australia, private sector finance forms of procurement, mainly known as PPPs, account for around 10% of state capital spending by Victoria, around 7% in Queensland, and lesser proportions by the other States and the Commonwealth (Love, Smith & Regan 2010a). Since these forms of procurement require very high levels of expertise from all parties, the delivery team needs to have highly skilled professionals in legal, design, operations and construction (Love et al. 2011; Walker & Hampson 2003).



Considering the structure of this approach, the major difference in contrast to a Turnkey approach is that there is a concern over the balance between long-term operating costs and short-term capital costs (Walker & Smith 1995). Thus, the level of contribution of construction professionals to the design is likely to be similar to a Turnkey approach, yet more sophisticated.

#### **2.3.3.4. *Management-oriented methods***

Management-oriented procurement systems are used where the client intends to contract the management of the design and construction out to a contractor who acts as a management consultant on behalf of the client (Rashid et al. 2006). The route is generally adopted where the client requires early start and completion and the project is planning and control driven (Morledge, Smith & Kashiwagi 2006; Walker & Lloyd-Walker 2014). There are two main systems under this category namely Construction Management and Management Contracting.

Under a construction management route, the client employs the design team and instead of allocating risk and responsibility to a single main contractor, a construction manager is appointed to manage the design and construction activities on a professional fee reimbursement basis. The construction manager provides professional construction expertise without any contractual links to design team and contractors, and all design and construction contracts are directly agreed between the client and trade (Package) contractors (Morledge, Smith & Kashiwagi 2006). One alternative to Construction Management practiced largely in the USA is Construction Management at Risk (CMR) where the designer or the engineer is first hired and the Construction Manager (CM) is then selected while the design is proceeding. After the design is finished by the designer, the CM gives input and finalises the design and eventually takes responsibility for finishing construction (Scheepbouwer & Humphries 2011a).

Although this approach (CM and CMR) features extensive use of constructability advice by the construction management team (Walker & Lloyd-Walker 2014b), it is generally accepted that the cost certainty cannot be achieved until the final trade contract is closed. Moreover, since there are no binding contracts between

construction management party and design team and trade contractors, the construction manager assumes no financial risks and is only liable for negligence by failing to perform the role (Morledge, Smith & Kashiwagi 2006).

The mechanism of the Management Contracting method is similar to a Construction Management form but with this route, unlike Construction Management, the management contractor has direct contractual links with all package contractors. Therefore, the liability of the management contractor extends to the construction works. The main advantage of management contracting is the contribution of the constructor to the design and project planning, however, poor certainty of price at an early stage is realised as one of this method's drawbacks.

#### **2.3.3.5. Alliances**

Alliance is a relationship based procurement method where parties work together collaboratively to deliver a project. The Queensland Government Chief Procurement Office (QGCPPO) (2008) defines it as

... an agreement between two or more entities, which undertake to work cooperatively, on the basis of sharing of project risk and reward, for achieving agreed outcomes based on principles of good faith and trust and an open-book approach towards costs.  
(p.8)

There are many different types of legal/commercial relationships in use that are referred to as 'alliances'. These range from traditional risk-transfer arrangements undertaken in a collaborative manner to 'pure alliance arrangement' where nearly all risks (and opportunities) are shared amongst participants. In Australia most of the alliances undertaken have been at the pure alliance end of the spectrum (Ross 2003).

There are two main types of alliancing:

- (a) Project alliancing; and
- (b) Strategic alliancing

In a project alliance the alliance team is constituted for one specific project. The team is usually dissolved upon completion of the project. This type of project alliance tends to be short term (Ross 2003). A strategic alliance is formed to exploit a particular segment of the market. At the inception of a strategic alliance, the number, nature, scope and duration of future projects may be unknown (Walker & Hampson 2003). Even though there are no specific formats of an alliance contract, there are classes to adjust the contract to the government requirements in terms of projects objectives and risk management.

Generally, there are two methods by which alliance tenderers are selected. The first and probably the most used method is 'single Target Outturn Cost (TOC)', in which the tender selection process is principally based on non-price criteria. The second method is the 'two TOC' alliance also called the Multiple TOC alliance or Competitive TOC alliance when the price competition is of the alliance owner's emphasis.

#### *Similarities and differences between Alliances and ECI*

The hybrid variation of Alliances such as competitive TOC incorporates the elements of competition (Cowan & Davis 2005). This method is similar to the ECI, which can cause confusion between these two forms.

Walker and Lloyd-Walker (2012) argue that misunderstandings about various relationship-based project procurement (RBP) forms encompassed by the concept of ECI results in participants having unrealistic expectations of team behaviours and of relationships between project parties. To fully understand the similarities and differences between Alliances and ECI, two sets of characteristics within both methods – those that pertain to contractual arrangement, and others that relate to behaviour characteristics – are examined (Emmitt & Gorse 2006).

Typically, both Alliancing and ECI contracting strategies use a relational approach during the front-end phase where the scope of project and preliminary planning is developed. However, the use of a relational approach during the front end does not necessarily lead to use of such an approach during

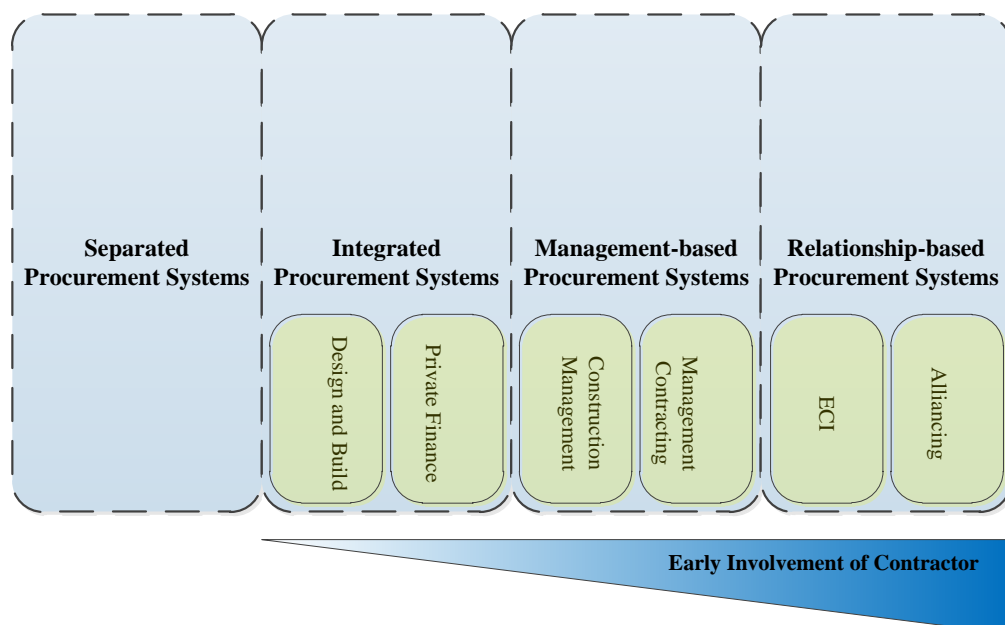
detailed design and execution phases (Hobbs & Andersen 2001). With alliancing, the contract is structured around a coalition of firms that form a separate virtual organisation responsible for delivery of the project from front end phase throughout the detailed design and execution phases (Walker & Hampson 2003). Nevertheless, under an ECI, although participants work together collaboratively during front-end phase, the contract does not require such an arrangement and all parties keep their own identity (Alliancing Association of Australasia 2010).

In terms of contractual arrangement, only one alliancing agreement governs the entire project from the project concept throughout the delivery phase, whereas the contractual arrangement with an ECI consists of two separate phases. The first phase is a relational oriented type of contract for the pre-construction phase and a traditional hard dollar lump sum type of contract for the detailed design completion and construction phases (Ross 2003; Swainston 2006). Alliancing agreements focus on problem solving within a no-blame setting. In the other word, the issue of 'no disputes' is an inherent feature of an alliance contract, making all project participants responsible for resolving any disputes that arise during the project. Only in the event of 'willful default' does a participant have an express legal cause of action against another participant under the terms of the agreement (Abrahams & Cullen 1998). Finally, the gain share/pain share mechanism is a key element of an alliance project that draws a distinctive line between this method and ECI (Ross 2003).

In terms of behaviour characteristics, since the ECI owns both relational and transactional attributes; it shares many characteristics with Alliancing, especially during the preconstruction phase in which the arrangement is very similar to an Alliance (Edwards 2009). Nevertheless, the transitional issue from a pure relational environment during the preconstruction phase into a formal traditional environment in the construction phase has drawn concern from some academics and practitioners. For instance, research conducted by Scheepbouwer and Humphries (2011a) focused on the concerns and problems associated with implementing ECI held by the owner, designer and contractor. The results suggested that despite the general agreement on the improvement

of quality and innovation when an ECI is adopted, the necessary collaborative culture is not present in the construction industry for adopting ‘open book’ costing, often practiced in the ECI phase. Swainston (2006) has questioned whether having a first phase based on alliance principles, followed by a traditional contract (i.e. D&C) for the second phase, would give the benefits of each strategy, or if the process would be compromised to the point where it was the worst of both strategies.

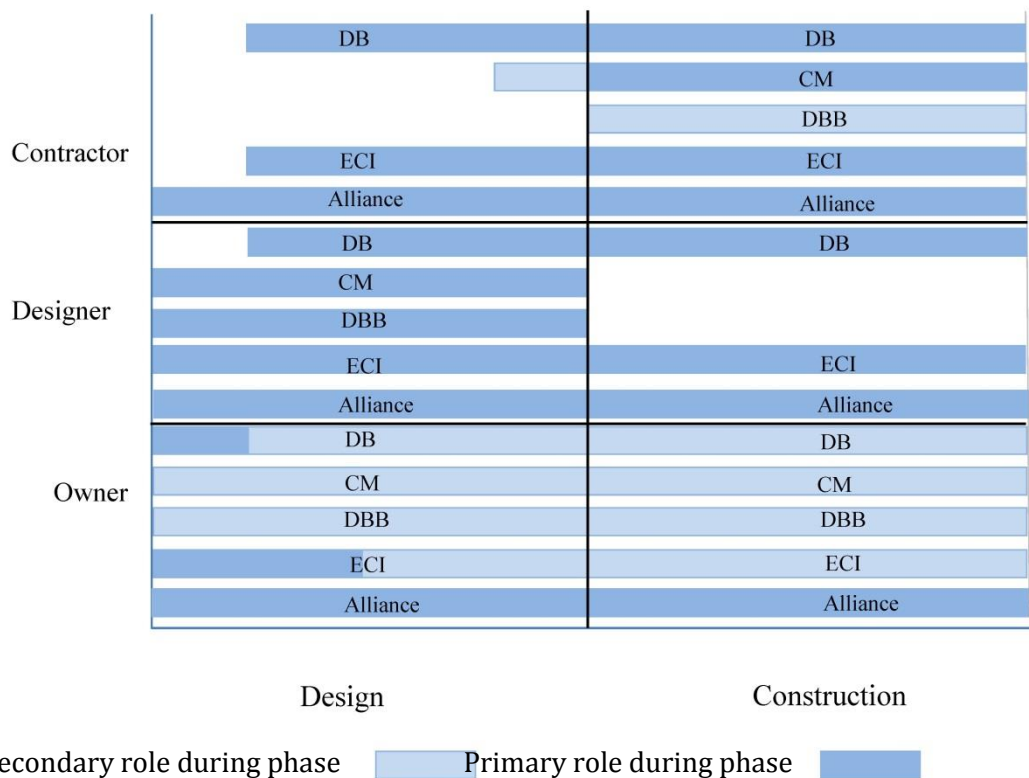
However, even though the challenging stage in implementing an ECI is the move from a relational approach in the pre-construction phase to a traditional risk allocation approach in construction phase, the teamwork and collaboration developed during phase 1, has generally continued into phase 2. Benefits such as contractor’s sense of belonging and commitment to the project success coupled with the improved communication and discussion mechanism without contractual status are achieved by implementing a collaborative contract in phase 1 (Swainston 2006). Figure 2.6 outlines the extent of contractor involvement at the early stage of a project in different delivery systems and Figure 2.7 illustrates an overview of the participation of the different parties during the design and construction phases of the different delivery systems.



**Figure 2.6. Extent of contractor involvement at the early stage of project (Source: Rahmani, Khalfan & Maqsood 2014)**

### 2.3.4. Implementation of ECI-drivers

The previous section argues that although ECI is one form of contractual model, there is a wide range of alternative delivery systems that employ the concept of the ECI. This section will discuss the drivers for a client to select an ECI over other alternatives followed by a discussion about the barriers in implementing an ECI. According to Song, Mohamed and AbouRizk (2009), contractors generally have a higher level of construction expertise compared to the owners and designers due to their comprehensive knowledge of construction materials, methods and prices.



**Figure 2.7. Delivery methods and party participation (Modified from Scheepbouwer and Humphries (2011a))**

When they ultimately become responsible for the construction operations, their input in design will have a direct impact on the quality of their own planning and construction performance (Song, Mohamed & AbouRizk 2009). Clients can benefit from ECI through improved schedule, cost, safety, higher level of innovation, better risk management and quality performance (Song, Mohamed

& AbouRizk 2009). Early availability of state-of-the-art knowledge from the contractor can create better awareness and understanding of risk profiles which will result in fewer changes during later stages (Bundgaard, Klazinga & Visser 2011).

ECI is also useful in avoiding re-work through developing thorough exploration of planning by the contractor who translates design into reality through a more constructible design program (McGeorge & Zou 2012). In an article based on a professional discussion forum related to the subject of Early Contractor Involvement, Bundgaard, Klazinga and Visser (2011) explore the drivers of using an ECI from all of the parties' perspectives. They suggest that ECI can build and develop a relationship that will overcome the lack of transparency between the parties and reduce risks. Rahman and Alhassan (2012) support this statement in their study by suggesting that improvement in relationships is one of the powerful drivers of using an ECI.

ECI has the potential to increase the opportunity of having better relationships and understanding of parties, whilst decreasing the potential for adversarial relationships as a result of the frequent interaction and enhanced communication between parties (Rahman & Alhassan 2012). Many authors suggest that the professional advice of the contractor in the design process during the early phase of the project would improve risk management due to the contractor's specialised construction expertise and in-depth knowledge of construction materials, methods and local practices (Gil, Tommelein & Ballard 2004; Jergeas & Van der Put 2001; Rahman & Kumaraswamy 2004; Uhlik & Lores 1998).

Based on the review of extant literature, the main drivers for using early involvement of contractors for clients can be summarised as: improved project delivery with reduced project cost and scheduled time; improved quality; enhanced constructability of design; and better opportunity for innovation (Chan, Chan & Ho 2003; Rahman & Alhassan 2012; Song, Mohamed & AbouRizk 2009; Swainston 2006). Nonetheless, Emmitt and Gorse (2009) in their research conclude that the occurrence of time delays, cost overruns and quality defects

can be addressed by improving the relationship between project parties.

Building on his findings, the main reason for the clients to adopt an ECI can be summarised into three drivers: 1) improvement in the working relationship between contractor and client by the involvement of team members early in the project; 2) enhanced constructability in design due to the contractor's professional advice; and 3) increased opportunity for innovative solutions through the collaboration between the contractor and designer. The following sections will discuss each driver in more detail.

#### ***2.3.4.1. Improved working relationships***

The working relationship between owner and contractor in engineering and construction projects is considered as the main relationship in a construction supply chain (Dainty, Moore & Murray 2007; Smith 1980). Emmitt and Gorse (2009) investigate the impact of supply chain relationships on project impact and suggests that the supply chain relationship has some significant influences on project performance. Therefore developing a good supply chain relationship may help to improve project performance.

Larsson et al. (1998) conducted a study on 280 construction projects and identify four different descriptions of the nature of the working relationships between the key management teams of the owner and contractor firms. Complete definition of each relationship type is tabulated in the table 2.3 below.

The adversarial type of relationship is characterised by dominance of suspicion and the threat of litigation. The guarded adversarial type addresses the formal contract for managing the project. The overarching concept on both approaches is that the only way to ensure that one's own interest is protected is being suspicious of the other party's motives. The third category is informal partnering in which owners and contractors attempt to cooperate and try to find fair and reasonable solutions to disputes.

Finally, the fourth alternative is when owners and contractors work together as a team towards achieving common objectives by following defined procedure



for collaborative problem solving. This approach is called partnering (Larsson et al. 1998).

**Table 2.3. Owner-client relationship (Source: Dainty, Moore and Murray (2007))**

Relationship	Relationship definition
Adversarial	Participants perceive themselves as adversaries with other parties pursuing their own concerns at the other party's expense. Major conflicts are deferred to the superiors and resolved on a win/lose basis on a spectre of formal litigation. Considerable time and energy is devoted to legal protection.
Guarded Adversarial	Participants cooperate within the boundaries of the contract. Performance is guided by strict adherence to the contract. Major disputes are deferred to the superiors and resolved by formal interpretation of the contractual obligations.
Informal Partners	Participants attempt to sustain a cooperative relationship that goes beyond the boundaries of the contract. Disputes are resolved through mutual give and take and finding solution that at least partially satisfy both parties.
Project Partners	Participants treat each other as equal partners with a common set of goals and objectives. Every effort is made to avoid litigation and to resolve disputes in a timely, mutual satisfying manner. Participants consider themselves part of the same team and work closely together to solve problems and make process improvement.

In an effort to improve project performance, focus on developing and practicing

better ways of working between owners and contractors is increasing (Anvuur & Kumaraswamy 2007; Gil 2009). According to Dessler (1976) alignment of interest between client and contractor through development of a collaborative working relationship can mitigate potential conflicts before becoming claims, facilitate knowledge sharing in a free environment and help to integrate parties' specific capabilities to complete the project successfully. To fully understand owner-contractor relationships, the distinguishing elements that characterise relationships should be identified. The literature on relationship management focuses several factors as important attributes in the relationship: the general construction of trust between the parties; the level of communication between the parties; and the commitment of the parties to the relationship (Anderson & Narus 1990; Handy 1995; Nishiguchi 1994; Rinehart et al. 2004). These attributes are discussed in greater detail below.

### ***Trust***

Trust has been studied widely by researchers in various fields and hence different definitions have been provided to describe it. Rotter (1971), for instance, views trust as an individual characteristic and defines trust as an individual's or group's generalised expectation that the word, promise, verbal, or written statement of another individual or group can be relied on. The definition of trust he provides is close to the Oxford English Dictionary definition of trust, which is 'confidence in or reliance on some quality or attribute of a person or thing, or the truth of a statement'.

Mayer, Davis and Schoorman (1995) have a different perspective on the concept and suggest that trust is an expectation that is related to a specific transaction and the specific person with whom one is transacting where vulnerability prevails (Bhattacharya, Devinney & Pillutla 1998). They define trust as 'the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the trustor, irrespective of the ability to monitor or control the party' (Mayer, Davis & Schoorman 1995).

In contrast to the latter definition, Barney and Hansen have no such limitation

on their definition of trust. Their view is that 'trust follows from the ability to structure contracts or rewards and punishments so that individuals behave in a pre-specified manner' (Bhattacharya, Devinney & Pillutla 1998) and define trust as 'the mutual confidence that no party to an exchange will exploit another's vulnerabilities' (Barney & Hansen 2006).

Bhattacharya, Devinney and Pillutla (1998) suggest a number of characteristics for trust based on a combination of the extant scholars and definitions as:

- Trust exists in an uncertain and risky environment. In an environment of certainty and sureness, trust doesn't mean a lot or it has very little impact on the outcomes. Individuals are not at risk of losing any privileges in a non-risky, immune situation and therefore trust cannot exist in such an environment.
- Trust reflects an aspect of predictability. Trust as expectancy is a multi-dimensional concept (Rinehart et al. 2004) and it is important to recognise which characteristics of trust are being studied. According to Bhattacharya, Devinney and Pillutla (1998), trust is not an expectation but can become part of an expectation. Individuals act based on their understanding of the actions of others and if their understanding changes at any point in time, the way they act will change based on the alteration in their understanding of other people's behaviour.
- Trust exists in an environment of mutuality. The extent to which an individual can be trusted is dependent on the situation that individual encounters and the people with whom she or he would interact.
- Trust is 'good'. Speaking of trust indicates positive rather than negative outcomes. Sometimes the meaning of trust is lost in sarcasm where the statement ironically aims to express that a person will or will not do something in a negative sense.

### *Trust classifications*

The definition of trust is generally made based on the perceived context, i.e.

personality psychological context (Rotter 1971), social psychological context (Mayer, Davis & Schoorman 1995) or economic context (Goffman & Manning 2009). Subsequently, trust models are influenced by these different contexts. There are also some authors who attempt to integrate different perceptions of trust (Barney & Hansen 2006; Lewick & Bunker 1995).

Lazar (2000) looks at the process through which trust is formed and developed. He suggests that trust can be (1) rational or calculus-based where it can grow and develop over time; (2) spontaneous where it appears emergently and unexpectedly in a relationship; or (3) pre-existing where it is already extant typically based on the reputation of an organisation or individual (Bhattacharya, Devinney & Pillutla 1998).

In the construction context, since the industry is frequently described as being dominated by a 'culture of confrontation' in which a vicious cycle of mistrust, conflict and waste dominates (Seymore & Fellows 1999), it is unlikely that trust between partners exists spontaneously or is pre-existent at the beginning of a contract. Trust in a typical construction environment begins with its lowest level and gradually, if it is meant to, grows throughout the project life time. However, regardless of the type of the trust existing between organisations, the research findings emphasise that a consistent cooperative behaviour is required to maintain spontaneous and pre-existing trust and to develop rational or calculus-based trust (Whitener et al. 1998).

Lewick and Bunker (1995) have a different perspective on trust and categorise trust based upon the source of expectations. Their definition of trust falls under three categories: (1) Calculus-based trust in which the expectations arise from a rewards/punishments mechanism; (2) Knowledge-based trust where the expectations are based on the predictability of others behaviour; and (3) Identification-based trust when the expectations depend on the other's internalised intentions.

Barney and Hansen (2006) with modern economic perspective typify trust in three forms: weak form, semi-strong form, and strong form. A weak form of trust refers to a relationship where neither party has any vulnerability that can

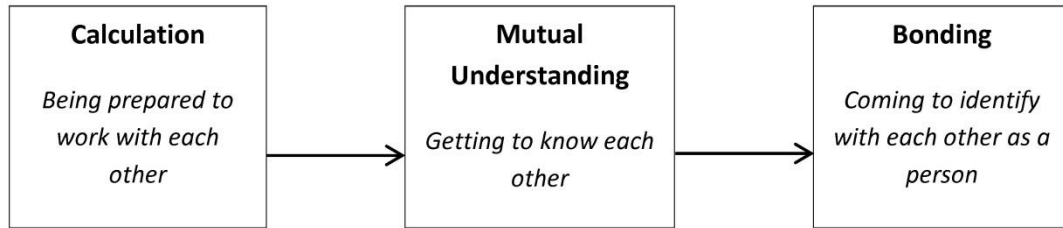
be exploited by the other one. In this form, there is no need for a contractual arrangement or governance mechanism between parties to build trust. Semi-strong trust refers to when vulnerability exists between parties however, there is a risk of opportunistic behaviour by parties and hence trust should be created by a contractual arrangement or governance mechanism. Finally, strong form is related to a form of trust where vulnerability exists and regardless of whether or not a contractual arrangement or governance mechanism exists to control the relationship between parties, there is trustworthiness between the parties. This form of trust is developed when opportunistic behaviour would contradict the standards, values and principles that have been internalised by parties to the exchange (Barney & Hansen 2006).

Since involved organisations in a construction project are generally bound by a legal contract, the dominant form of trust between the participants typically begins with semi-strong and calculus-based trust where a reward/punishment mechanism is governing the relationship.

#### *Development of trust*

Since the relationships between parties in construction are characterised by the business relationships, the development models of trust in the construction context are referred to as economic models (Hampson & Kwok 1997).

Amongst several models proposed by researchers for building and developing trust between organisations intended to work together, the model proposed by Child (2001) is applicable to a collaborative approach in the construction context perfectly. He suggests that trust in the relationship between organisations develops through a process and consists of three major stages (See Fig.2.8):



**Figure 2.8. Phases in the evolution of trust  
(Adopted from Child (2001))**

Trust at the *Calculation* (Information) Stage is based on a calculation of the probable outcomes related to the risks and cost of maintaining or serving commitment in initiating a business relationship. Trust in new relationships between partners or team members with no other social connections, is likely to be calculative trust. The concept of calculative trust can be applied to the formation of a new collaboration between two organisations. Prior to the formation process, the prospective partners try to learn as much as possible about each other to ascertain that the strategies between them are aligned. This stage is of significant importance for the ECI method as the main contractor is appointed through a qualification-based selection process. In this process, both client and contractor assess each other against the prevailing criteria in their own organisations. A sound selection process initiates trust between partners from the beginning of the contract.

At *Mutual Understanding* (Mutual Knowledge), the partners develop common pragmatisms as a result of sharing experience and information whilst they are gathering more knowledge about each other. The mutual confidence created through this process rests on mutual knowledge and common experience among the partners. The mutual understanding and predicting the thinking and actions of the other enables the partners to develop the trust between them further and reduce the sense of uncertainty which partners may have about each other. This stage of trust usually happens in an ECI contract whilst the contractor is sharing his construction knowledge and expertise at the design and planning phase of the contract.

The third stage of the trust building process is called *Bonding* and is

incorporated with strong personal relationships. Long term relationships between parties when they meet each other personally on a regular basis, establishes a mutual psychological bond between them. This form of trust

... permits stable, ongoing relationships to develop, relationships both between people in the collaborating organizations who have a responsibility for (or interest in) the collaboration and between people working on an everyday basis in joint ventures where these have been established. They are in a position to accumulate knowledge about each other, and this tends to reinforce the relationship. (pp. 281-282)

This type of trust is unlikely to be formed in a one-off contract or when the contract begins with a collaborative approach and proceeds to a traditional transactional one.

#### *Influencing factors*

There are many factors that influence trust building between partners. Some studies looked at trust and its associated influencing factors on a more personal level (Ha, Park & Cho 2011; Whitener et al. 1998) while some other studies viewed trust at the level of inter-organisational trust (Lazar 2000). As mentioned earlier, this paper focuses on trust and factors affecting trust building at inter-organisational level however, it is noteworthy that trust in both dimensions is interconnected (Dasgupta 2000).

Lazar (2000) emphasises competency and behavioural strategies as potentially important factors in trust development. He asserts that successful trust development and maintenance highly depend on consistent reciprocal cooperative behaviour and require competency to perform as a component of trustworthiness. Ha, Park and Cho (2011) support this statement by analysing trust within the context of inferential models and categorise it into two areas, namely affective trust and trust in competency. The elements that constitute an affective trust include openness, benevolence, liking, honesty, understanding and respect, while trust in competency consists of dimensions such as ability,

knowledge, skills, business judgment and specialty. Several researchers have used the term competency in analyses of trust (Lieberman 1981; Mishra 1996), whereas a number of authors discussed a similar construct using different terminologies such as ability (Cook & Wall 2011; Sitkin & Roth 1993) and expertness (Giffin 1967).

Das and Teng (1998) investigate trust in the strategic alliance context and propose some significant trust building techniques including risk taking, equity preservation, communication and inter-firm adaptation. In research conducted by Khalfan, McDermott and Swan (2007), trust is examined in the construction industry. They categorise factors influencing trust in relationships into five main groups: individual behaviour, company factors, project factors, contract and macro-economic factors. The other factors affecting trust suggested by other researchers include motives, intention, experience, expertise and willingness to reduce uncertainty (Crosby, Evans & Cowles 1990; Moorman, Deshpande & Zaltman 1993).

### ***Communication***

Communication is one of those human activities that everybody can recognise but few can define properly (Fiske 2002). Defining communication is difficult as it is a multidimensional and vague concept which can have a variety of meanings, contexts, and forms to dissimilar people in different situations (Dainty, Moore & Murray 2007; Dance 1970; Emmitt & Gorse 2009).

Torrington, Hall and Taylor (1998) state that communication involves giving out messages by one person and receiving and understanding of that message by another person. From this definition, communication can be considered as a professional practice in which application of sound rules and techniques can improve the utility of the exchanged information (Dainty, Moore & Murray 2007). Rogers and Kincaid (1981) look at communication differently and suggest the use of 'participant' in lieu of 'sender' and 'receiver'. They provide a robust definition of communication as 'a process in which the participants create and share information with one another in order to reach mutual understanding' (p.63).



Burgoon, Hunsaker and Dawson (1994) take 'power' and 'control' into account and suggest that the power rests with the sender of the message to take control over the process and communication is a tool by which people may gain some control over their social and physical environment.

### *Concept of communication*

Dance (1970) examines multitudinous definitions of 'communication' in an attempt to synthesise a single internally consistent concept. He concludes that the concept of communication as reflected in the reviewed definitions is too loose and includes contradictory components. He suggests the use of 'a family of communication concepts' instead where the concepts relate to experience but also relate to other concepts with an underpinning theory. The identification of the familial members is a task to be completed by investigating the contexts for which communication is being studied (Dance 1970).

Similarly, Craig (1999) argues that communication theory as an identifiable field of study does not yet exist and despite a plethora of existing theories introduced by many theorists, there is no general theory to which all these theories refer. He discussed this difficulty:

... Communication theory has not yet emerged as a coherent field of study because communication theorists have not yet found a way beyond the disabling disciplinary practices that separate them... The communication discipline initially tried to set itself up as a kind of interdisciplinary clearinghouse for all of these disciplinary approaches... the incorporation of so many different disciplinary approaches has made it very hard, however, to envision communication theory as a coherent field (pp.120-121).

### *Theoretical models of communication*

Decisions on how to communicate most effectively and efficiently can be informed by having theoretical perspectives on communication (Skyttner 1998). Accordingly, the following sections briefly expound the theory of

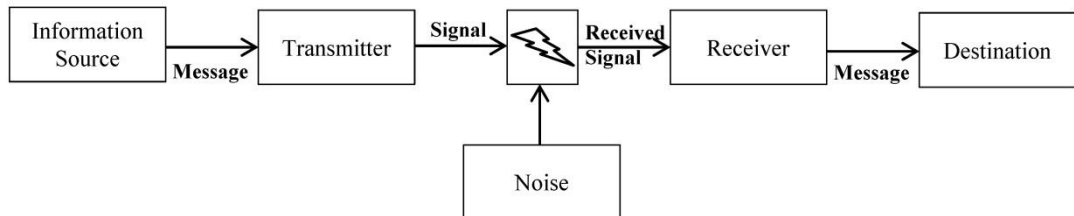
communication in general as well as in the construction context which provides important foundation for exploring ways of improving communication within construction organisations.

According to the conventional transmission concept 'communication' is defined as a means to transfer information from one party to another (Dessler 1976; Elkins 1980; Haimann & Scott 1970; Smith 1980). However the transmission model of communication is criticised by some communication theorists in recent years as the concept 'is philosophically flawed, fraught with paradox, and ideologically backward, and that it should at least be supplemented, if not entirely supplanted, by a model that conceptualizes communication as a constitutive process that produces and reproduces shared meaning' (Craig 1999,p125). Subsequently, in the majority of the communication literature produced by supporters of the latter concept the term is used to show the sharing of meaning to reach a mutual understanding and to gain a response in forms of reciprocal interaction between the sender and receiver of the message (Emmitt & Gorse 2006; Newman, Warren & Schnee 1987).

Fiske (2002) classifies the study of communication into two radically different schools, namely the 'process' school and the 'semiotic' school.

The process perspective recognises communication as a process in which messages transmit through one person to another in an attempt to influence the recipient. This school, therefore, tends to address itself to acts of communication and focuses on how transmitter and receiver encode and decode messages. The process school is concerned with the social sciences, psychology and sociology in particular (Dainty, Moore & Murray 2007; Fiske 2002). The mathematical theory of communication produced by Shannon and Weaver (1949) is probably one of the earliest theories that falls under the process school and sees communication as the linear transmission of messages. Even though the model is developed to improve the efficiency of communication through the electronic system, it has relevance to the ways people communicate, interpret and disseminate information (Dainty, Moore & Murray 2007). This simple model consists of a transmitter sending information to a receiver in

which the efficiency of the communicated information is affected by noise. 'Noise', therefore, plays a key role in this model because it can distort the clarity of the message to the receiver. Figure 2.9 demonstrates Shannon and Weaver's communication model.

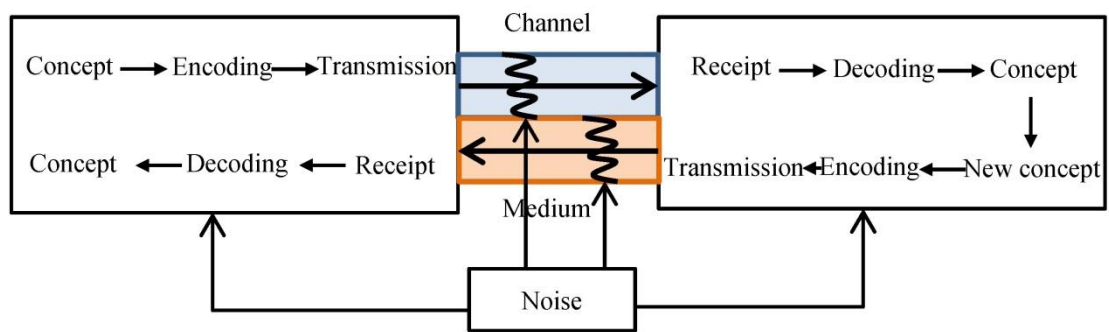


**Figure 2.9 Shannon and Weaver's model of communication**

Shannon and Weaver's model ignores the fact that communication is a two-way process rather than linear, and hence the concept of feedback is not considered in their model. Feedback is the transmission of the receiver's reaction back to the sender which can control how the communication would proceed (Clevenger Jr & Matthews 1971).

Many theorists have attempted to complement Shannon and Weaver's model by including the missing element – feedback. An example of a more sophisticated version is the one proposed by Baguley (1994) that sees communication as a two-way process and consists of medium and channel in which the transmission of information is passed along iteratively and the transmitter is continually receiving feedback. Figure 2.10 illustrates the communication process model provided by Baguley (1994).

On the other hand, the semiotic method perceives communication as the development and exchange of meaning. The semiotic school is concerned with linguistics and arts subjects, and tends to address itself as works of communication (Fiske 2002).



**Figure 2.10. The communication process (source: Baguley (1994))**

Semiotics, according to the Oxford dictionary, means the study of signs and symbols and their use or interpretation. This definition implies that communication is not just a process of transferring a message from sender to receiver but the use of signs to generate meanings. 'Sign' therefore is at the centre of the semiotic concern; it conveys the meaning to the reader.

Semiotic models of communication, unlike the process models, focus on the signs, that to which it refers and the user of the sign (De Saussure 2011; Ogden et al. 1946; Peirce 1974). Fiske (2002) argues that semiotics prefers the use of reader instead of receiver because 'it implies both a greater of activity and also that reading is something we learn to do; it is thus determined by the cultural experience of the reader. The reader helps to create the meaning of the text by bringing to it his or her experience, attitudes, and emotions' (p.38). Therefore, unsuccessful communication may not be a product of process failure, but of misunderstandings grounded in cultural differences with regards to meaning (Dainty, Moore & Murray 2007).

#### *Concept of communication in construction*

Dainty, Moore and Murray (2007) identify the main characteristics of the communication concept amongst a wide range of scholars and filtered those that can be referred in construction. These characteristics are demonstrated in table 2.4.

These eclectic perspectives on the concept of communication in construction suggest the importance of effective communication to individuals, teams and organisations involved (Emmitt & Gorse 2006). At an individual and team level, effective communication is vital for realising the project objectives and can encompass all other aspects of project management (Emmitt & Gorse 2009). Therefore, it is necessary to develop a mutually agreed communication procedure to support work activities (Dainty, Moore & Murray 2007). At the organisational level the adopted communication practices determine the way the organisation is operated and structured (Hill 1995; Thomas, Tucker & Kelly 1998).

**Table 2.4. Characteristics of the concept of communication in construction**

Generic	Construction
Communication is transferring knowledge, processed data, skills and technology (Cheng et al. 2001)	Involvement of numerous parties in construction causes a tremendous information diversity
Communication is bridging a distance (Skyttner 1998)	The disparate location of involved parties may require a long distance communication
Communication is a social skill involving the effective interaction between people (Hargie 1997)	Labour-intense attribute of the construction industry demands communication between various participants
Communication is conveying facts, feelings, values and opinions (Kakabadse, Bank & Vinnicombe 2004)	Many aspects of construction are value-laden and require subjective interpretation
Communication can occur between groups or organisations (Baguley 1994)	Involvement of a wide variety of teams is required to deliver a construction project
Communication is a transactional process of the exchanged information between the parties involved (Eisenberg 2009)	Construction is a series of transactions between participants

The reasons why communication is important to organisations are explained by Armstrong and Taylor (2014) as follows:

- Since the collective actions of people drives the organisational functions, good communication is required to avoid any independent action which may not be congruent with policy or instructions, or may not be reported properly to other people who are supposed to know about it.
- Inevitable changes in organisations affect their employees which can be managed only by setting up a two way communication channel in order to communicate to those affected in terms which they can understand and embrace the change and the ability for them to react with their views about management's proposals and actions.
- Individuals are motivated by the amount of responsibility and scope for achievement provided by their job as well as the rewards they will get in return which can be only felt by effective communication from their managers within the organisation.

#### *Construction communication dimensions*

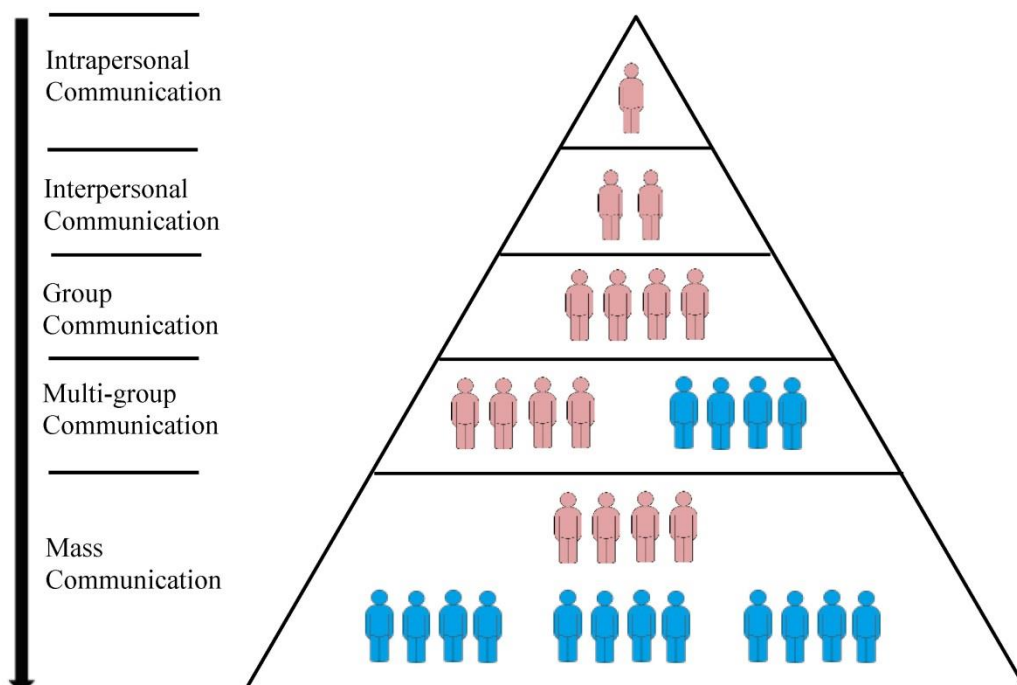
In trying to gain an understanding of communication in construction, it is important to understand the communication process (Hargie, Dickson & Tourish 1999). One of the methods used to analyse the communication process is to classify different 'levels' of communication within which people are involved. It assists us to facilitate our understanding of how to identify the unit of analysis (Bowen 1993). Even though 'Level' in the construction management context refers to the different operations and actions from the micro-level (individual) to meso-level (team) and then macro-level (project) (Emmitt & Gorse 2006), communication research commonly adopts the taxonomy provided by Kreps (1990) and Emmitt and Gorse (2006). According to their model, construction communication can occur in five levels as follows:

- Intrapersonal communication when only one person is involved and the process happens internally that enables individuals to manifest

information in the brain.

- Interpersonal communication, which usually involves two people (dyad) to create and attain relationships.
- Group communication that involves more than two people but is limited to a single group of people in order that they are able to co-ordinate activities.
- Multi-group communication where various work groups are involved.
- Mass communication when a message is sent through media to large audiences.

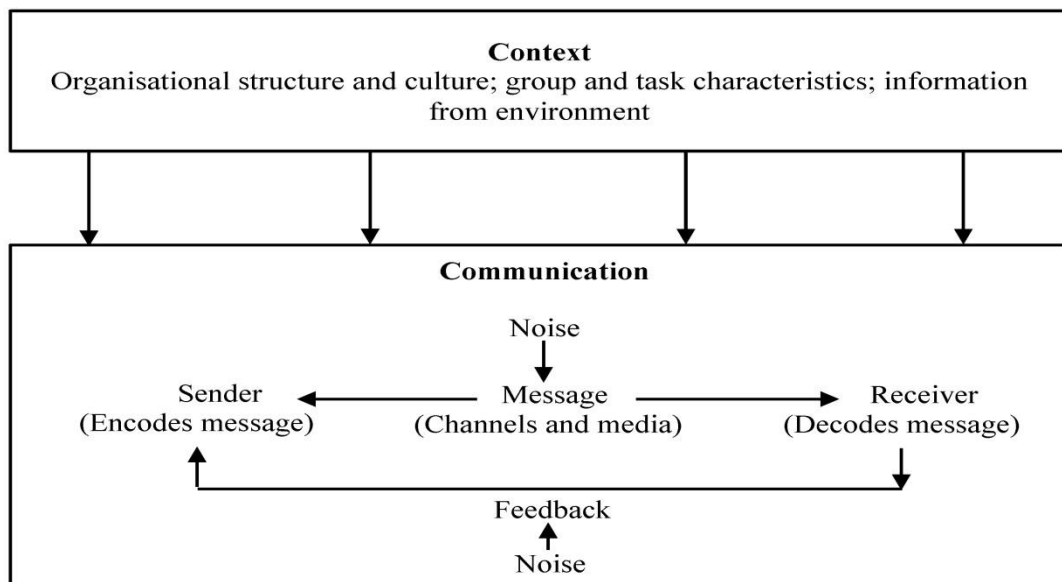
All these levels can be found to operate in the construction project environment from the intrapersonal communication level in which people understand and make sense of things to the mass communication level where the head office communicates with their site-based staff (See Figure 2.11).



**Figure 2.11. The construction communication taxonomy  
(Source: Kreps (1990))**

*Application of communication models in construction*

Although early models of communication were simplistic, linear and failed to address the complexity of human interactions, they are still widely used in the observation of the construction process and hence popular in construction publications (Calvert, Coles & Bailey 1995). The model provided by Thompson and McHugh (2002), based on Fisher (1993) organisational communication model, adds the dimension of context in the communication process in the form of the structures, cultures, group task characteristics and information from the environment (See Figure 2.12). Dainty, Moore and Murray (2007) employ this model to explain communication in construction (see Figure 2.13).



**Fig. 2.12 Context and the communication process**  
**(Source: Thompson and McHugh (2002) based on Fisher (1993))**

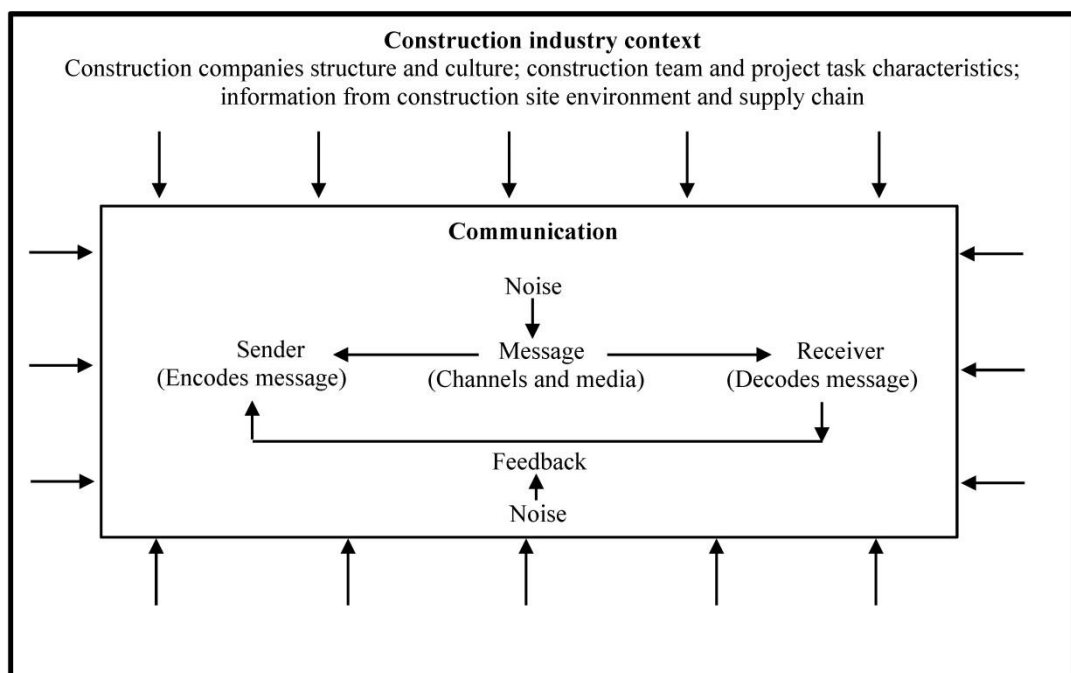
Nevertheless, all these models suffer from a central weakness: that they view communication as step by step rather than a simultaneous or concurrent process and hence ignore the factor of the interpersonal dynamics in forming a model for communication in construction (Thompson & McHugh 2002).



## ***Commitment***

The Oxford dictionary defines commitment as ‘the state or quality of being dedicated to a cause, activity, etc.’. Commitment is classified at the individual level that addresses the personal behavioural or psychological aspects (Burgess & Huston 2013) and inter-organisational level which refers to the amount of investment in time and resources that the organisation makes in the relationship with another organisation (Gundlach, Achrol & Mentzer 1995; O'Reilly & Chatman 1986).

At the individual level, commitment is referred to as a perceived goal and broadly categorised as personal goals commitment (Hollenbeck et al. 1989; Locke, Latham & Erez 1988), Organisational goals commitment (Buchanan 1974; Gordon et al. 1980; O'Reilly & Chatman 1986) and project/job goals commitment (Blau 1985; Randall & Cote 1991; Rusbult & Farrell 1983).



**Figure 2.13. Construction industry context and the communication process**  
(Source: Dainty, Moore and Murray (2007) based on Thompson and McHugh (2002))

Personal goals commitment implies a personal willingness to try for a goal or

keep trying for either a specified or unspecified goal even through difficulties (Locke et al. 1981). Organisational goal commitment is defined as an attitude toward the goals and values of an organisation that attaches the person to the organisation (Buchanan 1974; Sheldon 1971). This definition is supported by the definition provided by Porter and Steers (1973). They assert that the organisational goals commitment is characterised by three major components including a strong belief in and acceptance of the organisation's goals and values; a willingness to exert considerable effort on behalf of the organisation; and a definite desire to maintain organisational membership.

Job/project goal commitment refers to the possibility that a person sticks with a job and feels psychologically attached to it, irrespective of whether it is satisfying or not (Rusbult & Farrell 1983). Leung et al. (2004) point out that organisational commitment or project/job commitment has little impact on the personal dimension while the personal characteristics could affect the degree of organisational commitment (Balfour & Wechsler 1996).

(Mowday, Steers & Porter 1979; Steers, Mowday & Shapiro 2004) provide another classification for the personal goal commitment and contend that it is projected through two phenomena, namely attitudinal commitment and behaviour commitment. Attitudinal commitment is related to the identification of the person with the project or organisation and represents the affectivity (emotional attachment), continuity (investment in the current relationship) and normativity (obligation to remain in the project or organisation) of the commitment in psychological states (Allen & Meyer 1990). Behavioural commitment denotes binding of the individual's actions influenced by the attitudinal commitment (Mowday, Steers & Porter 1979). This type of commitment requires time and effort to quest the goals and carry out the goals to achieve the final products.

Commitment at the inter-organisational level is defined as the extent of time and resources that the organisations invest in the relationship (Gundlach, Achrol & Mentzer 1995). According to Rinehart et al. (2004), commitment to a relationship is indicated by committing resources to the relationship in various

forms such as a manager's time, money, facilities, equipment and so forth. Several studies suggest that longer-term relationships are characterised by a tendency of both parties to commit a variety of different resources (Friedman 1991; Heide 1994; Nishiguchi 1994; Yoshino & Rangan 1995).

#### *Commitment amongst construction professionals*

According to Liu (1999) commitment amongst construction professionals is essential in order to maintain the specific goals during the implementation process. In a study undertaken by Leung and Chan (2007) the antecedents and levels of commitment amongst construction professionals are analysed.

This study focuses on construction professionals (quantity surveyors, architects, structural engineers, building surveyors and project managers) in Hong Kong and identifies six meaningful factors as the commitment antecedents, including project assignment and acceptance, belongingness, specific goal achievement, membership maintenance in organisation, internalisation and task difficulty. It is suggested that the commitment amongst construction professionals is enhanced through the appropriate project assignment and acceptance, specific goal achievement, equity assessment and close team relationships.

The senior managers should strive to reduce the value discrepancy between project team members and the company by understanding the project team members' values and taking proper actions to minimise this deviation between staff values and company values (Leung & Chan 2007).

#### **2.3.4.2. Innovation**

According to Sher and Yang (2005) innovation is any incremental or radical change embodied in product and process, and includes changes in value activities such as service and administration. Egbu (2004) explains this dichotomy between radical and incremental innovation: 'Innovation can be radical, in response to crisis or pressure from the external environment, but it can also be incremental where step by step changes are more common' (p.305).

Zaltman, Duncan and Holbek (1973) view innovation in the context of

organisational culture and borrow the term of innovativeness. They define innovativeness as adoption of an idea or behaviour that is new to the adopting organisation. Innovativeness in organisations is seen as openness to new ideas which stems from the organisation's culture and considered as a measure of the organisation's orientation toward innovation (Hurley & Hult 1998).

Since the construction sector has been known as a low tech industry, with little innovation compared to other industries (Harty 2008; Reichstein, Salter & Gann 2005), innovation within the construction industry context has attracted many researchers' attentions in recent years in order to improve the current situation.

Rogers (1995) attempts to contextualise the industrial innovation concept to construction while defining innovation as an idea, practice or object that is perceived as new by an individual or other unit of adoption. Ling (2003) complements this definition by providing supposedly the most comprehensive definition of innovation in construction: that innovation is an implementation of a new idea to a construction project with the intention of deriving additional benefits, although there might be some associated risks and uncertainties. The new idea may refer to new design, technology, material component or construction method deployed in a project. Given the project based nature of the construction industry, innovation is the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change (Slaughter 2000).

Since the construction industry faces consistent changing conditions (Asad et al. 2005), there is a general agreement that innovation in construction is an essential proponent of success or more prosaically of survival (Egbu 2004; Khalfan & McDermott 2006; Slaughter 2000; Walker & Hampson 2003).

In order to achieve competitive advantage in the market, build long-term relationships with clients, increase organisational motivation and make improvements to the systems and processes, it is vital for the construction organisations to be innovative (Asad et al. 2005). Nevertheless, the process of innovation initiation and implementation require an appropriate climate to bring success and improvement.

There are different factors that drive or hinder innovation within the industry. The intrinsic characteristics of the construction industry such as industry sector fragmentation, boom-and-bust market cycles, use of relatively low technology, antagonistic procurement policies, the project-based nature of the industry and inadequate sources of information are barriers to innovation (CERF 1998; Sexton & Barrett 2003; Toole 1998).

On the other hand, in the general innovation literature, there is a range of external and internal drivers that fuel innovation including organisational capability for innovation (Burgelman, Maidique & Wheelwright 2004), attitude and behaviour of parties involved (Blayse & Manley 2004; Gann & Salter 2000), procurement method (Blayse & Manley 2004; Walker & Hampson 2003), type of relationship between parties (Anderson & Manseau 1999; Miozzo & Dewick 2002), regulations and standards (Blayse & Manley 2004; Gann & Salter 2000) and culture of innovation (Blayse & Manley 2004).

In a study conducted by Blayse and Manley (2004) the key influences on construction innovation are identified. They point out that industry relationships have a significant influence on construction innovation because they can facilitate knowledge flows through interactions and transactions between individuals and firms.

Miozzo and Dewick (2004) reach similar conclusion and state, 'in a complex systems industry such as construction, firms must rely on the capabilities of other firms to produce innovations and this is facilitated by some degree of continuing cooperation between those concerned with the development of products, processes and designs' (p.70).

Kumaraswamy and Dulaimi (2001) examine the role of procurement methods in encouraging innovation in the construction and find out innovation is significantly improved by adopting of a relationship based procurement method such as ECI or Alliancing in which the principles are stronger flows of knowledge between organisations and less reluctance by firms and individuals to propose and adopt nonstandard solutions.

### **2.3.4.3. Constructability**

#### *Historical evolution of constructability*

The concept of constructability dates back to the 19th century when new materials, systems and forms of construction were developed by builders, architects and engineers and when modern engineering emerged. The works by August Choisy, a famous French architectural historian in 19th century, recognised construction as an important ingredient of good architecture in that era (Uhlik & Lores 1998). Due to a great number of problems and difficulties in the construction industry during 1960-1970, many studies were undertaken to analyse the roots of the problems faced by the construction industry. The analysis indicated that one of the complex problems the industry was encountering was the lack of integration between construction and design (Emmerson & Emmerson 1962; Business Roundtable 1982; Business Roundtable 1983).

The importance of instilling construction knowledge in design and how cost and construction are influenced by the decisions made in the early phase of a project, were explained by Paulson (1976) in one of his earlier papers. RICS (1979) showcased how the construction knowledge was inserted into the design and the benefits achieved in the American construction industry.

In 1983, the Business Roundtable published a series of studies collectively called the Construction Industry Cost Effectiveness Project in an attempt to motivate the construction industry to advance its work methods and cost effectiveness (Pocock et al. 2006). The conclusion of these studies suggested that integrating advanced construction methods and material into the planning, design and engineering phases of the project creates opportunities for cost and time saving. It also recommended the owners and academia to make concerted efforts to help overcome the shortage of experts in constructability by restructuring the contracts, developing training materials and including constructability skills in higher education (Business Roundtable 1983).

In the UK, Construction Industry Research and Information Association (CIRA)

used the term 'Buildability' in 1983 to address 'the extent to which the design of the building facilitates ease of construction, subject to the overall requirements for the completed building'. Although the term implies the importance of the construction considerations in the design, the concept encapsulates the overall objectives of a project and not a working definition that directly addresses the design-construction interface (Martin Fischer 1997).

Constructability was officially introduced in 1986 by Construction Industry Institute (CII) based in Austin, Texas and defined as 'the optimum use of construction knowledge and experience in planning, engineering, procurement and field operations to achieve overall objectives'. In 1989, CII established the Constructability Implementation Force to evaluate the current state of constructability, to develop an evaluation toolkit for the use of the industry to enhance its implementation efforts and to investigate and overcome the existing hindrances. CII led the way in constructability research and guidelines for implementing constructability.

In 1991, Construction Management Committee of the American Society of Civil Engineers (ASCE) recognised the value of constructability and authored its 'Constructability and Constructability Programs: White Paper' to recommend the best practices for implementing constructability programs as the integration of experienced construction personnel into the earliest stages of project planning (ASCE 1991). Since then, several practitioners, government institutions and researchers at universities have conducted studies on constructability and published their results (e.g. Arditi, Elhassan & Toklu 2002; Arditi, Elhassan & Toklu 2004; Fox, Marsh & Cockerham 2002; Jergeas & Van der Put 2001; Mendelsohn 1997; O'Connor & Miller 1994; Pulaski & Horman 2005; Pulaski, Horman & Riley 2006; Radtke & Russell 1993; Uhlik & Lores 1998).

### *Constructability implementation*

In order to gain the greatest benefit from constructability, a process should be in place at the onset of the project (CII 1987, 1993) with a defined set of rules consisting of all of the essential concepts for how to implement constructability

into a workable package (Gambatese, Pocock & Dunston 2007). The process termed 'constructability program' is defined by ASCE (1991) as:

... the application of a disciplined, systematic optimization of the construction-related aspects of a project during the planning, design, procurement, construction, test and start-up phases by knowledgeable, experienced construction personnel who are part of a project team (pp.67-68).

Construction Industry Institute (1993) developed a road map in an attempt to guide the owner, designer and contractor to implement a constructability program. Depending on a number of factors, such as budget, managerial supports, resource availability and so forth, owners or contractors would decide to implement the constructability program at the corporate or project level (Gambatese, Pocock & Dunston 2007). O'Connor and Miller (1994), however argue that effective implementation of constructability requires efforts at both corporate and project levels.

Although the importance of constructability is largely acknowledged throughout the industry, the construction clients (and owners) have very limited knowledge in relation with the constructability. Pocock et al. (2006) state that 'there is a lack of knowledge by owners with respect to opportunities for cost reductions and shortened schedules by integrating advanced construction methods and material into the planning, design, and engineering phases of the project' (p.374).

The lack of construction experience in the owner and designer's organisation means that the construction input is requested too late to be of value (O'Connor & Miller 1994). In response to this shortcoming, it is recommended that constructability efforts should begin in the early stage of a project by facilitating open communication between owner, designers and builders (Mendelsohn 1997; Pocock et al. 2006). Involvement of a contractor at the early stage by adoption of the ECI method offers the opportunity for contractor to provide pre-construction services such as estimating, scheduling and constructability reviews.



### **2.3.5. Benefits of using ECI**

The major benefit of using ECI contracts for designers is establishing and developing better relationships with owners and contractors leading to a good reputation and fewer disputes (Song, Mohamed & AbouRizk 2009). There are also a number of benefits that ECI can offer to a project from consultants perspectives including improvement in the quality of design, long-term benefits to consultants by improving the quality and capability (knowledge) for their future projects, a more realistic and reliable schedule and cost estimate for the project, and better risk assessment leading to innovation (Bundgaard, Klazinga & Visser 2011).

It is generally accepted that the early involvement of construction knowledge and experience reduces the possibility of creating designs that cannot be built efficiently, hence design rework is reduced, project schedule is improved, and construction cost saving is established (Russell et al. 1994).

The use of ECI can facilitate the knowledge sharing between contractor, designer and client. Knowledge sharing refers to the process of transferring, distributing and creating knowledge (Soekijad & Andriessen 2003). Inter-organisational knowledge sharing between parties involved in a project enhances the competitive advantage of all the partners (Holland 1995).

Knowledge sharing is also recognised as one of the key principles of ECI as the contractor contributes his construction knowledge and experience to design in order to deliver best value to a project (Song, Mohamed & AbouRizk 2009). There is, however a wide range of conditions that influence knowledge sharing between organisations. These conditions are related to characteristics of each organisation, the exchange relationship between the parties involved, and the type of knowledge shared (Soekijad & Andriessen 2003).

### **2.3.6. Challenges of ECI**

There are some barriers in involving a contractor in the early design stage, including challenges in the areas of contracting practice, teamwork and culture

change (Song, Mohamed & AbouRizk 2009). There are some challenges in implementing an ECI from consultants' perspective. One of these challenges is the contractors' concern about adequate regulations to prevent other competitors running off with their ideas and the intellectual property issues of their contributions to the design. Choosing a suitable project, client and contractor for an ECI, and ambiguity in defining the role of consultants and their relationship between client and contractor throughout an ECI contract also can be seen as the challenges in using an ECI from the consultant's point of view (Bundgaard, Klazinga & Visser 2011).

Clients also find competition and trust as challenges they might face in adapting an ECI contracting model (Bundgaard, Klazinga & Visser 2011). Scheepbouwer and Humphries (2011a) examine ECI against the transitional projects issues and assert that disagreement over risk allocation, time constraints and cost reimbursement as well as level of staff capability and input, are issues in implementing ECI project delivery for all committed parties.

## **2.4. Procurement Selection**

The selection of the most suitable procurement method is critical for both clients and project participants, and is becoming an important and contemporary issue within the construction industry (Love, Skitmore & Earl 1998). There is evidence that the selection of an appropriate procurement strategy is an important contributor to overall project success (Akintoye 1994; Luu, Ng & Chen 2005; Naoum & Mustapha 1995; Naoum 1994) and this has been a driving force for the development of various procurement selection approaches.

The decision as to which procurement system to adopt for a given construction project is a complex and challenging task for clients (Love et al. 2008). Research conducted by Bowen, Hindle and Pearl (1997) shows that the majority of construction industry professionals have little understanding about the differences between the various procurement systems which inhibits their ability to make sensible recommendations as to which system would be most

appropriate for a specific project.

Since the range in choice of procurement system is now so wide and projects are becoming more complex, the selection process needs to be carried out in a disciplined and objective way within the framework of the client's overall strategic project objectives (RICS 2000). This need has been well recognised by a number of academics and practitioners in the field and led them to develop structured methodologies, tools and models of various types to aid the procurement selection process.

#### **2.4.1. Procurement selection process**

Depending on the type of client's organisation (i.e. experienced or inexperienced), the selection of a procurement approach can be undertaken by the client's organisation itself or through an external experienced professionals' consultancy (Love et al. 2008). Regardless of what approach the client uses to select a procurement method, the decision is made through a process of assessing the project and client's objectives, and considering the most appropriate procurement strategy by evaluating the available options to satisfy the defined objectives (Morledge, Smith & Kashiwagi 2006). However, the most challenging task in the process is identifying the criteria for the project and the client (Love et al. 2008). Since finding a procurement approach that satisfies the client's requirements and project constraints is a complex and difficult task (Kumaraswamy & Dissanayaka 1998; Luu, Ng & Eng Chen 2003), the use of only factors of time, cost and quality should not be a basis for selecting the procurement method, although the selection process dominantly revolves around these three criteria (Rowlinson & McDermott 1999).

#### **2.4.2. Procurement selection models and their historical development**

Despite the difficulties associated with procurement method selection, a plethora of models have been developed to assist decision-makers in selecting the most appropriate procurement method for a given project.

A model proposed by National Economic Development Office (NEDO) (1985),

namely The Procurement-path Decision Chart, suggests employing a set of criteria to establish a profile of the clients' requirements in order to assist the client in identifying their principal goals and objectives aiming to select the most appropriate procurement strategy for a project. The approach is further developed by Skitmore and Marsden (1988), using multi-attribute decision and discriminant analysis. The developed model is intended to be completed by adding utility factors which are in effect a relative measurement of the suitability of a certain procurement path for a given criterion (Skitmore & Marsden 1988).

Brandon et al. (1988) under a Royal Institution Chartered Surveyors (RICS) funded project based at Salford University attempt to automate the process through the development of knowledge-based expert system and propose a model called ELSIE. Similarly, PASCON is developed by Mohsini and Botros (1990) based upon a backward-chaining reasoning process to reach conclusions deduced from the input data and rules in the knowledge base.

Some other researchers borrow the term multi-attribute decision analysis approach (MADA) and propose different models with the relatively the same mechanism (Bennett & Grice 1990; Singh 1990).

Seydel and Olson (1990) introduce a method based on the merging of stochastic bidding models with the analytical hierarchy process (AHP). Inputs are cost data, competitor data, and decision-maker preferences, while output is a set of composite weights by which alternative bid mark ups may be ranked by multiple criteria.

Franks (1990) simplifies the selection process and suggests a simple procurement rating system based on the client's performance requirement. Masterman (2002) argues that this technique is flawed with subjectivity and although the technique is useful as a guide to eliminate unsuitable procurement methods, it is insufficiently sophisticated to enable a final decision to be taken as to the appropriate procurement method.

In 1993, Cook, Johnston and Kress provide an extension to the conventional

decision theory structure and introduce their model with the use of a multi-level decision tree.

Chan et al. (1994) adopt Skitmore and Mardsen's model to suit the Australian construction industry. By utilising an act-to-outcome process governed by organisational goals, Liu (1994) develops an organisational behaviour-based model that determines goal-performance relationship and Gordon (1994) proposes a model by the use of the three groups of drivers, the risk-allocation analysis, and the commodity versus service analysis to guide the owner in choosing the correct method. Zavadskas et al. (1996) continue the theme by adopting the multi-criteria decision making (MCDM) method in selecting the procurement system.

Love in 1996 introduced a systematic first-principle analysis and in 1998, along with Skitmore and Earl suggests a procurement path decision chart which allows clients to weight a simple set of criteria based on their requirement multiplied by set utility rating for the different systems (Love 1996; Love, Skitmore & Earl 1998).

The model proposed by Dell'Isola, Licameli and Arnold (1998) attempts to rate the performance of each procurement system for selected issues and their relative importance on a client/project profile.

Ambrose and Tucker (1999) develop another multi-attribute model but based on a three dimensional interaction matrix that provides a procedure to evaluate the appropriateness of a procurement system for a particular project and the needs of the client.

Following the Seydel and Olson approach, almost a decade later, Alhazmi and McCaffer (2000) integrate the techniques of the analytical hierarchy process (AHP) and Parker's judging alternative technique of value engineering (Parker 1985) into a multi-criteria multi-screening system.

Newcombe (2000) adopts a relatively different approach and attempts to develop the skills in analysing and translating client needs into an appropriate

procurement path by presenting the development and field-testing of a construction procurement simulator designed for this purpose.

Since 2000 the development of procurement selection model is growing. The presence of a plethora of tools and techniques in selection of the procurement system is evident of the intense interest in the procurement selection process amongst professionals and academic bodies. Table 2.5 summarise the historical development of the procurement selection models over the past three decades.

## **2.5. Summary**

This chapter provides a review of literature and research in different areas related to this research. The major contribution to the literature which is most relevant to the research of using and managing ECI are;

- The construction clients, their characteristics, needs, objectives and responsibilities.
- Construction project life cycles, understanding the different frameworks, structuring a typical construction project into phases.
- Defining of early contractor involvement, exploring of ECI as concept and as a delivery method, comparison of ECI with other models.
- Client-contractor working relationship, factors influencing relationship including trust, communication and commitment.
- Benefits and challenges in implementing ECI .
- Procurement selection process and available selection models.

The literature findings contribute to the development of the guide on dealing with the ECI in the client organisations. The main themes emerging from the literature review are;

- The importance of optimal selection of delivery system for fulfilling the clients' requirements.

**Table 2.5. Alternative procurement selection models**

Year	Model	Author	Description
1985	procurement path decision chart	NEDO	Assessing criteria to establish a profile of the clients' requirements
1988	Multi-Attribute Decision and Discriminant Analysis	Skitmore and Marsden	Developing the NEDO procurement path decision chart by adding utility factors
1988	ELSIE	Brandon et al.	Development of knowledge-based expert systems based on project characteristics and client's requirements
1990	PASCON	Mohsini and Botros	Computer-based model based on backward-chaining reasoning process to reach conclusions deduced from the input data and rules in the knowledge base
1990	Multi Attribute Decision Analysis	Singh	Developing the NEDO with rating system and weighting of client's priorities
1990	Developed Multi-Attribute Decision and Discriminant Analysis	Bennett and Grice	Developing the NEDO and Skitmore & Marsden model with weighting specific criteria multiplied by set utility rating
1990	Stochastic bidding models with the analytical hierarchy process	Seydel and Olson	A model based on the use of fuzzy set theory
1990	Procurement rating system	Franks	simple procurement rating system based upon client's performance requirement
1991	PIPS	Kashiwagi and Byfiled	A full information system that discourages non-performers, identifies the best-performing contractor for the project to minimise the owner's risk

**Table 2.5. Alternative procurement selection models**

Year	Model	Author	Description
1993	Multi-level decision tree	Cook, Johnston and Kress	an extension to the conventional decision theory structure
1993	Project acquisition strategy consultant	Mohsini	A knowledge-based expert system based on the project characteristics and project control and risk taking
1994	Multi Attribute Decision Analysis in the Australian context	Chan et al.	A model utilising the Bennett and Grice model with different procurement category for the Australian construction industry
1994	Act-to-outcome process	Liu	Developing an organisational behaviour based on goal-performance relationship
1994	Three drivers	Gordon	The assessment of project, owner and market along with a risk allocation analysis and commodity versus service analysis
1996	Multi-criteria decision making with the application of Additive Ratio Assessment (ARAS) method	Zavadskas et al.	Developing a model by adopting the multi criteria decision making method
1996	Systematic first-principle analysis	Love	A model utilising a systematic first principle analysis



**Table 2.5. Alternative procurement selection models**

Year	Model	Author	Description
1998	Developed procurement path decision chart	Love et al.	Developing the procurement path decision chart which allows clients to weight a simple set of criteria based on client's requirements multiplied by set utility ratings for the various systems
1998	Decision matrix	Dell'Isola et al.	Rating the performance of each procurement system for selected issues and their relative importance on a client/project profile
1999	Three dimensional interaction matrix	Ambrose and Tucker	A model with a procedure to evaluate the appropriateness of procurement system for a particular project and the needs of the client
2000	Procurement process simulation	Newcombe	Analysing and translating client needs into an appropriate procurement path by presenting the development and field testing of a construction procurement simulator
2000	Integration of analytical hierarchy process with Parker's judging alternative technique	Alhazmi and McCaffer	Integrating Parker's judging alternative techniques of Value Engineering and Analytical Hierarchy Process (AHP)
2001	Procurement selection by the application of Delphi method	Chan et al.	Weighing a set of exclusive criteria multiplied by set utility rating

**Table 2.5. Alternative procurement selection models**

Year	Model	Author	Description
2001	Analytical Hierarchy Process	Cheung et al.	A multi attribute model with the application of AHP
2002	Fuzzy membership functions	Ng et al.	The fuzzy membership function of procurement selection criteria through an empirical study conducted in Australia
2006	Case-based reasoning approach	Luu et al.	Formulating the procurement selection criteria with the use of Case-based reasoning approach (CBR)
2007	Decision Support System model	Ratnasabapathy and Rameezdeen	A model based on Multi Attribute Utility Technique with inclusion of a set of exclusive selection criteria at macro level and wide range of various procurement options
2012	PROMA-A Decision Support System	Okunlola	A computer-based model using the weighted sum model equation

- Impact of involving the contractor at different stages of a construction project on the project outcomes based on the project objectives and the client's needs.
- The main drivers for clients in selecting ECI over other alternatives.
- The influence of trust, communication, commitment on the client-contractor working relationship.
- Constructability and innovation as the significant benefits of using an ECI.

There are also a number of key gaps within the body of knowledge established through literature review including:

- Inconsistencies in the use of Early Contractor Involvement (ECI) terminology within the construction industry.
- The lack of pragmatic procurement selection model for selecting ECI .
- The lack of any prescriptive guidance for managing the client-contractor relationship in an ECI project.

Chapter 3 describes the research methodology and approach undertaken.

## **Chapter 3: Methodology**

The aim of this chapter is to describe the research methodology and design that was employed to conduct this research study. The chapter starts with an overview of the philosophical perspective of the research and then provides an understanding of the different research paradigms as fundamental beliefs that affect the ways to conduct social research, including the choice of a particular research methodology followed by a discussion on research approach and strategy for this study. Upon the justification for the selected the research strategy for this study, the data collection and analysis techniques will be discussed.

### **3.1. Research Philosophy**

Research philosophy refers to the progress of scientific practice based on people's philosophies and assumptions about the world and the nature of knowledge (Collis & Hussey 2009 ). The knowledge of research philosophies can help researchers to clarify the research designs, to recognise the appropriate designs and to identify and even create designs that may be outside the researcher's past experience (Easterby-Smith et al. 2008).

According to Wahyuni (2012) there are two philosophical assumptions and two basic beliefs that effect investigation of the reality. The two philosophical assumptions are ontological and epistemological and the two basic beliefs are axiology and methodology. These assumptions and beliefs will help to position the research within the philosophical continuum (Lewis, Saunders & Thornhill 2009).

*Ontology* is concerned with the study of the nature of reality (Collis & Hussey 2009; Lewis, Saunders & Thornhill 2009) and is the theory of being based on suggestions about the nature or phenomenon (Lancaster 2007). In other words, ontology is the science of being and existence (Easterby-Smith et al. 2008). Creswell (2012) points out that the reality is constructed by the individual

involved in the research situation and the nature of reality for the researcher is addressed by the ontological issue. In terms of social science, an ontological assumption can perceive that the existence is objective or subjective. Objectivism or realism (Neuman & Neuman 2006) represents the position where social entities exist in a reality that is external to social actors concerned with their existence. On the other hand, subjectivism or nominalism (Neuman & Neuman 2006) holds that social phenomena are created from the perceptions and consequent actions of those social actors concerned with their existence (Lewis, Saunders & Thornhill 2009).

*Epistemology* is concerned with 'the nature of the relationship between the would-be knower and what can be known' (Guba & Lincoln 1994,p.108). In other words, epistemology is the study of the criteria by which we can know what does and does not constitute scientific knowledge (Johnson & Duberley 2000). Epistemological assumptions are concerned with the nature and forms of knowledge and how knowledge can be acquired, and how they can be communicated to other human beings (Cohen, Manion & Morrison 2000).

*Axiology* is concerned with the judgment about the values of the research (Collis & Hussey 2009; Lewis, Saunders & Thornhill 2009) and whether the researcher values particular methods or data collection techniques over the other options. Quite succinctly, axiology is concerned with ethics, encompassing the roles of values in the research and the researcher's stance in relation to the subject studied (Wahyuni 2012).

*Methodology* refers to the overall approach to a problem which could be put into practice in a research process, from the theoretical underpinning to the collection and analysis of data in the context of a particular paradigm and includes quantitative or qualitative stances (Collis & Hussey 2009; Swartz et al. 1998).

The research philosophical stance taken for this study is discussed in details in section 3.4.1 by justifying the ontological and epistemological assumptions and axiological and methodological beliefs. Ontologically, this study understands the reality as a subjectivist approach to social science. From epistemological

perspective, this study aims to understand how reality is socially created and from axiological and methodological stance, this study is qualitative and pragmatic.

Given the different philosophical perspectives on the research undertaken in the natural science context and the social science context, three different streams of research are induced under the research paradigm title. These are discussed in the next section.

### **3.2. Research Paradigms**

Research paradigms refer to the philosophical dimensions of social sciences that represent 'a basic set of beliefs that guides action' (Guba & Lincoln 1994). According to Jonker and Pennink (2010), a research paradigm is a set of fundamental assumptions and beliefs that address the way the researcher perceives the world and serves as a thinking framework that guides the behaviour of the researcher.

Since the research paradigm substantially influences how the researcher undertakes a social study in the way they frame and understand social phenomena, it is important to initially define the research paradigm to be applied in carrying out research (Berry & Otley 2004; Creswell 2008; Lewis, Saunders & Thornhill 2009). The paradigms in social sciences are generally divided into three main groups including Positivism and Post-positivism (realism), Interpretivism (Constructivism), and Pragmatism (Guba & Lincoln 1994; Hallebone & Priest 2008; Lewis, Saunders & Thornhill 2009).

The **Positivism** and Post-positivism paradigm looks at the social sciences through the natural science lens which uses observation and reason as a means of understanding behaviour; explanation proceeds by way of scientific description (Cohen, Manion & Morrison 2000; O'Leary 2004).

Ontologically, the key idea of positivism is that the social world exists externally, and that its properties should be measured through objective methods, rather than being inferred subjectively through sensation, reflection or intuition

(Easterby-Smith et al. 2008).

Epistemologically, the acceptable knowledge in positivism is generated by developing numeric measures through a scientific approach (Wahyuni 2012) and axiologically, the researcher maintains the separation from the research by taking the etic perspectives (Guba & Lincoln 1994). Although both positivism and post-positivism believe in generalisation, they use different philosophical assumptions. Positivism seeks to obtain solid generalisations regulated by a universal law through value-free research to measure social phenomena. Therefore, social phenomena can be approached with scientific methods and the study of human behaviour should be conducted in the same way as studies conducted in the natural sciences (Collis & Hussey 2009; O'Leary 2004). On the other hand, post-positivism acknowledges social conditioning and believes that to understand social reality it needs to be observed in a certain context of relevant law or dynamic social structures that have created the observable phenomena within the social world (Wahyuni 2012).

Post-positivists therefore see the world as ambiguous, variable and multiple in its realities (O'Leary 2004). They argue that the 'Interrelationship of the investigator and what was being investigated was impossible to separate, and what existed in the social and human world was what we (investigators and laymen) thought existed' (Smith 1983,p.7). In terms of methodology, positivists adopt quantitative methodology which deals in numbers, logic and an objective stance while post-positivists employ either quantitative or qualitative methodology. From the point of view of **Interpretivist** point of view, reality is not simple and cannot be clearly explained, described or translated by researcher into the research report, but is rather constructed through communication, interaction and practice (Tracy 2012).

Ontologically, interpretivists refuse objectivism and a single truth and believe reality is constructed by social actors and people's perceptions of it, and hence, it is subjective.

Epistemologically, interpretivists try to understand the real meanings of social phenomena by using a narrative form of analysis to describe specifics and

highly detailed accounts of a particular social reality being studied (Neuman & Neuman 2006).

Axiologically, interpretivists believe that in order to understand the social world from the experiences and subjective meanings that people attach to it, researchers should interact and communicate with the studied participants by taking the emic perspective (Wahyuni 2012). In terms of methodological stance, Interpretivists employ a qualitative stance to understand meanings, experience, ideas, beliefs and values.

In the **Pragmatist** paradigm a mixture of ontology, epistemology and axiology is an acceptable approach to understand social phenomena (Tashakkori & Teddlie 2003). Instead of joining the ontological and epistemological war between positivist and interpretivist, pragmatists are concerned with action and change and the interplay between knowledge and action, hence, it intervenes into the world rather than merely observing the world (Goldkuhl 2012).

Table 3.1 outlines the basic beliefs as they relate to research paradigms based on Hallebone and Priest (2008), Guba and Lincoln (1994), and Lewis, Saunders and Thornhill (2009). Methodologically, pragmatists adopt both quantitative and qualitative (mixed or multi-method design).

This research is positioned within the Interpretivist research paradigm as discussed in section 3.4.2.

### **3.3. Research Methods**

Research method, termed research strategy in some textbooks, refers to the various means by which data can be collected and analysed (Collis & Hussey 2009). The choice of research method is guided by the research questions, the sources from which data is collected, feasibility of the study and other factors such as time, location and ethical issues (Lewis, Saunders & Thornhill 2009). Yin (2008) proposes three main conditions for identifying a research method: the type of research question; the control an investigator has over actual behavioural events and the focus on contemporary as opposed to historical



phenomena.

**Table 3.1. Fundamental beliefs of research paradigms in social sciences**

**(Based on Hallebone and Priest (2008), Guba and Lincoln (1994), Lewis, Saunders and Thornhill (2009) cited in Wahyuni (2012))**

Fundamental beliefs	Paradigm			
	Positivism (Realism)	Post-positivism (Critical Realism)	Interpretevisim (Constructivism)	Pragmatism
Ontology What is the nature of reality	External, objective and independent of social actors	Objective, exists in a certain context of relevant law or dynamic of social structures (critical realist)	Socially constructed, subjective, constructed by social actors and people's perceptions	External, multiple views chosen to best achieve an answer to the research question
Epistemology <i>What constitutes knowledge</i>	Only observable phenomena can provide credible data, facts.  Focus on causality and law-like generalisations reducing phenomena to simplest elements	Only observable phenomena can provide credible data, facts.  Focus on explaining within a context or contexts	Subjective meanings and social phenomena.  Focus on the details of situation, the reality behind these details, subjective meanings and motivating actions	Either or both observable phenomena and subjective meanings can provide acceptable knowledge dependent upon the research question

Fundamental beliefs	Paradigm			
	Positivism (Realism)	Post-positivism (Critical Realism)	Interpretivism (Constructivism)	Pragmatism
Axiology  <i>The role of values in research and the researcher's stance</i>	Value-free and etic.  Research is undertaken in a value-free way, the researcher is independent of the data and maintains an objective stance	Value-laden and etic.  Research is value laden; the researcher is biased by world views, cultural experiences and upbringing	Value-bond and emic.  Research is value bond, the researcher is part of what is being researched, cannot be separated and so will be subjective	Value-bond and etic-emic.  Values play a large role in interpreting the results, the researcher adopting both objective and subjective points of view
Methodology  <i>The model behind the research process</i>	Quantitative	Quantitative or Qualitative	Qualitative	Quantitative and Qualitative

In addition to the above three conditions, the philosophical position of the study needs to be considered while deciding the research method (Sexton 2004). A list of more common research methods in quantitative and qualitative research is provided in Table 3.2 and Table 3.3 respectively.

**Table 3.2. Various quantitative approaches**

Quantitative Methods (Source: Fellows & Liu 2009; Sekaran 2006)	
Laboratory Experiment:	This approach is used for the Identification of the precise relationship between chosen variables in a designed laboratory situation. It uses quantitative analysis and allows intensive study of a small number of variables.
Field Experiment:	It is an extension of laboratory experiments into real life. Field experiment is an activity or process, a combination of activities, which produces events, possible outcomes or situations. However it is often difficult to find organisations prepared to be experimented upon.
Archival Analysis:	This method is based upon the quantitative and qualitative analysis of archival records to describe the incidence or prevalence of a phenomenon, or to be predictive about certain outcomes.
Forecasting Future Research:	It provides insights into likely future events or impacts, these studies use techniques that include regression analysis, time series analysis, or the Delphi method and change analysis. They attempt to deal with the impact of change, but must deal with complexity and changing relationships between variables under study.
Simulation:	This method is used to study situations that are otherwise difficult to analyse by simulating the behaviour of the system by the generation or introduction of random variables.
Surveys:	Allow large number of variables to be analysed quantitatively, but do not provide insight into underlying causes. Questionnaires, interviews and observations are used to obtain data on the practices, situations or views of a sample of a particular population.

**Table 3.3. Various qualitative approaches**

Qualitative Methods (Source: Berg, Lune & Lune 2004; Glaser & Strauss 1967; Phillipson 1992; Schoen 2007)	
Case Study:	Case studies can be explanatory, exploratory, or descriptive, in all cases focusing on contemporary phenomenon in real-life settings. They allow the capturing and analysis of many variables, but are generally restricted to a defined event or organisation, making generalisation difficult.
Archival Analysis:	This method is based upon the quantitative and qualitative analysis of archival records to describe the incidence or prevalence of a phenomenon, or to be predictive about certain outcomes.
History:	Explanatory studies that deal with operational links over time.
Action Research:	Combines research with action and participation in the field of the research subject. Action research is defined as selecting a focus, observing, reflecting, planning data collection, analysing and interpreting data, evaluating, taking action, reflecting and continuing to modifying actions.
Grounded Theory:	This method is a structured approach for defining theory based on data collected. Grounded theory establishes its footings from facts and observations rather than pre-conceived notions and prejudices and it also unfolds complexities of qualitative research.
Descriptive:	Seeks to represent reality using an in-depth self-validating process in which presuppositions are continually questioned, and the understanding of the phenomena under study is refined.

Qualitative Methods (Source: Berg, Lune & Lune 2004; Glaser & Strauss 1967; Phillipson 1992; Schoen 2007)	
Ethnography:	This method is the study of cultural groups and explores a way of life from the point of view of its participants. It aims at exploring cultural phenomena that reflect the knowledge and system of meanings guiding the life of a cultural group.

### 3.4. Selection of Research Strategy for This Study

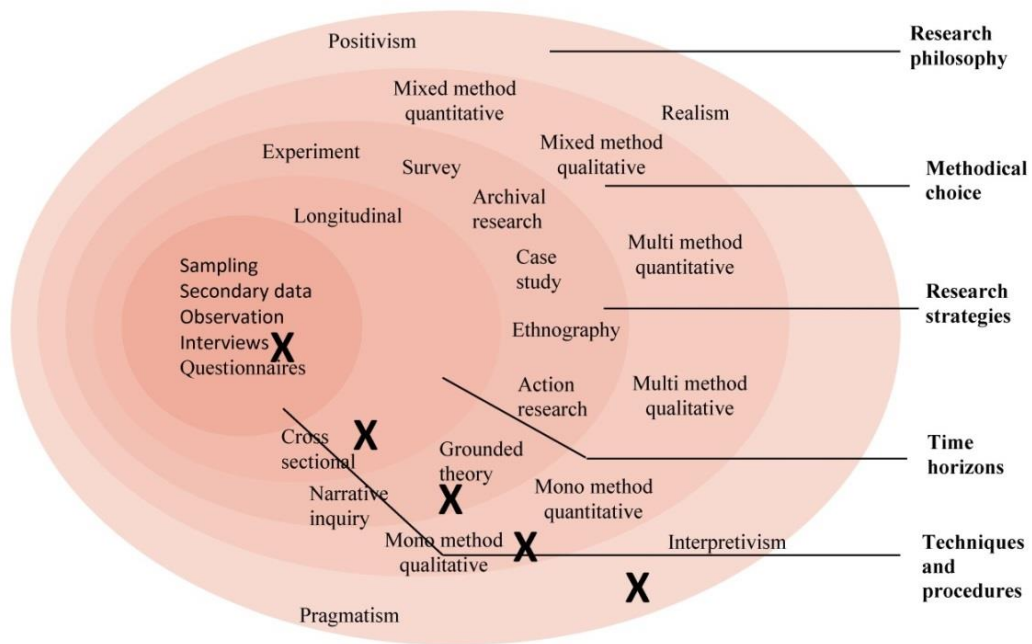
This study justifies its methodology selection under three main sections: research philosophy, research paradigm and research methods and also adopts the research process onion to place its position (See Figure 3.1). The ‘research onion’ proposed by Lewis, Saunders and Thornhill (2009) is designed in an attempt to simplify the understanding of the research process due to the confusion caused by different research terminology in different texts books.

The outer layer of the onion represents different philosophies and paradigms.

The second layer of the research onion highlights a choice between using a quantitative method or methods, a qualitative method or methods, or a mixture of both.

Peeling away the methodological choice reveals the next layer of the onion, which addresses the research method or strategy. Researchers can use one or more strategies within their research design as they plan how to go about answering a research question or addressing a research question.

The final layer of the research onion, before reaching the core, illustrates the time horizon over which the researcher undertakes either cross-sectional or longitudinal study. If the study is undertaken in one point in time, it is a cross-sectional study and if it is conducted at several points in time, it is a longitudinal study. Finally, the core of the onion addresses decisions on the selection of data collection and analysis techniques that is influenced by the upper layers (Lewis, Saunders & Thornhill 2009).



**Figure 3.1. Research positioning at each layer of research process (Source:Lewis, Saunders & Thornhill 2009)**

### 3.4.1. Justification of the research philosophy

This research justifies its research philosophy through ontological and epistemological assumptions and axiological and methodological beliefs to position the research within the philosophical continuum.

This study believes that ‘realities are social constructions of the mind and that there exist as many such constructions as there are individuals (although clearly many constructions will be shared)’ (Lincoln & Guba 1989,P.43).

This research aims to define and establish the concept of ECI within the industry and gain a consensus on the appropriateness of this method for a project leading to adopting management strategy by clients, hence the reality exists in the involved organisations’ views and through social and individual perceptions.

This shows that this study considers the reality through a position of the social construction of information. This subjectivist point of view of reality as projection of individual imagination encourages a concern for understanding the process through which human beings concretise their relationships to the

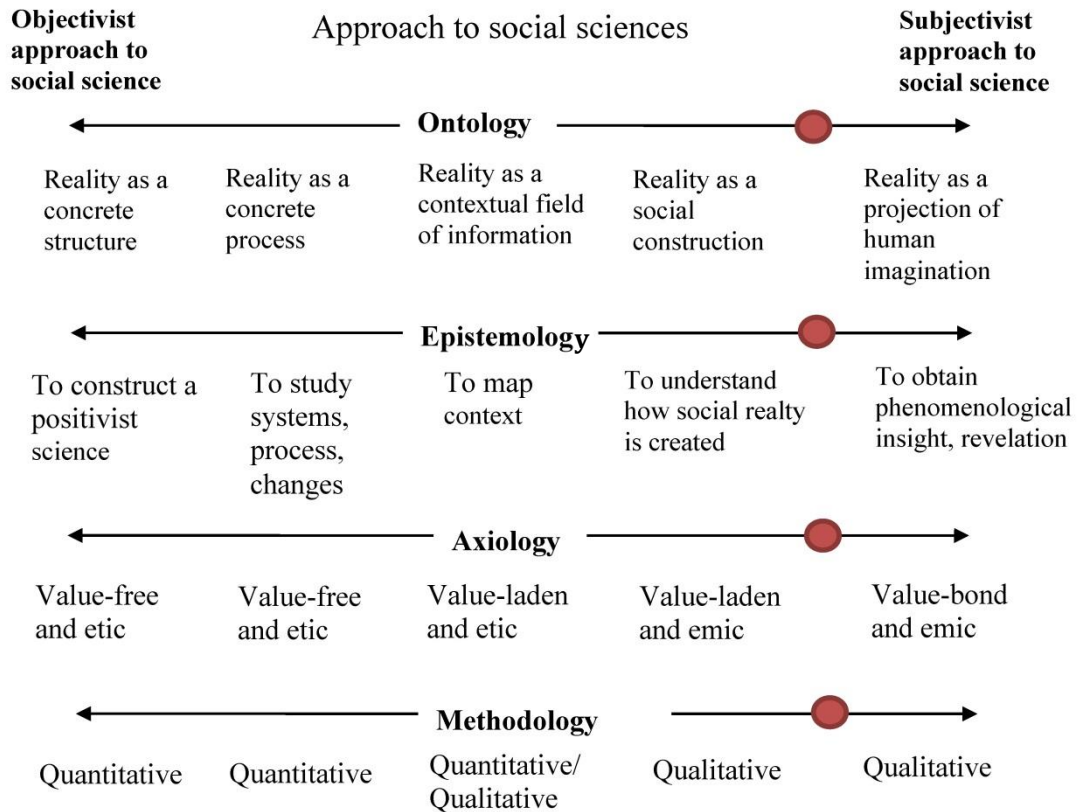
world (Morgan & Smircich 1980).

Axiologically, the researcher needs to gather information by personal interaction and through the interpretation of the data collected. The researcher is not an objective, authoritative, politically neutral observer standing outside and above the text; rather, they are historically positioned and locally situated as an observer of the human condition (Denzin & Lincoln 2008).

The authenticity of the experts who participated in the study was also trusted because they were immersed in and lived the reality of the projects under the ECI form of procurement. These key actors were chosen because they had extensive industry experience across a range of projects and they were the people best able to gauge what was occurring in the ECI projects. Thus a pragmatic axiological approach was pursued (Biedenbach 2015).

Methodologically, the research employs a qualitative approach as advocated for the study of the complex nature of the phenomenon when the objective of the research is to develop new theory techniques and processes (Creswell 2008) based on understanding and describing the phenomena from the participants' position (Flick 2009). The choice of a qualitative approach is also supported by the prior studies undertaken in the related subject by other researchers and the methodologies they have adopted for their research.

Summary of research methodologies adopted by other researchers in studies that have high or medium relevance to the subject being studied is included within Appendix A. It is revealed that most of the studies adopted a qualitative methodology manifesting the fact that the research studies in construction management should be in an era of methodological pluralism and paradigm diversity which can be characterised by a range of researchers choosing to investigate problems from a range of paradigms. The philosophical position of this study is depicted in Figure 3.2.



**Figure 3.2. Positioning the research within the philosophical continuum  
(adopted from Morgan and Smircich (1980))**

### 3.4.2. Justification of the research paradigm

The aim of this research is to understand *how* ECI is perceived and defined by respondents and under *what* circumstances they make the decision to select an ECI approach for delivering a project. Respondents create their own realities caused by their culture, experience and circumstances. It also aims to find *how* this decision would affect the selection of team and strategies for managing the working relationship, which makes this research exploratory and theory building in nature.

Generalisation is not an aim of this study as ECI is not being undertaken industry-wide but instead this study aims to carry out in-depth exploration with an aim of formulating theory. Such studies fit very well in the exploratory research in which the purpose of the research is not typically generalisation of the subject or phenomenon being studied to the population at large. Rather, it is



to investigate *how* people deal with the situation under question and *what* is meant by their actions (Schutt 2011).

In addition, the nature of this study falls within the field of project management study that aims to deal with complex problems that do not have simple or easy solutions. Bredillet (2008) argues that Positivism fails to address the relativity of the world and complexity of the reality. He contended that most research in project management lacks a solid theoretical foundation and a clear epistemological position because the majority of them have adopted a positivist paradigm causing over-simplification of the nature of problems.

Considering the above discussion, and influenced by the philosophical assumptions and beliefs discussed earlier and the purpose of the research, this study adopts an *Interpretivist* position.

#### **3.4.3. Justification of the research method**

The previous section justified the choice of a qualitative approach for this research study. In Table 3.3 a list of various methods related to a qualitative approach was also provided. According to Flick (2009) qualitative research methods are distinguished based on the specific understanding of their object. In this study, ECI is the object and clients are the subject or the unit of analysis. Selection of the research method for this study is justified through examination of each method provided in Table 3.3 against the characteristics of the topic being studied.

**Case study:** the case study method can be used for this research because the use of case study is advocated when the researcher has little control over events and when the focus is on contemporary phenomenon (Yin 2008). This study would focus on understanding the phenomenon within the particular organisations and their present perception about the selection of ECI and its link to the development of professional practices. The researcher would be able to define and develop questions and hypotheses during the data collection process. However, case study limits the research process to only organisations and people who were directly involved in particular projects causing the

omission of other professionals' perspectives who have knowledge or demonstrable experience and expertise in this area.

**Archival analysis:** archival analysis is not suitable for this study. ECI is a relatively new delivery system with little documented records and the research subject (clients) are all government organisations. Difficulties encountered in the process for obtaining access to governmental documents (e.g. classified documents, security checks, confidentiality of records) make this study unfeasible in terms of data sources and required time.

**History:** this research is not aimed at answering the research questions through historical operations in order to discover the actual roots of current practices in dealing with selecting ECI and its effect on development of the management strategies. Therefore, historical methodology is not applicable here.

**Action research:** action research is a potential research method for this study because the researcher could control the data gathering by working and engaging with the subjects, leaving the research subjects as passive actors that may not necessarily know that they are being watched (Tashakkori & Teddlie 2003). Eikeland et al. (2008) suggest that an action research strategy's purpose is to solve a particular problem and to produce guidelines for best practice. However, action research requires strong within-person and between person dynamics, especially if hidden agendas appear to be operating (Dick 2002). The researcher has not been working with the research subjects' organisations and had little acquaintance with the people under investigation which would lead to undermining the quantity and quality of the collected data.

**Grounded theory:** Grounded theory was used in this study as it is appropriate for answering questions of process, that is, 'how' rather than 'why' (Glaser & Strauss 1967). Subsequent to an initial review of the literature it was decided that the concept of ECI was new to the construction industry and there is a dearth of research in this area. On account of the novelty of ECI, grounded theory can provide an efficient means of generating theory and illustrating the current situation. Strauss and Corbin (1990) state that grounded theory uses a systematic set of procedures to develop inductively derived grounded theory

about phenomena. The theory development starts and overlaps the data collection stage iteratively (Strauss & Corbin 1990) from different cross sections until the saturation point is achieved and a theory is developed.

**Descriptive:** a descriptive type of study is useful for answering the 'why' question. This research aims to find out 'how' an ECI is selected by clients and 'what' is the effect on the professional practices instead of providing a detailed picture on the background or describing the context of the situations.

**Ethnography:** ethnographic methodology aims at exploring cultural phenomena which reflect the knowledge and system of meanings guiding the life of a cultural group (Phillipson 1992). This mainly relies on a longitudinal study that exceeds the scope of this research study.

#### **3.4.4. Selecting data collection and analysis techniques for this study**

The choice of techniques for collecting data is highly influenced by the strategy adopted for conducting the research. The choice of Grounded Theory guides this study to employ interviews as the data collection technique. This study intends to describe the conditions and challenges for the client's organisations in using ECI for a project. Interviews can document individual attitudes, feelings, beliefs, experiences and reactions. Nevertheless, various types of interview are available for qualitative research hence it is necessary for any one aiming to use interviews as a data collection technique to first understand the different types of interviews and then clearly state what technique they want to adopt. Different types of interview are described as follows:

**Structured interviews:** According to Corbetta (2003), structured interviews are '...interviews in which all respondents are asked the same questions with the same wording and in the same sequence' (p.269). The aim of structured interviews is for all interviewees to be given exactly the same context of questioning. This means that each respondent receives exactly the same interview stimulus as any other. The goal of this style of interview is to ensure that interviewees' replies can be aggregated (Bryman

2012).

**Semi-structured interviews:** Semi-structured interviews are non-standardised and are frequently used in qualitative analysis when the interviewer does not do the research to test a specific hypothesis (Sutton & David 2004). According to Corbetta (2003), in a semi-structured interview,

... the order in which the various topics are dealt with and the wording of the questions are left to the interviewer's discretion. Within each topic, the interviewer is free to conduct the conversation as he thinks fit, to ask the questions he deems appropriate in the words he considers best, to give explanation and ask for clarification if the answer is not clear, to prompt the respondent to elucidate further if necessary, and to establish his own style of conversation. (p.270)

**Unstructured interviews:** In an unstructured interview, the researcher conducts a more casual non-directed interview. Generally, the interviewer has received little or virtually no training about the interview process. The interviewer asks questions allowing respondents to express their opinions, knowledge and share their experience (Kajornboon Unknown).

**Non-directive interview:** In non-directive interviews there are no pre-set topics to pursue. Questions are usually not pre-planned. The interviewer listens and does not take the lead. The interviewer follows what the interviewee has to say. The interviewee leads the conversation. The interviewer has the objectives of the research in mind and what issues to cover during the interview. The interviewee is allowed to talk freely about the subject. The interviewer's role is to check on unclear points and to rephrase the answer to check for accuracy and understanding (Gray 2009).

The primary data collection with this study was based on semi-structured interviews with senior managers and key players of client organisations involved in ECI projects. With this type of interview the researcher was able to probe or ask more detailed questions of respondents' situations and not adhere

only to the interview guide. In addition, the researcher could explain or rephrase the questions if respondents were unclear about the questions.

Since all of the participants in the client organisation had experience with ECI, the answers might have been biased from a wish to either promote or discourage the delivery strategy. In order to mitigate this issue and reduce the possibility of responses that skew the results, two participants from a professional consultancy organisation were also selected to ensure the reliability of the responses from the client organisations.

#### **3.4.5. Research design**

This research was carried out in four phases. In Phase1, salient literature was reviewed to develop an understanding of the existing knowledge elements. In undertaking this study, initially, it was important to explore the definition of ECI and its perceived structure as practiced in the industry, as an aid to understanding the current knowledge of the ECI and highlighting pertinent lacunae in existing knowledge. A preliminary literature review was conducted in response to this inquiry. The literature review could help to develop a generalised sense of reference termed *sensitising concepts* (Blumer 1954). It also assisted in the choice of research methodology. The grounded theory method of research was employed to elicit the theory and build a construct. The initial research question was developed as a result of the sensitising concepts and its adopted methodology.

In Phase2, the study conducted a trial study to test the adequacy of research instruments. During the development of the research question, the researcher was informed that a research project close to the field of the study was being concurrently conducted by an experienced researcher. Given the complexity associated with the nature of grounded theory, such a trial study would help to clarify the research questions boundaries and align the research focus. The experience gained from the qualitative research process associated with the trial study helped the researcher, who was a novice to qualitative research, to facilitate the analytical process of the main study. Corbin and Strauss (1998) acknowledge this issue and point out that experienced researchers 'work faster

because they have internalised this mode of thinking and can go about it less self-consciously' (p.289). In this study, the researcher borrowed the pilot study principles to utilise the trial study. A pilot study offers an opportunity to pre-test some of the objectives, research questions, and explore methods (Baker & Risley 1994) letting any amendments be made before conducting the main study. A pilot study could also provide early warning alerts about where the main research project could fail, where research protocols may not be followed, or whether proposed methods or instruments are inappropriate or too complicated (van Teijlingen & Hundley 2002). Detailed discussion of the trial study is discussed in the following section. Development of the interview questions were largely guided by the work of Corbin and Strauss (1998). Questions were designed to be less structured and more in the form of guidelines such as 'What do you think about...?', 'What was your experience with...?' and so on (Corbin & Strauss 1998). The full discussion as to how the interview schedule was developed is provided in chapter 5.

Phase3, focused on the research data collection, data analysis and the development of the theory. After the trial study, the interview sampling size was changed from 20 to 15 experts within client organisations who held senior managerial level roles in their organisations. Fourteen out of 15 selected participants responded to the research participation request and confirmed their willingness to take a part in this research study. The major study involved in-depth telephone interviews with 14 experts and key management representatives on four state government client organisations and one professional consultant organisation. Data was collected from 29 questions. The 14 people who were interviewed all performed senior leadership roles for their department with several decades of experience within their field of practice.

An in-depth interviewing methodology enabled detailed discussion of the issues tackled in the research. Each interview took 60-90 minutes and all interviews were recorded as audio files. The interview sound files were then transcribed to text format files. In total, 300 pages of transcribed data were converted to text file format. The analysis process was carried out by the use of the latest version of qualitative data analysis toolkits, NVIVO 10.0.303.0, to organise and assist

with the analysis of content from interviews. The analysis process adopted a 'content analysis' approach for the identification of common threads that extends throughout an entire interview or set of interviews. The process was also guided by the 'constant comparison' of participants' responses considered as one of the core Grounded Theory analytical tenets highlighted by Suddaby (2006) in order to attain theoretical saturation of the concepts under exploration. The full description of the Grounded Theory analysis procedure is discussed in chapter 5.

In Phase4, expounded theory was tested and validated. Whilst building each block of the theory, literature in the substantive area of the theory was brought to support and ground the theory. This iterative process continued until the entire theories were developed, theoretically saturated and grounded by the extant substantive literature. Validation of the theory was ensured by carefully practicing the theoretical coding procedures through 'open coding', 'axial coding' and 'selective coding' as guided by (Strauss & Corbin 1990). Finally, all findings were integrated and collated to produce discussion and the subsequent conclusion. The research design is demonstrated in Figure 3.3.

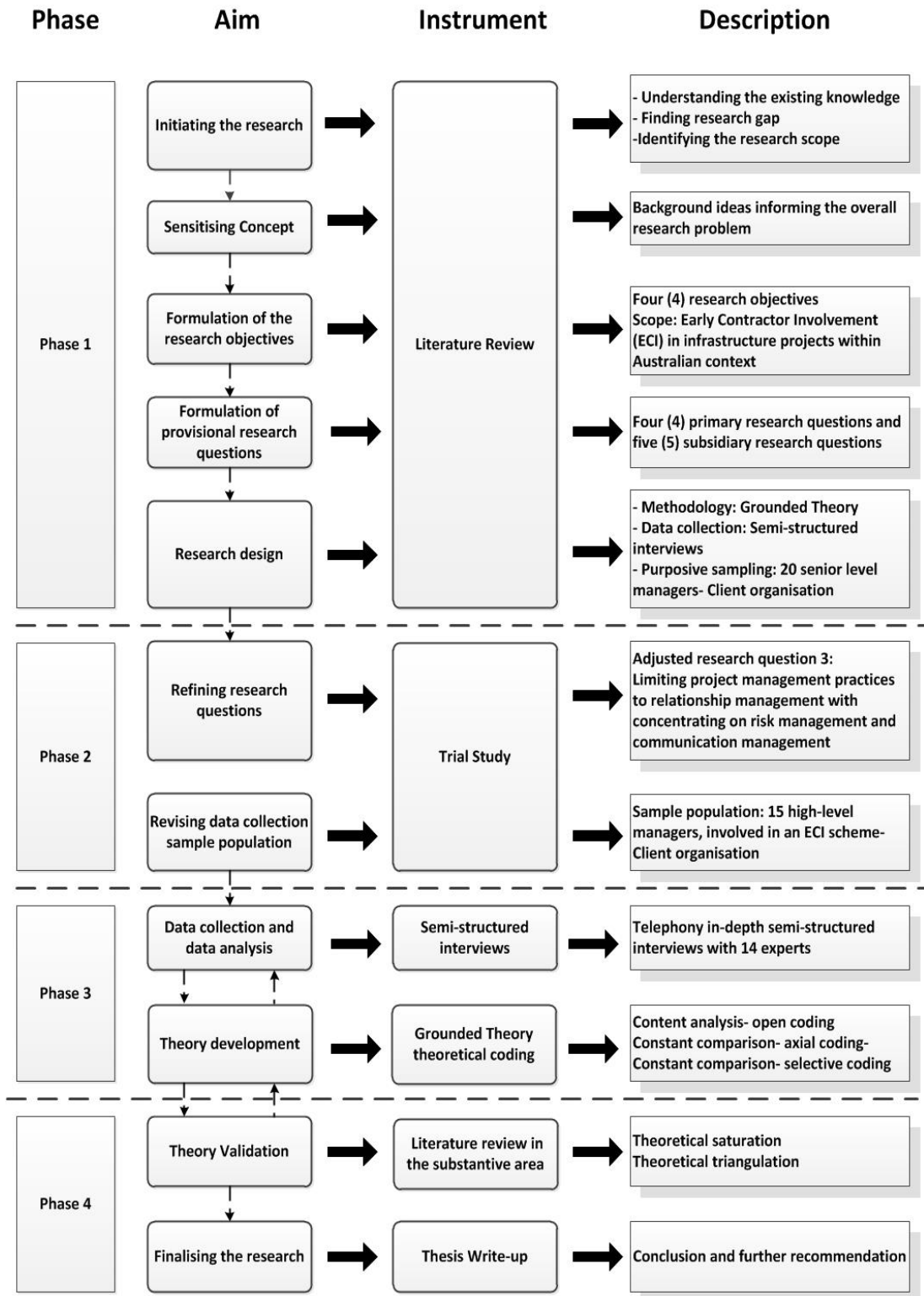


Figure 3.3. Research process for this study



### **3.4.6. Trial Study – Water Treatment Plant Project**

The trial study was one of a series of projects investigated as part of a study into program alliancing. The selected project required the design and construction of a sewage and wastewater plant in Victoria. Its features closely resembled an alliancing for the design stage after which a decision was made to move to a different model for the delivery phase of the project.

A case study approach was chosen as the research technique so that the project context of the chosen embedded interviewed experts could be explored. The data comprised experts' experience of their adopted procurement choice and the unit of analysis formed the nature of collaboration that was adopted. The epistemological stance was based on interpretation through dialogue conducted by interviewers and experts using a semi-structured instrument.

#### ***3.4.6.1. Case study detail***

This case was rare in terms of contractual arrangements.

First, it was a project with two distinct and separate project owners who had formed a quasi-joint venture to deliver the project. One party was a government instrument (the water authority) and the other a multi-national oil company.

This presented organisational complexity due to culture diversity and how these two entities worked together with very different core values, operational styles and accountability to their organisational owners.

The project was funded (AUD\$94.2 million) from three sources: the regional water authority (\$17.5 million), the oil refinery company (\$47.5 million) and the state government (\$9.2 million). These organisations had different governance requirements that added to project complexity. The water authority had experience of alliances while the oil refinery company's head office had outlawed the use of alliancing and only permitted a narrow range of more traditional project delivery approaches. The state government had experience of a whole range of project delivery approaches therefore it neither imposed nor denied any particular project delivery form.

Second, the project was technically complex. There was also tension between the two project owners' host organisations governance requirements for passing the project through a stage gate process. Decision making processes about how the project should be delivered from inception to preliminary design to bid and then delivery was quite different for each owner party. The result was a very rich contextual set of project delivery circumstances.

The initiation of the project was based on a common goal for both project owners for water conservation during a 14 year long drought that threatened the community and the industry's viability. The water authority and major oil refinery company decided to jointly develop a new water treatment facility that would process town sewerage and waste water along with industrial waste water generated by the refinery plant. Each party, together with the state government, agreed to contribute to the project's development and that the water authority would own and operate the facility. The oil refinery company had a global policy of stage gate decision making (Tzortzopoulos, Sexton & Cooper 2005) at the proposal, concept design, detail design and construction commitment decision points with a commitment to using an Engineering, Procurement and Construction (EPC) approach. The water authority and state government were not averse to this process and so the insistence on an EPC project development approach was adopted.

The plant was to deliver potable water quality. Treating a mixture of industrial as well as town and residential waste water presented a number of technical uncertainties about the optimum treatment technology to use and how it would function; this required iterative modelling of various innovative options. The water authority had sufficient experience and expertise to project manage the process of the design solution and work package tender preparation with design advice and input from the Contractor. The initial cost estimation was in excess of that budgeted and so the final design solution to reach an acceptable capital expenditure was arrived at after numerous value engineering workshops. Collaboration between the parties enhanced the process of reaching a committed budget. Tendering of the lump sum work packages and the contractor's management fee was undertaken using a transparent process. The

project's final cost at \$94 million occurred as a result of significant front-end and design stage collaboration. Project delivery followed two phases. Phase 1 adopted a collaborative Design Alliance model followed by a construction Phase-2 undertaken based on a lump sum price EPC basis.

Design Phase 1 comprised collaboration between a project owner consortium, a specialist design consortium and a contractor. The main project owner entity was a water authority and the second project owner was an oil refinery organisation. The specialist design consultant comprised a lead design group and a small specialist advisor team. The construction contractor organisation had also been heavily involved in establishing and working within a program alliance with the water authority project owner.

Consultancy input by both the design and contracting parties was based upon agreed hourly rates using co-located facilities funded by the project owner consortium.

The water authority had a program alliance arrangement in which it collaborated with a construction contractor and a different design consultant. Appointment of design teams was based on an estimated number and cost of time (hourly rates) proposal with the project owner consortium paying for other direct costs. Similarly, appointment of the construction contractor was based upon agreed hourly rates and an estimated number of hours. The water authority was able to benchmark hourly rates from their experience of program alliance establishment as well as from previous experience of recent similar projects. The scope of Phase 1 work was to design the facility, estimate capital and operating costs to optimise the life-cycle-costs, seek and obtain statutory approvals and to undertake the necessary stakeholder management for internal project stakeholders as well as for community and other external stakeholders.

#### **3.4.6.2. Case study interviewee overview**

Subject matter experts were interviewed who were instrumental at the senior level at the design and delivery phases and were holders of the most reliable data about that project that could be found. Each interview was semi-structured

with questions to enable the analysis to reach the research objectives. Each interview took approximately one hour, was recorded and then transcribed. This yielded approximately 60 transcription pages. Table 3.4 below provides details of the interviewees

**Table 3.4. Trial study interviewed project participant details**

<b>Ref.</b>	<b>Role</b>	<b>Notes and comments</b>
[PN]	General Manager of the Water Corporation	Had a strategic view of this case study as part of a large infrastructure delivery program with overall responsibility for the entire business.
[SC]	Program alliance manager and Project Owner Representative (POR) throughout both design and delivery phases	Had a strategic and early involvement operational view being involved at the early stages of the design stage. He was the POR for the project at the early stages to establish the procurement arrangements and reporting to[PN].
[MP]	Construction manager, for the early contractor involvement (ECI) design phase and later for the delivery phase.	Was involved in the project design and then led the EPC delivery phase. The project followed a stage gate approval process in which an initial project solution was cost estimated. Tenders were called for the role of EPC contractor once the 'go' decision was made. ConC won the tender against other contracting bidders and he continued as project manager at the delivery phase.
[PM]	Design manager at the early design stage	Was involved at the early stages of design as part of the service alliance as design manager but not involved at the project delivery stage.
[DdK]	Design manager at the project delivery stage	Was involved at the early stages of design as part of the service alliance as design manager and then through the project delivery stage.

#### **3.4.6.3. Trial study outcomes**

Two outcomes from the trial study have been achieved.

First, experience gained from the trial study provided in-depth understanding of potential deviations in the core principles as realised from the analysis, which led to refining the research question and developing the interview schedule for the main study. The research question was originally aimed at exploring the practices in managing an ECI project. However, the area of project management and its practices is too broad and would have made the study impractical in terms of the amount of efforts required for each stage of the research process and the time feasibility of the study (Churchill & Sanders 2007; Phillips & Pugh 2010).

The analysis of the trial study reframed the expectations, originally developed from the literature review, that proved to be important in developing a full understanding of ECI project management. The finding elicited that a collaborative relationship during the design alliance phase (phase 1) was the main reason of the project success.

This finding is generally consistent with the current studies in the field of collaborative procurement arrangements. Studies show that the performance of projects extends beyond the traditional *iron triangle* of time (Lim & Mohamed 2000; Odeh & Battaineh 2002), cost and quality (Chan & Tam 2000; Georgy, Chang & Zhang 2005). Rather, a growing number of studies suggests that the relationship between project participants is a key determinant of project success (Love, Gunasekaran & Li 1998; Rahman & Kumaraswamy 2008; Rahman, Kumaraswamy & Ling 2007). In addition, the trial study analysis showed that risk arrangement and communication mechanisms had a significant influence on the relationship between parties involved in the Water Treatment Plant Project.

The risk arrangement in the project was unique and specific to this project. The project started with a purely collaborative relationship during the preconstruction and detailed design stage and then switched to a traditional

arrangement of EPC during the delivery phase. While the risks in the delivery phase were dealt by the EPC contractor, during the collaborative phase the project risks were identified jointly by the client, contractor and designer.

This process differs to a traditional lump sum method where the client hands over all risk to the EPC entity, and the entity manages that risk through its lump sum price. This includes risk and time contingency allocations without involvement of the project owner at the front end of project collaborating with the design and construction teams (Merrow 2011, 2012). This also differs to a pure collaborative approach or alliance in which the pain share/gain share is institutionalised in the contract.

The collaborative relationship at the early stage of the project required a certain set of competence and capabilities to enable all parties work together in a collaborative manner. Although the delivery phase transitioned the collaboration to a typical lump sum arrangement, the relationship built during the collaborative phase did not vanished completely and the quality of the relationship was reported as satisfactory in the delivery phase. The working relationship and communication differed to a typical traditional EPC contract where the project is delivered with no relationship between the owner and contractor, causing a potential culture of blame and conflict.

The process also differed to a pure relational contract in which the contractor is involved in the project from the conception throughout the delivery phase and the collaboration is part of the contract. The research question was subsequently revised to look at the project management practices through the lenses of relationship management and amongst the project management areas,. In the area of project management this study focused on the risk management and communication management in managing ECI working relationship.

The second outcome of the trial study was a change in the interview sample size and specification. The initial sampling population was 20 individuals in the clients' senior and top level management teams. After conducting the trial study the researcher experienced difficulty in arranging interviews with high level senior managers and thus changes were made to encompass more in-depth

interviews with 15 high level managers who had first-hand experience in an ECI project and were involved in the ECI selection process.

The analysis of the Water Treatment Plant Project illustrated that semi-structured interviews with high level management who were directly involved in the project was far richer and could provide insights into their rationale for action within a specific context. Mingers (2003) and Pasian (2015) asserted that experiences of interviewed experts are socially constructed ‘realities’. Nevertheless, these do not exist in isolation but are formed by perception of the context experts find themselves in. The summary of the trial study outcome is presented in table 3.5 below:

**Table 3.5. Trial study outcomes**

<b>Before Trial Study</b>	<b>After Trial Study</b>
Initial research question 3: How can an effective strategy for project management be developed as a result of an ECI process?	Reframing research question 3: How can an effective strategy for relationship management be developed as a result of an ECI process?  The focus on communication management and risk management.
Sample population was initially designed for 20 individual interviews with the general management team.	Sample population revised to interview with 15 high level managers who had first-hand experience in an ECI project and who were involved in the ECI selection process.

### **3.4.7. Participant Recruitment**

The strategy for recruitment of participants for this study was driven by the principles of ‘purposive sampling’ advocated by Corbin and Strauss (1998). The

main purpose of purposive sampling is to elaborate and refine the categories constituting the emerging theory (Charmaz 2014). The purposive sampling strategy seeks involvement of participants who could contribute to generating the theoretical concepts being explored. Targeted participants were involved in the construction industry within Australia and those who were involved in an ECI scheme.

The participants were in the infrastructure departments of public sector client organisations including state government departments and one leading professional consultant organisation specialising in the establishment and delivery of collaborative contracts for complex projects and programs. According to Gibb and Isack (2001) the regulated infrastructure clients are more knowledgeable about the construction process and standard components than other private or public clients.

Ideal individual participants had been involved in the selection process of ECI and could provide input into their experience in that area. Targeted organisations were identified through the Internet and since they were public sector organisations and one well established professional consultant, their websites were publicly accessible. The organisational chart of each organisation was obtained and the relevant department was identified.

The organisational chart for the identified department was attained. Approval to conduct the study within the organisation was sought from senior executives through emails. Four departments in Victoria, New South Wales, Queensland, Western Australia and South Australia responded to the request and agreed to participate in the research project. Upon receipt of the approval, a list of candidates who had interest in participating in the research study including their contact details was requested. Initially participants were sought through invitational emails sent directly to them or their secretary. As the study continued, additional participants were identified through referrals from the other participants during the interview. This is termed a 'snow ball sampling' approach.



### **3.5. Validity and Reliability**

Healy and Perry (2000) emphasise that the quality of scientific research has to be judged within the terms of the paradigm in which that research study has been conducted. For example, the merit of qualitative studies should not be judged by the canons or standards which quantitative studies are judged (Guba 1981; Merriam 1995; Miller & Kirk 1986).

For positivist researchers validity and reliability of the research are essential elements to ensure the quality of research (Chia 1997; Neuman & Neuman 2006). Reliability of research is defined as the extent to which results are consistent over time and how they represent the total population under study accurately.

A research instrument is considered to be reliable if the results of the study can be reproduced under a similar methodology (Joppe 2000 cited in Golafshani 2003). Validity of research determines whether the research truly measures that which it was intended to measure or how truthful the research results are. Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others (Joppe 2000 cited in Golafshani 2003).

In quantitative research, validity is referred to 'construct validity' where the initial concept, notion, question or hypothesis determines which data is to be gathered and how it should be gathered (Wainer & Braun 1988). Involvement of quantitative researchers in the research process would greatly reduce the validity of a test.

On the other hand, some qualitative researchers argue that the reliability and validity in qualitative research are viewed differently and the findings of qualitative research should be evaluated through different lenses (Hoepfl 1997; Winter 2000).

Amongst interpretivist researchers, credibility, transferability, dependability and conformability are the criteria by which the quality of research is evaluated

(Healy & Perry 2000; Lincoln & Guba 1985; Thomas & Magilvy 2011). Merriam (1995, P.52) states that 'more commonly, writers make the case that qualitative research is based on different assumptions regarding reality thus demanding different conceptualisations of validity and reliability'. To address this, Thomas and Magilvy (2011) make a comparison between qualitative and quantitative validity and reliability criteria terms. They explain that credibility, similar to internal validity in quantitative terms, refers to the recognition of the experiences contained within the study through the interpretation of participants' experience.

Transferability is equivalent to external validity in quantitative research and determines the ability of the research results or methods to be applicable in other contexts or within other participants (Lincoln & Guba 1985). Dependability, equivalent to reliability in quantitative terms, is the element that allows the other researchers to follow the research path as undertaken by the researcher. Conformability, similar to objectivity in quantitative terms, is achieved when credibility, transferability and dependability have been ensured (Thomas & Magilvy 2011).

Merriam (1995), however, argues that despite the use of a different nomenclature by qualitative researchers, 'notions of validity and reliability need to be grounded in the worldview of qualitative research' (p.53, emphasis in original).

Even though this research adopts a qualitative approach and employs an interpretivist paradigm, the quality of the study has to be examined against validity and reliability criteria. The following discussion endeavours to ensure the rigor of this research study in terms of three major aspects of internal validity, reliability and external validity.

**Internal validity:** internal validity of this research was ensured by employment of a number of strategies as advocated by Merriam (1995). These strategies are described as follows:

- *Triangulation:* the use of multiple methods to confirm the emerging

findings is termed 'Triangulation' (Mathison 1988). Denzin (1970) states that triangulation can be accomplished through the use of a number of methods such as data triangulation, investigator triangulation, theory triangulation and methodological triangulation. This study adopted a Grounded Theory methodology for developing the theory and validates the evolving theory by iterative rounds of revisiting the same data set to validate the emerging findings while building the whole blocks of theory. Corbin and Strauss (1998) point out that one way of validating a theory is to conduct a high-level comparative analysis by going back and comparing the theoretical scheme against the raw data. The analytical process consisted of three microanalysis stages of 'open coding', 'axial coding' and 'selective coding' to ensure the theoretical triangulation and the constant comparison continued until a theoretical saturation was achieved.

- *Member check*: transcription derived from the interviews recorded audio, was sent back to the interview respondent whom the data was gathered from to check and confirm that the transcription was accurate and plausible.
- *Peer/Colleague examination*: findings of this study were constantly checked and examined by an experienced researcher who was the researcher's supervisor.
- *Statement of researcher biases*: in preparation of this thesis, every effort was made to explain the whole process of the research study and present the researcher's experience, assumptions and biases towards collecting, interpreting and developing the findings.
- *Engagement in the research situation*: the duration of each individual interview was long enough to ensure that all interview questions were sufficiently answered and discussed by participants and an in-depth understanding of the phenomenon has been attained.

**Reliability**: some of the strategies used to ensure the internal validity of the research can ensure the reliability of the study as suggested by Merriam

(1995) i.e. triangulation and peer examination. Beside those, the process of data collection, derivation of categories and decision making throughout the study (Merriam 1998) was described in detail in preparation of this thesis.

**External validity:** strategies adopted to ensure the external validity of this study are highlighted below:

- *Thick description:* detailed description of the research process throughout all phases was provided enabling readers to determine how closely this research matches their situation and if the findings are transferable (Merriam 1995). The details of the conceptualisation and formulation of the theory also enable other researchers with any perspectives to follow the analysis process to understand the analytical logics and confirm the plausibility of the explanation of the phenomenon (Corbin & Strauss 1998).
- *Multi-site design:* this study used 14 experts from 4 different client organisations within different states in Australia and one professional consultant organisation located in Victoria in an attempt to allow the results to be applied to a greater range of other similar situations (Glaser & Strauss 1967).

### **3.6. Ethical Considerations**

The consideration of ethical issues is integrated in the development of a research proposal and in the conduct of research (Sieber & Stanley 1988). The ethical consideration aims to ensure that no harms to research participants would be caused in consequence of the research activities (Cooper & Schindler 2006).

In addressing the ethical consideration for this research, this study had to fulfil RMIT University's ethical code of practice in research. Since this research involved human subjects, it was subject to human research ethics policies. Written approval needs to be obtained by RMIT staff or students to conduct a

research when humans are involved as participants in the research.

For the higher than low risk research studies this is obtained from the Human Research Ethics Committee (HREC) or for low risk research studies from the College Human Ethics Advisory Network (CHEAN).

In complying with the human research ethics policies of the university, a formal approval was sought before carrying out the data collection phase. This was included in a formal ethics application providing a summary of the research scope, project aims, research methods and information about the participants involved in the research.

Before conducting any interviews, participants were requested to accept to take part in the research voluntarily through the approved Participants Information Consent Form (PICF) by the ethics committee. A copy of the approved PICF is enclosed in Appendix B.

During the whole process of the research the ethical standards of doing the research were strictly followed. This included providing assurance to all participants that they remained anonymous and their privacy was kept intact at all times during and after the research. Participants were assured that their involvement was voluntary, and that they were free to withdraw from the study at any time and to withdraw any unprocessed data previously supplied.

### **3.7. Summary**

This chapter presents the research methodology for this doctoral study. The chapter starts with an explanation of the research philosophy, paradigms and methods. The chapter then justifies the philosophical foundation of the research in terms of the ontological, epistemological, axiological and methodological positions taken in this research. The choice made with regards to research method is contended. The research stages, data collection procedure and analysis techniques are then presented in the research design section. The chapter continues with a detailed discussion of the trial study

conducted for this research and the impact of the trial study outcomes on the research question and sample population. In addition, the participant recruitment process is highlighted. The cardinal issues of validity and reliability of this research are addressed. Finally the ethical consideration for this study is discussed.

## **Chapter 4: Grounded Theory Discussion**

Chapter 3 comprehensively reviewed the research methodologies and justified the research strategies used for this research project. The aim of this chapter is to describe the Grounded Theory process that was undertaken in conducting this study.

The chapter starts by explaining Grounded Theory and the evolution of this qualitative research methodology and then provides an understanding of the adoption of Grounded Theory in the field of management research. This is followed by a discussion on the rationale for the use of a version of Grounded Theory for this study that is rooted in Strauss and Corbin (1990) interpretation and applicable in management study.

The next section provides an explanation of the development of the interview questions for this research study influenced by the Grounded Theory guidance and refined by the trial study described in the previous chapter. The last section discusses and presents the analysis process and coding procedure that predominantly follow the coding process as prescribed by Strauss and Corbin (1990).

### **4.1. Understanding Grounded theory**

Founded on the seminal book 'The Discovery of Grounded Theory', Grounded Theory was developed by two sociologists, Barney G. Glaser and Anselm L. Strauss in an attempt to redefine qualitative research principles towards a 'good science' in which the realities of qualitative research fit the complexity of social phenomena (Corbin & Strauss 1990).

Since 1967 when Grounded Theory was first introduced, the theory has undergone diverse and somewhat fractured variations. Sbaraini et al. (2011) argue that Grounded Theory now exists in four main types with a fifth emerging. They explain that type one is the work of Barney G. Glaser and Anselm L. Strauss (1967). Type two is the later work of Anselm L. Strauss and Juliet Corbin (1990). Type three and four are proposed by Kathy Charmaz (2014) and Adele Clarke

(2005) who were both students of Anselm Strauss. The fifth emerging variation is 'dimensional analysis' developed by Schatzman (1991), a colleague of Strauss and Glaser in the 1960s (Sbaraini et al. 2011). Therefore, in order to make a sensible decision on what approach to adopt, it is essential to understand the different types of Grounded Theory.

Type one and two of Grounded Theory, referring to the Glaserian and Straussian respectively, share the same philosophical stance that the theory should emerge by itself from data. The difference between Glaser's version and Strauss's version lies in beliefs about and approaches to analysis. Heath and Cowley (2004) point out that the main source of divergence between the Glaserian and Straussian approach is methodological rather than ontological or epistemological.

The core of the conflict between Glaser and Strauss is whether verification should be an outcome of grounded theory analysis or not (Heath & Cowley 2004). Strauss's version emphasises that induction, deduction and verification are absolutely essential (Strauss & Corbin 1990), while Glaser asserts that Grounded Theory is inductive only (Glaser 1992). He criticises the Straussian approach as being no longer a Grounded Theory but 'full conceptual description' and 'forcing data' (Glaser 1992, p.122).

Influenced by this ideological split, the Straussian approach accepts that one must form the hypothesis prior the commencement of the research, whereas Glaser argues that the research problem should be dealt with minimally or with almost no prior conceptualisation or constructs in the researcher's mind (Locke 2001). This represents a polemical and divisive issue of the use of existing literature relevant to the research topic. The original Glaserian approach explicitly advises against conducting a literature review at the early stage of the research process claiming that the extant theoretical frameworks and associated hypotheses inhibit the natural emergence of categories from the empirical data during analysis (Dunne 2011). Furthermore, from a more pragmatic perspective, Glaser (1998) argues that the literature most relevant to the emerging theory may not actually be known at the outset due to the



unpredictable nature of Grounded Theory. Conducting an extensive literature review in a specific substantive area requires time and effort which may be eventually wasteful and inefficient (Dick 2007; Glaser 1998; Locke 2001).

However, it is noteworthy that Glaser and other purists do not deny the importance of conducting a literature review in the substantive area of study but 'the fundamental issue relates to when, and not if, engagement with extant knowledge should occur' (Dunne 2011, p.115). They acknowledge the essential role of extant literature in later stages of study when the course of the research unfolds and the theory is sufficiently developed (Heath & Cowley 2004). Stern (2007) emphasises that it is essential the researchers conduct a literature review within the emergent grounded theory in order to demonstrate how the study builds on and contributes to extant knowledge within the field.

The Glaserian's argument against conducting a literature review in the substantive area of the research at the early stage of Grounded Theory is questioned by many authors who believe conducting an early literature review before commencing data collection and analysis is compelling (Dunne 2011; McCann & Clark 2004; McGhee, Marland & Atkinson 2007; Strauss & Corbin 1990). It is argued that any researcher who undertakes a study has some level of prior knowledge or ideas hence the argument that reviewing literature may contaminate the research by imposing assumptions and preconceptions is not valid. Cutcliffe (2000) points out that 'no potential researcher is an empty vessel, a person with no history or background' (p.1480).

Having acknowledged the distinctive differences between the Glaserian and Straussian approaches, Hunter et al. (2005) argue that adopting either approach depends on the nature of the research problem and the particular style of the researcher. Glaser and Strauss (1967) in their original statement of the method also invited their readers to use grounded theory strategies flexibly in their own way.

The third type of Grounded Theory, developed by Kathy Charmaz, is a move away from the both Glaser's and Strauss's positivist philosophical tradition towards a constructivist mode of Grounded Theory. Being faithful to most of the

characteristics of the original concept, Charmaz adopts a more subjective and reflexive stance. The outcome of a constructivist grounded theory is presented as a narrative including categories, but not as a theory (Charmaz 2014).

Adele Clarke proposes the fourth type of Grounded Theory by including assumptions of feminism and post-structuralism to create a fusion (Clarke 2005). Her version of Grounded Theory presents a situational analysis, and Schatzman's dimensional analysis, similar to Grounded Theory, is designed to generate theory directly from data by the constant comparison analysis technique. However, Schatzman includes the element of perspectives in the analysis process in an attempt to generate a theory with deeper understanding of the phenomena (Schatzman 1991).

## **4.2. Grounded Theory in Management Research**

Application of any precisely delineated and prescribed grounded theory in the field of organisation and management research has been reported difficult and bewildering by some authors (Bryman 2003; Goulding 2002; Locke 2001). It is possible that the nature of organisational and management research – standing outside of the established norm of positivism – requires a more formal, step-by-step procedure for generating theory from data rather than producing results by trusting in a highly uncertain creative process inherent in the pure grounded theory (Partington 2000).

In addition, while Strauss and Corbin (1990) aimed to provide a universal process to fulfil qualitative researchers' requirements in all social science disciplines, the importance of considering the research context and data sources is emphasised (Orton 1997) when conducting grounded theory and thus the amenability of classic grounded theory has caused the procedure to become over-complicated (Partington 2000).

In response to the challenges in applying grounded theory to the context of organisation and management research, several attempts have been made by theorists to produce remodelled versions of grounded theory in an effort to simplify the method and make it applicable to organisational and management

studies (Fendt & Sachs 2008; Goulding 2002; Jones & Noble 2007; Locke 2001).

Subsequently, a number of erosions of grounded theories through the qualitative embrace have been created to address the organisational and management research inquiries with their own philosophical stances and methodological procedure. For instance, Partington (2002) entails the development of research questions and a theoretical perspective through preconception and forcing the research into the areas that researcher is concerned with instead of waiting for the real concerns of the research participants that might emerge. He also preselects and forces specific theoretical codes on the data rather than relying on the theoretical codes emerging from the data (Holton 2008).

This migration from the original tenets of classic Grounded Theory implies the embrace of this methodology by researchers in diverse social science and professional substantive disciplines while nestling it within a qualitative paradigm in order to accommodate their research requirements. Locke (2001) supports this point of view and invites researchers to proclaim a theoretical perspective of Grounded Theory to orient their own study.

### **4.3. Selecting Grounded Theory for This Research**

Having expounded how the evolution of the Grounded Theory led to creation of several interpretations regarding how Grounded Theory studies should be conducted, this study specifically follows the original tenets of the Straussian interpretation of Grounded Theory, as reflected in the work of Strauss and Corbin (1990).

The justification of this selection is provided below:

- From an empirical perspective, PhD ethical approvals, confirmation of candidacy and progression through the research process require a detailed literature review before commencement of primary data collection. Lack of literature review in the substantive area of the research embedded in the Glaserian approach would cause difficulty to fulfil these requirements. Several authors including Glaser himself also acknowledge

this issue and question the practicality of this approach (Dunne 2011; Glaser 1998; McGhee, Marland & Atkinson 2007).

- Glaser advocates the need for constant reading in 'other substantive areas' while undertaking the research. However, without prior knowledge of the field, the boundaries of the substantive and non-substantive areas are vague (Dunne 2011).
- Without reviewing literature in the substantive area, the right choice of methodology and the rationale for the study is not compelling (McGhee, Marland & Atkinson 2007).
- Conducting a literature review can inform the researcher whether or not a similar study has been undertaken before. Coffey and Atkinson (1996) point out this issue as it is '...not very clever to rediscover the wheel, and the student or researcher who is ignorant of the relevant literature is always in danger of doing the equivalent' (p.157).

The work of Strauss and Corbin (1990) is used as the main guide for this study's approach. The researcher tries to adhere as closely as possible to the principles incorporated in Grounded Theory. Techniques and procedures for developing Grounded Theory for this study predominantly follow what Corbin and Strauss (1998) described, however, since this study focuses on the process of the selection and management of ECI, the theory required by this study may deviate from the classic grounded theory principles into a process-driven theory in an effort to match the research purposes. Partington (2000) validates the diversion in the qualitative process, as '... there is almost limitless scope for further development of ideas about how qualitative research procedure may be developed and matched to specific purpose' (p.110).

Thereby where there is an inquiry for further clarification on an approach, additional resources are augmented and referenced (for example Corbin & Strauss 1990; Glaser 1992, 1998; Glaser & Strauss 1967; Goulding 2002; Heath & Cowley 2004; Locke 2001; Partington 2000, 2002).

#### **4.4. Interview Questions Development**

In developing interview questions for this study, the initial questions were based on concepts derived from the conducted literature review and the trial study undertaken during the development of the research questions. According to Corbin and Strauss (1998), it is not usually easy for researchers to begin gathering data without some conception of what it is that they are going to study.

This study seeks to understand the circumstances when an ECI is adopted by clients and to find the link between the selection of ECI and development of the project management strategies for risk management, communication management and relationship management.

The major concepts derived from the literature review led to the formation of seven topics structuring the interview questions. These topics are *Concept of ECI, Selection of ECI, client's competence, Performance of ECI, innovation, constructability and possible improvement*. In addition to dividing the interview questions into these seven distinctive sections, connecting questions were also developed to integrate sections in order to find links between the emerging categories essential for generating a theory.

Development of the interview questions for this research along with the elements that influenced forming the questions is demonstrated in Appendix C.

During the interviews, questions were asked in a random order depending on the situation and ongoing discussion. Some questions also were paraphrased or rephrased wherever the respondents seemed not to understand the question properly. Every effort was made to let the participants speak as much as they could without intervention in order to give them room to answer in terms of what was important to them.

#### **4.5. Coding Procedure**

Analysis of this study predominantly follows the coding process incorporated in the Straussian interpretation of Grounded Theory. The analysis process is

associated with the microanalysis and consists of open, axial and selective coding. Microanalysis is a qualitative analysis that involves substantially different perspectives on data. It demonstrates that analysis is not a structured, static or rigid process, rather it is a free flowing and creative one letting the data speak for itself (Corbin & Strauss 1998).

The following sections discuss the approach this study adopted to analyse data including conducting the analysis procedure of open and axial coding, the process of selective coding, and formulation of the theoretical framework that emerged and evolved throughout conducting this study.

In order to facilitate the process of coding and analysis, the latest version of a qualitative analysis toolkit called QSR Nvivo 10 was utilised. Upon the receipt of confirmation from the respondents on the accuracy and plausibility of each interview, the transcription was imported in to the software for the analysis process including open, axial and selective coding.

**Open coding:** The coding process used throughout this research was broken down into a series of activities. Although the breaking down of an analytic process was an artificial task, it was essential in order for the researcher to understand the logic that lay behind the analysis.

The term 'open coding' refers to the process where the text is opened up to expose the thoughts, ideas and meanings contained in the documents in an attempt to uncover, name and develop concepts (Corbin & Strauss 1998). This is an iterative process of analysis consisting of reading and re-reading, and creating the extensive memos that leads to identifying, naming, exploring and describing the emerging concepts and categories. During open coding, the collected data were broken down to discrete parts and closely examined and compared to other parts to find similarities and differences (Corbin & Strauss 2014).

Each part was then given a name that represented or stood for its concept. The name was chosen either based on the perceived meaning or imagery of the researcher when examining the data comparatively or taken from the words of

respondents themselves, referred to as 'in vivo codes' (Glaser & Strauss 1967).

As the analytic process was proceeding any other new identified concepts were compared to the ones had been already labelled and if they would share some common characteristic, then the same label was assigned to that concept. In conducting this research, despite the fact that the development of the research questions was influenced by the review of literature undertaken at the beginning of the research, there was no deliberate effort to direct or force the information towards any set of pre-defined codes. Rather, all answers to questions were carefully reviewed and analysed to derive concepts from the responses and subsequently an appropriate label was assigned to the identified concept on which the open coding was based.

During open coding, many different categories were identified. Some of these pertained to a phenomenon while others referred to conditions, actions or interactions, or consequences. The labels placed on categories were carefully selected by the researcher to make this distinction as emphasised by Corbin and Strauss (1998). Table 4.1 provides an example of the approach adopted in open coding with memos developed during reviewing the data based upon the perceived meaning of what the respondent indicated in one of the conducted interviews.

**Axial coding:** Upon the identification of categories, they were assigned to their related sub-categories along the lines of their meanings to form more precise and complete explanations about phenomena. This process is termed axial coding because coding is undertaken around the axis of a category, linking categories in accordance with their core meanings (Corbin & Strauss 1998). Strauss (1987) identifies four basic steps associated with the axial coding including:

- Started during open coding, laying out the properties of a category and their dimensions.
- Identifying the variety of conditions, actions/interactions, and consequences associated with a phenomenon.
- Relating a category to its subcategories through statements denoting how

they are related to each other.

- Looking for cues in the data that denote how major categories might relate to each other.

**Table 4.1. An example of the analytic process of open coding**

Interview notes	Open codes	Memos
<p><b><i>Question:</i></b> What are the main characteristics of ECI? Under what circumstances should ECI be adopted for a project?</p> <p><b><i>Answer:</i></b> the main characteristics, or why you would do an ECI contract is when you have a project that you have a fairly good idea of what the scope is, what you want to achieve, you have reasonable understanding - or very good understanding, rather - of your constraints, particularly from your stakeholders, but there is still a lot of room for innovation in the Design and Construction stage. Even though you might have the scope reasonably well-defined, how to go about designing that road and constructing that road is pretty much up for grabs. That's when I would tend to use an Early Contractor Involvement project.</p>	<p>Required Knowledge-Awareness of scope</p> <p>Selecting ECI - Uncertainty</p> <p>Selecting ECI - Opportunity for innovation</p>	<p>Memo1: The client needs to have good understanding of the project scope and objectives to select an ECI project. The high level of uncertainty has to be in the nature of project not due to the lack of knowledge.</p> <p>Memo2: Even though the scope is well-defined, there should be still room for creative ideas of contractor in the design and construction stage of the project in order to benefit from the early contractor involvement.</p>



Interview notes	Open codes	Memos
<p><b><u>Question:</u> What is the process for selection of ECI?</b></p> <p><b><u>Answer:</u> we're looking at a whole range of characteristics; and then, by looking at that range of characteristics, we'll start doing some sort of multi-criteria assessment, if you have a risky project which lends itself to a lot of innovation, is clearly defined, we've got a fairly good idea what the stakeholders need and there's a good market which is available to do the works, then we'd likely choose an ECI. So, it just depends on the project and you would look at the characteristics. It's very much a subjective process, but you look at the characteristics, you use your experience based on your knowledge of how you delivered projects in the past and you say, on balance, on those issues, that would be the best way to deliver that project.</b></p>	<p>Selection process-multi – criteria assessment</p> <p>Selection process – subjective process</p> <p>Selection process – previous experience</p>	<p>Memo3: In selection of ECI all criteria are taken into account through a multi-criteria assessment. The selection is based on a trade-off between defined criteria and based on the whole range of characteristics.</p> <p>Memo4: The selection process largely relies on individual experience. This experience is mainly derived from the experience attained from previous projects as to how they were delivered in the past and whether or not they were successful.</p>

The analysis process for this study was guided predominantly by the above steps. During open coding, an overall sense of the data was perceived and the initial categories at dimensional levels were formed. The emerging connections between categories and subcategories were identified and validated through continued comparisons of data incident to incident in which to develop the axial coding structure. The axial and open coding proceeded naturally together until a

theoretical saturated point was reached for each category. Even though a category is considered saturated when no new information seems to emerge during the analysis, according to Corbin and Strauss (1998, p.136): ‘...this statement is a matter of degree. In reality, if one looked long and hard enough, one always would find additional properties or dimensions’. However, saturation is more a matter of reaching the point where any new emerging concepts just extend the scope of research rather than adding to the explanation.

In addition to identification of high-level categories that emerge from the data, lower-level open codes are identified under the overall categories, and then sorted and organised into meaningful sub-categories. For example under the ‘*Use of ECI*’ theme, the following codes represented the open codes that emerged under the overall category of ‘ECI Selection Criteria’:

- Uncertainty
- Risk
- Having formal contact
- Value for Money
- Opportunity for Innovation
- Constructability
- Size of project
- Culture of organisation
- Complexity
- Time frame
- Design variations
- Market situation
- Collaborative behaviour
- Stakeholders impact
- Political influences
- In-house resource availability
- Source of funding
- Design capability
- Local community influences

- Nature of contractor
- Regulation influences

The open codes were also grouped into meaningful sub-categories to provide an understanding of dimensions related to the identified higher-level category. This resulted in segregating codes into four sub-categories, namely Project Characteristics, Client's Objectives, External Environments, and Internal Environments. Table 4.2 demonstrates the open codes, related sub-categories and conceptual meaning of each category.

**Table 4.2. An example of the analytic process of axial coding**

<b>Sub-Category</b>	<b>Open Codes</b>	<b>Definition</b>
<b>Project Characteristics</b>	<ul style="list-style-type: none"> <li>- Uncertainty</li> <li>- Risk</li> <li>- Size of project</li> <li>- Complexity</li> <li>- Time</li> </ul>	Some projects can benefit from the ECI the most. These projects are to be recognised by evaluating certain criteria related to the characteristics pertaining to the nature of project.
<b>Client's Objectives</b>	<ul style="list-style-type: none"> <li>- Having formal contract</li> <li>- Constructability</li> <li>- Innovation</li> <li>- Value for Money</li> <li>- Collaborative behaviour</li> <li>- Design variations</li> </ul>	Needs and expectations of the clients are also a set of criteria that should be considered in the selection of ECI
<b>External Environments</b>	<ul style="list-style-type: none"> <li>- Nature of contractor</li> <li>- Market situations</li> <li>- Stakeholders impact</li> <li>- Political influences</li> <li>- Regulation influences</li> <li>- Local community influences</li> </ul>	There are some factors which are imposed by the environment outside of the project and the parties directly involved
<b>Internal Environments</b>	<ul style="list-style-type: none"> <li>- In-house resource availability</li> <li>- Source of funding</li> <li>- Design capability</li> <li>- Culture of organisation</li> </ul>	These criteria represent the limitations or opportunities that the client owns and can be seen as influencing factors in selection of ECI

**Selective coding:** Once the major categories have been identified, they were integrated to form a larger theoretical scheme that the research findings were able to convey what the research was about. Corbin and Strauss (1998) define the selective coding as the process of integrating and refining categories towards forming the theory.

Through a process of selective coding, two central themes were shaped: the process for selecting ECI and the cyclical process for managing ECI. A supporting category *prospect* was also identified that served to explain how clients opt for selecting an ECI whilst other procurement methods can also fulfil the procurement selection criteria. Identifying two central categories through selective coding is confirmed by Corbin and Strauss: 'Analysts sometimes identify what could be two central themes or ideas in the data' Corbin and Strauss (1998, p.147).

Strauss (1987) defines a list of criteria to determine whether the identified core category through a selective coding process qualifies:

- 1- It should be central and other categories are related to it.
- 2- It needs to appear frequently in the data.
- 3- It has to evolve and emerge from data with no forcing of data.
- 4- It should be sufficiently general to be applicable to other substantive research areas.
- 5- Integration of major categories with the refined core category leads to the theory expansion in depth and explanatory power.
- 6- The concept should be able to explain variations and the explanation should be valid even when conditions change.

The core process for selecting and managing ECI and the related supporting categories appeared to fulfil the criteria identified above. These models were developed after an intensive review of the data. Once the themes of ECI selection process and cyclical process of managing ECI appeared in the participants' description as to how they select and manage an ECI, they were developed as the central core category that could explain the diverse variations and exhibit explanatory power. After identification of the core categories,

supporting categories were integrated through the revisiting and re-reviewing the data. Detailed discussion of the selective coding, and the categories that emerged as being primarily influenced by the core category, is provided in the theory development chapter (Chapter 6) of this study.

### **Development of theory**

Two theoretical frameworks were developed as a result of employing Grounded Theory in this study. The first framework identifies the circumstances in which an ECI should be adopted as a project delivery system by clients and the second framework demonstrates a cyclical process consisting of a number of practices to manage the client-contractor relationship once the ECI is used. These theoretical frameworks were developed directly from the emerging concepts and categories from the data. Creswell (2012) points out that the development of theory in Grounded Theory approach should be drawn from the conducting research instead of generating a conceptual model prior to data collection that is typically practiced in many other research approaches. Despite the iterated description of themes by the participants, the development of frameworks progressed around central categories that formulated through considerable rounds of data analysis. Once each block of theory was developed, it was drawn on relative existing models to provide sufficient explanation in an effort to validate the construct. The validated blocks of theories that collectively formed the theoretical frameworks, ensure the validity of the models. The presentation of frameworks in forms of conceptual models were also guided by Creswell (2012). He suggests that the theory should be presented in a way that identifies the relationship among categories and identifies the conditions and consequences that affect the central phenomenon of the study.

### **4.6. Summary**

This chapter presents details on the use of Grounded Theory in this research. It starts by providing an overview of the Grounded Theory and its evolution since 1967 when it was initially originated by Barney G. Glaser and Anselm L. Strauss. A discussion about the different variations of Grounded Theory is then provided

including the introduction of a remodelled version of Grounded Theory applicable to organisational and management studies. Furthermore, the chapter justifies the choice made with relations to the type of Grounded Theory for this study.

Development of the interview questions is demonstrated in this chapter. It is explained that the questions were structured under seven major topics namely *Concept of ECI, Selection of ECI, client's competence, Performance of ECI, innovation, constructability and possible improvement*. These topics were formed as a result of the critical analysis of literature.

Finally, this chapter presents the analytical coding procedure that mainly follows the coding process incorporated in the Straussian interpretation of Grounded Theory. It is associated with a presentation of examples for *open coding, axial coding* and *selective coding* extracted from the research analysis process. In addition, it is described that how the emerged themes and categories led to generation of two theoretical frameworks for selecting an ECI as a delivery system for a project and managing client-contractor relationship in an ECI arrangement.

## **Chapter 5: Research Finding**

This chapter presents the findings from the Grounded Theory process of this research in forms of initial coding. Grounded theory used in this research involved interviewing fourteen professional practitioners in four Australian government client organisations and one Australian professional consultant organisation.

The chapter begins with the overview of the selection of the organisations and details about interviewed participants including their background and experience, and phenomena that is studied using grounded theory. This will be followed by a section that reports the initial findings of this research that were used for developing the theories.

### **5.1. Organisation selection and their backgrounds**

Before initiating the use of grounded theory approach, it is of paramount importance to carefully select the organisations including the numbers and their nature. The objective of this research focuses on the clients who are involved in an ECI scheme and aims to investigate how their decision making process led to the adoption of ECI.

Since ECI has been mainly adopted for the infrastructure projects in Australia, the departments of infrastructure of state's governments were selected as the targeted samples. Details of the projects completed by each department were available online. All the departments had utilised a type of ECI either as a delivery system or contracting model as well as other traditional procurement methods for their completed infrastructure projects in the past or under progress projects at the time of research. There are six states in Australia with their own state constitution dividing the state's government into the same divisions of legislature, executive, and judiciary as the federal government (Australian Government 2015). Four departments responded to the request and agreed to participate in the research project. In addition, one leading professional consultant organisation specialist in the establishment and

delivery of collaborative contracts for complex projects and programs was also selected to moderate the possibility of biased perception of the clients toward the use of RBP . The private professional consultant organisation was a leading advisor, facilitator and coach for the establishment and delivery of collaborative forms of procurement. An overview of each organisation is provided below.

#### **5.1.1. Overview of Organisation 1**

Organisation 1 is one of the departments in the Queensland's Government responsible for planning, managing and delivering Queensland's integrated transport environment to achieve sustainable transport solutions for road, rail, air and sea. Funding to meet departmental operational requirements is received from the Queensland Government, own sourced revenue and from allocations from the Australian Government.

In 2013-2014, the department administered an operating budget of \$5.458 billion and a capital budget of \$4.369 billion on national and state transport networks and capital works to replace and repair roads destroyed by adverse weather. Organisation 1 is the pioneer in using ECI in Australia and delivered several road and rail projects under a type of ECI.

#### **5.1.2. Overview of Organisation 2**

Organisation 2 is one of the departments in the government of South Australia. The department is in charge of delivering planning policies, transport and social and economic infrastructure. The department consists of seven groups and divisions:

- **Building Management:** provides advisory and management services in the construction and refurbishment of private and government employee housing and road, rail and marine property to other government agencies and the departments.
- **Corporate and Strategic Services group:** deals with governance and communication services to support the delivery of agency projects, initiatives and programs.
- **Infrastructure division:** is in charge of the developing strategic



infrastructure and coordinating infrastructure planning for the State and Commonwealth governments. It also oversees the provision of services for land administration and property transactions in South Australia.

- Office for Recreation and Sport: is responsible for the provision of strategic policy, programs, services and sporting infrastructure. It also provides strategic policy advice to the Minister for Racing on matters relating to the South Australian Racing industry.
- Public Transport Services: has responsibility for operating and regulating the state's public transport network, including bus, train and tram services as well as taxi industry.
- Planning division: delivers planning and development within the state, overseeing the assessment of the state's major developments and the implementation of the development plan in South Australia.
- Transport Services is responsible for the regulation of transport behaviour, development and implementation of road safety programs, administration of motor vehicle registration and driver licensing legislation, managing and improving road and marine infrastructure and road traffic control.

### **5.1.3. Overview of Organisation 3**

Integrating three key transport agencies in the Western Australian state government, Organisation 3 was established in 2010 as one of the largest geographically spread road agencies in the world responsible for an area of more than 2.8 million square kilometres and managing assets valued at over \$43 billion which represent almost 30% of the state's total assets. The agency supports the needs of all road users across the state by working closely with its portfolio partners and local governments in planning, building and maintaining the road transport network.

### **5.1.4. Overview of Organisation 4**

Organisation 4 is a statutory corporation in Victoria, Australia responsible for managing, planning and delivering Victoria's train, tram and bus services. The

organisation was established in late 2011 as a single coordinating statutory authority to be responsible and accountable for the public transport system in Victoria. The authority commenced operations on 2 April 2012 in order to enhance the performance of the system and contribute to the economic and social development of the state. In order to meet the organisation's legislative objectives, a number of core functions were executed. These functions include

- 1- managing the public transport network in a way that the highest levels of safety and service delivery is ensured;
- 2- acting as the public face of the public transport network and as an advocate for public transport users;
- 3- managing ongoing improvements to the network through new rolling stock procurement and infrastructure delivery;
- 4- planning for the public transport needs of future generations and;
- 5- ensuring that public funds are spent prudently and efficiently.

#### **5.1.5. Overview of Organisation 5**

Organisation 5 is a private professional consultant company that provides strategic commercial advice, education and facilitation in all aspects of Alliancing and collaborative contracting. The company has a very high success rate in helping proponent teams secure selection and preparing them to be partners in collaborative contracts as well as developing human capital and navigating complex team and organisational dynamics to drive and develop individual, team and organisational performance. Their services address a wide variety of client needs, specifically using a partnering approach to work with their clients to create high performance. These services cover the areas of Organisational Change and Development, Project Management, Business Optimisation and Human Factors Safety.

## **5.2. Participants**

Grounded theory requires as many people to interview as to achieve theoretical saturation where no new data results from additional data collection; this is the point of saturation: 'One keeps on collecting data until one receives only already

known statements' (Hjørland & Seldén 2005,P.124). Hence, the research design involved interviewing professional practitioners at the senior management level who have been involved in ECI projects and played significant roles in the project process and thus have the potential to provide high quality data with deep insights from different angles into the research problem being explored.

All respondents were interviewed by telephone since the research did not require any nonverbal data and information. Although used less often than face-to-face interviews in qualitative research (Opdenakker 2006), telephone interviews are a methodologically valuable data collection technique in qualitative research (Novick 2008), especially when the interview schedule is formal or semi-structured (Berg, Lune & Lune 2004). Sweet (2002) argues that researchers should not rely exclusively on the face-to-face interview for qualitative research, as the telephone interview can be an equally valuable data collection approach. Hagan (2006) asserts that telephone interviews are a useful way for the researcher to monitor ongoing interviews easily to assure quality and to avoid interviewer bias. Some authors also find telephone interviews effective for conducting interviews with interviewees who are hard to locate (Champion 2006; Hagan 2006).

The research conducted the following interviews: six individual telephone interviews with respondents within Organisation 1; four individual telephone interviews with respondents within Organisation 2; one individual telephone interview with respondents within Organisation 3; one individual telephone interview with respondents within Organisation 4; and two individual telephone interviews with respondents within Organisation 5. Table 5.1-5.5 provide the interview participants' details within Organisations 1 to 5 respectively.

**Table 5.1. Interviewed participants' details within Organisation 1**

Participants Reference #	Role	Notes and Comments
P#1 [SD]	Director of Programs and Specialist Delivery at the State Program Office – Program Delivery And Operations	Participant has been involved in delivery of projects, mainly transport industry, for about 30 years. This has included policy, planning, detailed planning, project development, bid-design and detailed-design through to construction of all disciplines and all different phases and stages of projects.
P#2 [AU]	Director of Program Services at the State Program Office – Program Delivery and Operations – Infrastructure Management and Delivery Division	Participant has been working for over 25 years including delivering marine projects and major road projects as a project manager for over 10 years. They have responsibilities and liability in selection of procurement programs including Alliances and ECI.
P#3 [SHL]	Assistant Director (Project Review & Procurement) in Infrastructure Management and Delivery at the State Program Office	Participant has worked in construction for over 30 years – from superintendence roles to systems development and now specialising in procurement methodologies for major infrastructure projects anywhere in the range from \$50 million to \$1 billion plus, which encompasses road, rail, and other. They have delivered nine ECI projects over the last 5 years.
P#4 [DK]	Construction Team Leader at Delivery and Operations	Participant has worked for the department for more than twenty years and mostly performed a consulting role with designers and contract administrators. They have spent a bit of time administering contracts for the department in a normal hard dollar environment initially as the department's contract arm and then moving to the client side. They have experience working on ECI projects as well as projects predominantly with an alliance

Participants Reference #	Role	Notes and Comments
		flavour but also hard dollar with an overarching relationship type model.
P#5 [PA]	Principal Engineer (Civil) at North District Office in Program Delivery and Operations Branch of the Department	Participant has been working over 40 years mainly in road construction looking after contracts and building major infrastructure as a consulting engineer. Initially the participant was working on behalf of local authorities building their infrastructure, mainly their roads. Then being employed by local government authorities, they have been involved in repair and maintenance works.
P#6 [ST]	General Manager (Project Review and Procurement) at Program Delivery And Operations	Participant has been working for more than 20 years in traffic and transportation only. They have not gone outside these areas since they joined the department. Involvement of the participant in ECI or procurement on infrastructure projects was mostly related to transportation. Participant has worked on detailed design or concept design, to its finalisation of the project and has been involved in different parts of contractor involvement.

**Table 5.2. Interviewed participants' details within Organisation 2**

Participants Reference #	Role	Notes and Comments
P#7 [RE]	Manager Contracting Services	Participant has been working in the department for 33 years and has worked for various Design & Construct sections. For the last ten to 12 years they have been managing contracting services and been responsible for the tendering and contracting processes in the department.
P#8	Senior Contract	Participant has been working for 16

[PN]	Manager of Rail at Public Transport Services	years in civil engineering and performed as a contract manager within the department. They have experience with roads, highways, railways, upgrades to stations, signals and communications engineering, bridges, etc. Participant had a lot of contracts across a fairly diverse range of projects and worked on a number of ECI projects in South Australia.
P#9 [PB]	Project Director of Rail Revitalisation Program	Participant has worked in the major capital projects delivery area for about the last six years and been involved in a multi-billion dollar project to revitalise the metro or suburban rail network in South Australia. Their role has been to champion and lead all of the tracking infrastructure programs. They have been involved in getting ECI contracts on board and breaking the work up into various work packages, and then managing those works delivered on the ground.
P#10 [DH]	Manager Network Safeguard and Development	Participant started in construction 30 years ago and performed various roles within different organisations in the construction industry including working for a private company for about ten years, then moving over to the department about 20 years ago. They have been heavily involved in contract management as well as project management and have also undertaken some policy works. Participant was responsible for two ECI contracts in South Australia.

**Table 5.3. Interviewed participants' details within Organisation 3**

Participants Reference #	Role	Notes and Comments
P#11 [MH]	Project Director at the Infrastructure Delivery Directorate	Participant has worked for the department for about 20 years and been involved in a number of major road works contracts including Alliance-type contracts and an ECI contract. They have also been engaged in some planning Alliances and a fairly large Alliance in Western Australia and had experience in a variety of different Alliance models – from pure Alliances right through to competitive models. Participant has been in the construction industry long enough to see the benefits and the disadvantages in all the different types of relationship-type contracts that were utilised in the projects they were involved in Western Australia.

**Table 5.4. Interviewed participants' details within Organisation 4**

Participants Reference #	Role	Notes and Comments
P#12 [MV]	Project Manager for the department's projects	Participant started his career for an environmental contractor and after two years moved into civil construction working for a small civil contractor. After three years they moved to a large contractor and has been working there for about ten years. Participant was then seconded across to the department. They have a valuable view and different perspectives on the ECI selection and its effect on the managing strategy practices as they have been on both the contractor's and client's sides. However, they have been involved only in the delivery phase of projects.

**Table 5.5. Interviewed participants' details within Organisation 5**

Participants Reference #	Role	Notes and Comments
P#13 [JR]	Founder of the organisation and Specialist Consultant	Participant was the founder of the organisation and started their career working in a local government in the UK for a couple of years. They spent five years in Canada working in a structural design office and in specialty materials engineering. Participant has spent about 14 years working for various contractors in Australia as Project Engineer, Project Manager, Senior Project Manager and State Manager. They moved into consulting work specialising in construction claims and procurement areas where they became more involved in developing relationship-based strategies to avoid construction disputation. For the next ten years after that they focused on Alliancing and were involved as the primary advisor on about 70 project alliances and program alliances around the world. Participant has also been involved in other fields of relationship-based contracts.
P#14 [JD]	Senior Consultant and Partner	Participant has worked and been in management consulting for 30 years, in the last 15 years they have been involved exclusively with complicated contracts and with a range of employers including Organisation 5 focusing on helping the parties strike and execute a central agreement where both the commercial arrangements support the intention of the contract. They have also consulted on the human aspects of the relationship-based strategies to be appropriately established and in line to support the client's objectives.



### 5.3. Findings

The preliminary analysis of the interviews led to forming a number of initial categories in five main themes based on participants' statements. These categories served to encapsulate the new codes and the emerging categories, which provided the framework that guided the continual analytic process until the attainment of theoretical saturation. The robust extensive content analysis of data generated over 300 fine-grained codes, which are enclosed in Appendix D. The discussion of the core themes, categories and codes under each main theme that emerged during the preliminary analysis is structured as below:

Firstly, the **ECI realisation** is presented in section 5.3.1 secondly; the **ECI selection** is discussed in section 5.3.2 thirdly, the **ECI preparation** is presented in section 5.3.3. This is followed by section 5.3.4 which discusses the **Expectations of ECI**. Finally, the **Managing strategies** are presented in section 5.5.6. The section concludes by summarising the key findings of the Grounded Theory initial analysis and the implications for further theory development.

#### 5.3.1. ECI realisation

The main theme of 'ECI realisation' encompasses the dimensions of the fundamental concept of ECI and the knowledge of the term amongst the participants as well as identification of other aspects that are essential to understand the core characteristics of ECI. Four categories were identified that constitute the 'ECI realisation' including

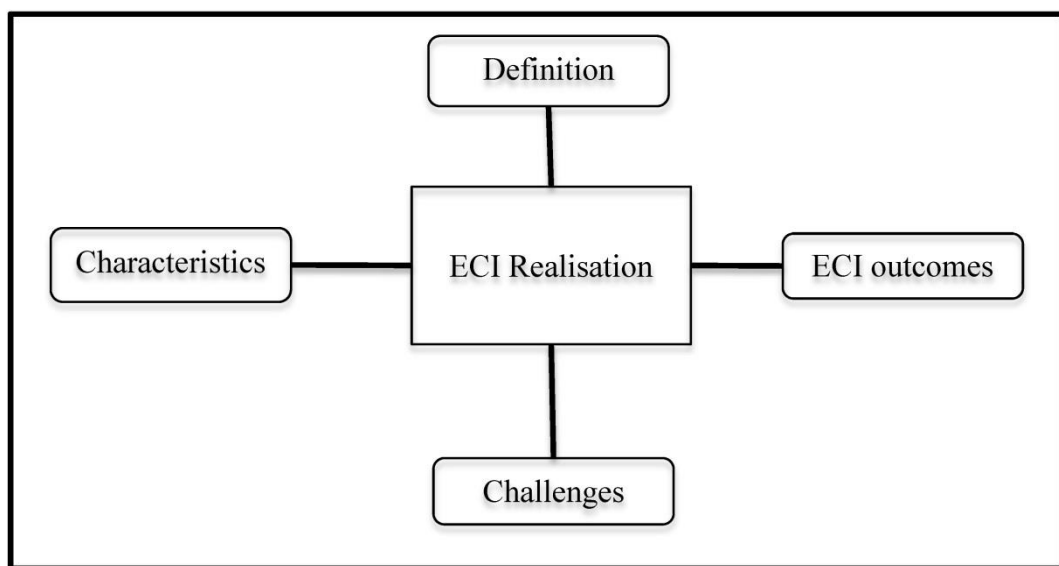
- Definition of ECI
- ECI Characteristics
- Challenges in implementing ECI
- ECI outcomes

The overall structure of the four categories that emerged under the 'ECI realisation' theme is illustrated in figure 5.1.

#### *Definition of ECI*

The majority of the respondents recognised the ambiguity in the definition of ECI and their responses indicated that the term is used to address a

procurement method by some people whereas it is used to refer to a contract form by some others. Some participants precisely acknowledged the confusion in the adoption of the term in the industry. For example P#13 pointed out that *'I find that the use of the term ECI can be quite confusing, that different people have different perceptions of it'*, or P#14 explained that *'If you say ECI to me, it might mean one thing, and if you say it to somebody else, they would take the meaning to be something else'*.



**Figure 5.1. The categories emerged under 'ECI realisation'**

Some participants recognised the variation in the use of ECI depending on the nature of the organisation and the scope of the project, and hence no standard definition of ECI can be provided. P#14 stated that *'ECI is a very broad church, and it means different things to different people. I think, unlike many other forms of contracts or many other forms of procurement process, there is no single method that is completely regarded, or universally regarded, as the ECI approach'*, and P#9 pointed out that *'ECIs can be used, obviously, differently, depending on the organisation, depending on what the scope of work is'*.

Some participants understood ECI as 'a concept' in which the contractor is

involved at the early stage of the project to work with the client and designer to develop the design and planning, whereas the majority of participants identified ECI as 'a contractual framework' with a specific structured process. However all participants indicated that ECI runs on relationship-based principles.

Those who realised the ECI as a concept stated that the concept of ECI is embedded in many types of relational contracts used to deliver a project. *'The Early Contractor Involvement is really getting the contractor involved in the design and development of the project early up... The ECI part is how early you get the contractor involved in developing the project. Each of different contract forms can have the contractor involved in the early development'* (P#1).

ECI for two of the participants is perceived as a variation of the Alliancing type of contract where the sources of the client join the contractor's team for the project design and planning developments and then client launches into a Design and Construct (D&C) phase. *'In terms of actually the delivery of the project and construction part of it, it's an alliance method in the sense that the sources from the [Organisation 1] would be embedded into the contractor's team, who would constantly assist them as much as they can in terms of site inspections, site reviews, getting the things in proper order'* (P#6). *'The model we used for Early Contractor Involvement here is that the first part of it is very similar to an Alliance – where we form a team, and we scope up a project together. Then we develop a price together. And then, if we agree on the price, then the ECI phase finishes. We then launch into a D&C contract for the next phase'* (P#11).

One participant also recognised ECI as an extension of Alliance in which the principles are very similar and hence the management methods for both systems are the same. *'I think [ECI] is very much similar to an Alliance...We're very much thinking of the Alliance being an extension of an ECI and not looking at changing things dramatically or changing the thinking a lot from what we've been doing with the ECIs apart from a different back end, because there's no D&C but largely [we are] looking at what we've been doing with ECI and then extending that to an Alliance framework'* (P#8).

Nonetheless, one participant indicated that although alliancing is less price

focused, extra team building workshops are required at the beginning of the project to bring the culture of all parties into one. However, ECI as a contractual framework was practiced differently depending on the organisation in which it was adopted.

All participants in Organisation 2 discussed the same structure of the ECI contract as being practiced in their organisation. *'It's a two-stage process, where there's a collaborative first stage with the company to progress the design and develop the project and then, the second stage is a hard-dollar, Lump Sum contract; so, in the way we've done it, it's been in a different route to conventional tendering to get to a hard-dollar contract'* (P#9).

Other participants provided a different structure of the ECI contract even though they were in the same organisation. Some other standard forms of ECI practiced under 'Collaboration Project Agreement' (CPA) were also identified by some participants including 'Early Tender Involvement', 'Double ECI', 'Umbrella ECI' and 'Maintenance ECI'. Interestingly, both participants in Organisation 5 acknowledged that ECI is adopted by the industry as both the concept and contractual framework.

### ***Characteristics of ECI***

The 'ECI characteristics' code reflects the core properties of ECI that distinguish it from other forms of procurement methods. Characteristics identified by the participants were grouped into two main sub-categories of 'Contractual structure' and 'Relationship-related characteristics'.

The contractual structure codes address the governing structure of ECI process described by participants with their organisations. 'Risk transfer regime' was identified as one of the distinctive contractual characteristics of ECI. *'The whole model of the ECI is based on risk and what differentiates ECI from Alliance is the risk transfer. So you'll know from Alliancing, there is a thing known as shared risk, in an ECI, it's not shared risk. It's either the contractor's risk, or the client's risk. It's very clear as to which one it is. There's no sharing and caring in an ECI'* (P#14).

Participants described the 'compensation mechanism' associated with the ECI process as a 'cost reimbursement' mechanism for the first stage to 'develop a preliminary design' and a 'maximum guaranteed lump sum' mechanism for the delivery stage.

The unique characteristic of ECI was defined as the 'transitional process' of the contract from a collaborative environment to a hard-dollar transactional environment. Participants had different opinions towards the transitional process associated with the ECI contract. Some participants stated that the essence of collaboration generated during the first phase remained in the second phase – *'We tried to create the ECI environment for the delivery of the D&C also'* (P#9) – even though the contractual environment changed to the hard-dollar type of contract. *'The fact that the risk is transferred in the delivery phase, does not necessarily mean that it's going to be adversarial. Particularly with the benefits of the open-book phase upfront and the careful management of the relationship, then there's no reason why that delivery phase should not be highly collaborative, even though closed-book; and the risk being transferred to the constructor, doesn't preclude this from being highly collaborative and with virtually no adversarial conduct'* (P#13).

On the other hand, some participants recognised the transitional process as the Achilles' heel of ECI contract when the process is modified from the soft to the hard 'competitive environment'. *'I think the danger with that, also, is that because we went into a D&C afterwards, whilst we said we want to work together as a team, part of that sort of disappeared when it came into the D&C phase'* (P#10). One participant identified the transitional process as an 'avenue to escape' in which *'If things aren't going as they should be, then you can start fresh, after the design period'* (P#12).

In defining 'relationship-related characteristics', the majority of participants identified that they had high level of interaction with stakeholders and were actively involved in the design process. *'The most notable characteristic is an active involvement by the client in the design process'* (P#3). *'You have the client involved; you have some stakeholders which are the community people, who can*

*be involved in it' (P#6).*

The effective 'information sharing' between contractor, designer and the client was also identified as a noticeable characteristic in the ECI phase. Even though the final decisions are ultimately made by the client, exchanging enough and rigorous information in the ECI phase helps the client to make informed and educated decisions.

### ***Challenges in implementing ECI***

Participants' discussion of 'challenges in implementing ECI' addressed a wide range of factors that clients encounter in implementing an effective ECI process. These factors were related to two main groups of 'business-related challenges' and 'relationship-related challenges' which were discussed in detail by virtually all participants.

The factors identified under the 'business-related challenges' sub-category describe those challenges that reflected the technical aspects of the process. The majority of participants identified 'demonstrating value for money' to the government as being one of the challenges they had in implementing the ECI process.

Although the hard-dollar stage of the model gives the client the ability to justify obtaining value for money to the government to some extent, a perception that ECI is a softer form of contract raises treasury's concerns with respect to the value for money. *'Our challenge was to insure that [it] was a value for money outcome, that it was going to give us what we expected in terms of scope, and then once we agreed on price, we had to go to the Cabinet to get approval to award the contract' (P#9).*

Some participants identified 'unfamiliarity' of the client with the process as being a barrier in implementing ECI. *'From having gone through the process I think one of the challenges is from a client's side because they're quite unique projects and they're rarely used' (P#4).*

One participant indicated that they had fairly good understanding of the

traditional contracts such as D&C or Construction only as well as highly collaborative approaches such as Alliancing but unfamiliarity with the ECI process caused them to use the approach as a trial.

Participants indicated that the 'remuneration' mechanism in the ECI contract for the first stage did not cover the actual costs of design and tendering to the contractor and this was seen as one of the challenges in 'motivating contractors' to get engaged in an ECI process.

One participant identified unrealistic 'political time-frame' as being a significant impediment for them in doing planning and concept design essential for understanding the project. Two participants described that misunderstanding of key strategic decisions, lack of the confidence and knowledge in the delivery team essential for running and facilitating the ECI process as a result of 'lack of adequately trained resources', were the challenges they encountered.

In describing 'relationship-related challenges', the majority of participants indicated that 'change in relationship protocol' was one of their challenges in transitioning from early stage of collaborating and open-book into an environment where it is more traditional. *'One of the risks that people don't appreciate is that [there] has been moving to the delivery phase and the risk has been transferred, is that what might have been appropriate behaviours and communication protocol in the early stage are no longer appropriate'* (P#13).

'Cultural barriers' were identified as another challenge by participants where the traditional hard dollar mentality was being brought to the ECI front-end by contractors or the clients. *'[For] people who grew up in an environment that is adversarial or always has been adversarial, they find it difficult to transition into more of a relationship type of environment, being upfront'* (P#4). One participant described the teamwork between parties as dysfunctional due to challenges in 'empowering' the team in decision-making. *'Typically we get the lower order people on site making decisions and when those decisions start to get over ridden by people at top for whatever reason that's when we start to have troubles'* (P#4).

'Level of contribution' from the designer and encouraging them to put enough

time and effort into working with the contractor, was also identified as one of the challenges that one participant faced. Two participants pointed out that 'misusing the relationship' by the contractor in an attempt to avoid contractual commitments and obligations negatively affected the working relationship between the client and contractor.

Finally, one participant asserted that the biggest barrier to ECIs is a strong leadership on the client side and strong leadership on the contractor's side in which an 'imbalanced leadership' between the two sides means that one side dominates the leadership.

### ***ECI outcomes***

The category of 'ECI outcomes' reflects the participants' perspectives about the project outcomes where an ECI contract had been employed for a project they were involved in. Since participants were not directly asked about the project outcomes as a result of ECI, only two participants' responses in their discussions directly addressed this aspect. The majority of other participants' responses indirectly addressed this to the project outcomes. However, the depth of discussions was enough to have 'ECI outcomes' emerged as a sub-category.

One participant exhibited overall 'dissatisfaction towards ECI' outcomes, indicating *'a couple of ECI have not gone as well as we would have liked. But there is a myriad of reasons as to what happened. It wasn't simply because it was an ECI; it was a number of other factors, including the people involved, or the nature of the project, which is another complicating factor. We had another [project]... which is a major intersection in [name of the city]. It went ok, no real problems with it but the critical question mark was that, perhaps we could have gotten a keener price if we had just gone into a competitive tender [and another example] there's one train-line extension, which has turned out to be quite expensive'* (P#7).

On the other hand, another participant reported 'successful outcomes' of the project when ECI was adopted as the delivery system while providing more details about the project. For Instance, *'[a] motorway project, which was a ... million dollar project, we put it out as an ECI. We had two design and construct*



*ECI proponents and both of them came up with very different scenarios to our reference design. Both of their designs were better as opposed to our reference design and cheaper, so then the process was really good in constructability, and the innovation was just fantastic' (P#1).*

A number of participants indicated that they set up 'financial incentives' as the reward for outstanding outcomes during the design and development phase but *'through the D&C, there was no financial award for early finish. The carrot for the D&C component of the ECI was that if the contractor did a good job, delivered it for the lump-sum price they put in as part of the D&C, [eventuation of] any variations in [accordance with the] right and conditions that we come across through delivery, then they were well-positioned to position themselves to "get the next D&C contract" as a result of an ECI phase' (P#9).*

Influenced by the project outcomes, some participants posited that they are 'unlikely to use ECI' in the future very much as before and it has to be very special circumstances for the specific projects. This statement, however, does not imply a reluctance to use ECI in the future but instead, suggests that the industry is learning the lessons from the previous projects and growing to maturity in adoption of ECI ensuring that it is utilised in the right circumstances.

### **5.3.2. ECI selection**

'ECI selection' establishes the process by which a client makes a decision to utilise an ECI for a project and factors that influence this decision. Two main categories associated with the 'ECI selection' theme were identified in interviews including:

- Selection criteria
- Selection approach

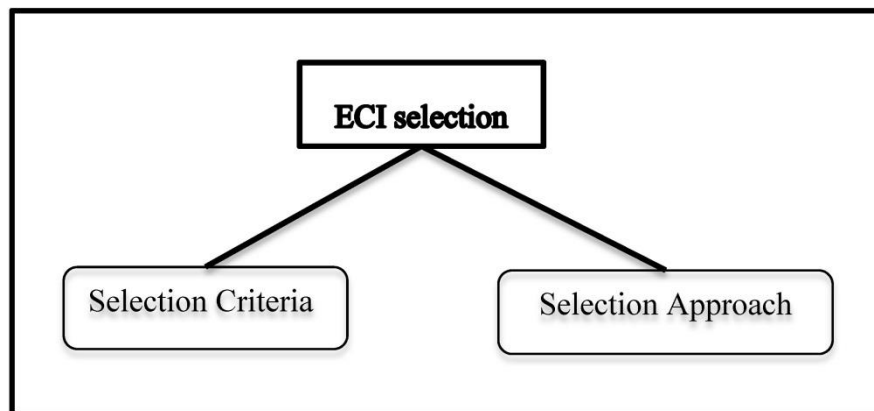
The overall structure of two categories identified under 'ECI selection' theme is illustrated in the figure 5.2.

#### ***Selection criteria***

The code of 'selection criteria' identifies the circumstances that clients consider

the use of ECI model over other contractual methods.

Thirteen participants identified a degree of ‘uncertainty’ in the project scope, time and budget as being the main factor they were considering in selecting the ECI. Respondents indicated that although they had good understanding of preliminary design aspects, some of unknowns still existed around the project that still haven’t been sorted out.



**Figure 5.2 The Categories that emerged under ‘ECI selection’**

While respondents described that uncertainty was the major criterion for selecting ECI, there was an emphasis on understanding the concept of uncertainty. It was elicited that the uncertainty should be associated with the nature of the project and not because of inadequate upfront planning. *‘Why you would do an ECI contract is when you have a project that you have a fairly good idea of what the scope is, what you want to achieve, you have reasonable understanding of your constraints, particularly from your stakeholders...but even though you might have the scope reasonably well-defined...how to go about designing and constructing that [project] is pretty much up for grabs’ (P#1).*

For the majority of participants, ‘complexity’ of the project where the contractor’s contribution could offer a significant savings to the design, was the only reason that they considered ECI. *‘If you’ve got a project which is very complex, with lots of different solutions that might be available and lots of different ways of undertaking the construction – so lots of different methodologies*

*– there's a lot of range for innovation ... [there is lots of] variation ,... more benefits you are going to get from an Early Contractor Involvement in the development phase' (P#1).* However, two participants indicated that ECI is not suitable for very complicated projects with a large number of interfering stakeholders and hence in circumstances where there is a need for the contractor's continuous involvement during the delivery phase, the best choice of procurement will be an alliance or a form of alliances.

Participants described that they selected ECI for the projects with a high-risk profile or the projects that risks were hard to quantify in order to remove or reduce the impact of those risk as part of the process hence the factor of 'risk' was identified as one of the criteria that had considerable influence on the selection of ECI.

Amongst various potential risks, participants emphasised the risk of 'design variations' during the construction phase. For the majority of the participants, if only the likelihood of design variations was high due to technical issues, environmental issues, stakeholder pressures or political change, the case for any form of ECI was increased. *'It is a waste of time to go into an ECI if we've got a content design that we're not going to change' (P#2). 'If your design is fully developed, and you don't have to make any changes to the design, so that means no changes to the scope altogether, then your traditional delivery methods are good enough for that' (P#6).*

For some participants, 'size of project' was the criterion when considering ECI. While generally, participants indicated that ECI was used for substantially large and high-value projects, some participants described that ECI can be used for any projects with any size. One participant explained that since setting up an ECI process required upfront investment by both the client and the contractor, if this investment yielded a benefit, the use of ECI was being justified regardless of the size of project. Another participant described that the value of the project normally represents the complexity and this is the reason that the use of ECI is advocated for projects with a minimum of a certain value. However, ECI should be used *'where there's opportunity for the contractor to make significant savings*

*to the design... and not necessarily a large value project' (P#4).*

Some participants identified the project 'time frame' as being the factor affecting the decision to select ECI. The majority of participants described that for projects with a really short timeframe or a need to start very quickly, ECI was the best option to select because they could continue with the development of the design as part of the ECI. *'When you have really short deadlines and timelines around [the project], and you actually need to have those conversations happening, so you need to be able to bring somebody else in, somebody who starts to understand what the risks are, and you can almost do the design as you're going through the ECI phase and by the time that you get to a point that you're ready to build; it [won't be] ...a really hard process' (P#10).* However, three participants had opposite points of view and asserted that using ECI for projects with accelerated time frame is wrong due to lack of adequate upstream planning. *'It's a bit sad and it's a bit complicated, but we feel that just because you've got a very tight deadline, in those circumstances I think you should not use an ECI' (P#7).*

The majority of participants described that when a project required the contractor's input in terms of 'constructability' that affected the design at a very high level, the choice of ECI was very strong. *'It's good when you need constructability input upfront. That's one of the early phase – if one of your main risks is constructability, you need to get the contractor on board early, to get that constructability thinking early' (P#8).* For one participant, constructability was a key consideration to the successful outcome of the project and when the constructor could get involved much earlier than is normally the case in traditional procurement methods such as D&C, they obtained the benefits of the constructor's knowledge very early on the project.

Some participants identified 'having a formal contract' was their objective to select an ECI over other relational contractual frameworks such as Alliance. The need for meeting commitments to stakeholders about qualitative costs and delivering the project without involving in an intimacy drove the participants to use the ECI contract. One participant pointed out that ECI *'allows you to be quite clear about what your expectations are, so that during the construction phase it is*

*run more as a conventional contract, so it's quite clear what the risk allocation is, it is quite clear what the design standards are, and they can all be locked in whereas with an Alliance, it tends to be a bit more flexible and I guess it also means that you can run the contract in the true sort of D&C' (P#3).*

Some participants pointed out that when a 'collaborative environment' during planning phase was really required to resolve or understand the main issues of the project, they considered the ECI as the project delivery system.

Some participants pointed out that if obtaining 'Value For Money' was their concern, ECI was a potential vehicle for achieving the best value in terms of design and construction. 'Innovation' was also one of the client's objectives when considering ECI. *'You want to get some input in designs, innovation in design, and/or innovation preferred to technologies which are outside your region, which you want to bring into or test probably, into your project' (P#6).*

There were significant factors in selecting ECI that encompass the situation outside of the project and the internal client's environment. In discussing these factors, most of the participants identified the degree of 'stakeholders' impact' as being an influencing criterion while assessing the suitability of ECI for a project. *'If the jobs were simple and didn't have any stakeholder interests, or unknown stakeholder concerns that will only emerge later, then there's nothing wrong with a hard [money] contract' (P#14).*

Participants identified both 'regulation' and 'political' influences for establishing the selection of ECI. The regulation influences included approvals from local authorities in relation to the environmental, safety, technical and construction aspects of the project. Political influences were characterised as *'certain [political pressures] which cannot be controlled ... [and] can make you go into one direction, from the other' (P#6).*

Some participants described that 'market situation' was also the criterion that influenced their decision for selecting an ECI. While most of these participants indicated that one of the criteria to select an ECI was the industry's availability and capability, two participants described that the competition in the market

was a driving or impeding factor to select an ECI. Although these participants had opposite views on the selection of ECI in different marketplace situations, both identified the factor of marketplace 'competitiveness' as being an important criterion in the selection decision.

Participants discussed some factors affecting their decision to choose ECI that reflect the characteristics within the client's organisation that needed to be taken into account during the selection of ECI. In defining of these factors, participants identified 'funding' as being a crucial factor affecting the selection of ECI or other forms of contracts. *'In terms of funding, that's requisite that you have funding to pay the contractor every month. Obviously, if you have a different funding model, then you have a different discussion. It could become a PPP or some other [models]'* (P#3).

For the majority of participants, 'in-house resource availability' was a factor they had to consider in the selection process. When they realised that the organisation's internal resources in terms of expertise and required technology for the specific project were lacking, their preferred choice of procurement model was ECI. *'We as an organisation didn't really have the right internal expertise to be able to help us understand exactly what needed to be done in that situation...[so when] we feel that we're not adequately geared up or have got the right expertise and there's a fair bit of risk, that ECI is the preferred model'* (P#9).

A small number of participants indicated that design capability and the extent of developed design, were also important factors for them in selecting ECI. Furthermore, for three participants, ensuring that their organisation has the right culture required for the ECI process was a criterion for considering the adoption of ECI.

### ***Selection approach***

The 'selection approach' category defines the selection practices clients employ for the project procurement selection. The participants' responses exhibited a diversity of practices in procurement selection. Participants did not tell the same story over and over again; their responses showed that very different

approaches were applied in different organisations, with differing levels of formality and subjectivity. However, the selection process described by them can be grouped into three broad approaches: 'structured practices' with a formal structured framework; informally compiled or assessed selection process mainly based on individual 'subjective' judgments; and 'industry consultation' when the clients seek advice from external consultants within the industry.

In discussing 'structured practices' some participants identified a number of techniques that followed an established instruction or process. The majority of these techniques aimed to identify a single preferred option or distinguish acceptable from unacceptable possibilities. The core principles of these approaches pertained to a 'multi-criteria analysis (MCA)' technique in which preferences between options were established by reference to an explicit set of identified objectives (key result areas (KRAs)) and for which it had established measurable criteria to assess the extent to which the KRAs could have been achieved. *'We have basically a qualitative assessment of the key result areas for a project. So you might have viable 10 key result areas for a project and looking for the different forms of contracting models. That might be construct only, that might be D&C, Alliance of some form, ECI of some form, potentially managing contractor; and then for each of those key result areas, score each of the contracting forms from 1-10 on what we believe the certainty of the outcome is'* (P#8).

One participant identified that they used 'pair-wise analysis method' for their procurement selection model. *'Pair-wise analysis is a process of determining weightings on topics. So if you have six topics, and you didn't know how to rank them in order of importance, the pair-wise process enables you to work out the ranking and the importance of each of those factors... It's based on comparison. If you say you have a total of two points, where '2' is very important '1' is the same, and then you have two measures, 'a' and 'b', if 'b' is more important than 'a' then 'b' will get two points. If 'b' is the same as 'a' you score it one point. So if you've got four topics, a, b, c, d, you go 'a' compared to 'b', 'a' compared to 'c', 'a' compared to 'd', then you do 'b' compared to 'a', 'b' compared to 'c', 'b' compared to 'd'. You keep*

*going all the way through the matrix, and it falls out and it will tell you what the weighting is for a, b, c, and d' (P#3).*

Three participants stated that there was an inter-organisational procurement selection 'manual' which they were to follow. Along with the structured procurement selection instruction, the manual also dictated the type and minimum size of a project to consider an ECI form of contract.

In reference to the formality of the selection process, the majority of participants emphasised that in their organisation, decisions on the type of procurement method was made through an informal 'subjective process'. *'We haven't got a systematic way to make determination... It's not like having a list of points of projects... decision-making on the type of procurement and the type of delivery model is pretty subjective and... it depends on a lot of things' (P#9).*

A large number of participants stated that the process to select a procurement method for their project was based on their 'personal judgment'. For two participants, the selection process was less transparent and hence they relied on their 'feeling' about the environmental constraints (e.g. market situation and stakeholders' commitment). Some participants described that their selection of procurement was based on knowledge obtained from their previous experience about how projects were delivered in the past. One participant indicated that *'We would normally have a reasonably strong opinion about which way we wanted to go in terms of procuring [a project because we were] making educated decisions based on experience' (P#2).*

A small number of participants identified 'workshops' as being their method for selecting a procurement system. They indicated that in those workshops decision-makers and those who had influence on the selection decisions made an assessment of all the circumstances of the project and on balance, deciding on a procurement method that would be the best way to deliver that project. One participant explained the selection procedure in workshops in more detail as *'We start procurement methodology from the beginning, so when the preliminary analysis is done... we start having, put them in workshops, at least once, before we try that like preliminary evolution part of it... we can find out,*



*based on the workshop, we can see whether we are going from an Alliance to a D&C or in between, so we find out through the context of workshop, take from that workshop, what we are going to deliver’ (P#6).*

Two participants pointed out that after undertaking adequate planning, and when they had a sufficient understanding of the project scope and objectives, decision on *‘packaging and procurement type for that [project] would be [made through the] consultation with industry’ (P#2).*

There was a broad spectrum of responses provided from participants when they were asked about the ‘efficiency of the current procurement selection practice’ within their organisation and within the industry. One participant was ‘sceptical’ about the efficiency of a formal framework for the selection process and believed that the selection procedure is absolutely a subjective process whereas another participant recognised a ‘need for developing a systematic process’ to select the best procurement model for a project.

Some participants however provided another perspective and asserted that the effectiveness of the process is dependent on the ‘educated decisions’ made by people involved through deliberate behaviour. *‘The quality of [the] process is determined by the vigour with which the process was conducted, the people who were involved and ensuring it is without bias and that it’s fully informed... I would say it’s that approach of assessing the suitability and selecting the right delivery model, viewed across the public sector and the private sector ranges between been done very well and very thoroughly and done very poorly with no formal process at all. It’s very poorly done in some and very well done in others’ (p#13).*

### **5.3.3. ECI preparation**

The main theme of ‘ECI preparation’ defines the conformance requirements from the clients for preparing an effective ECI implementation including the required planning undertaken at the front-end stage of the project and required staff the client should acquire to be able to implement an ECI successfully. Two sub-categories associated with the ‘ECI preparation’ were identified in interviews including:

- Upfront planning

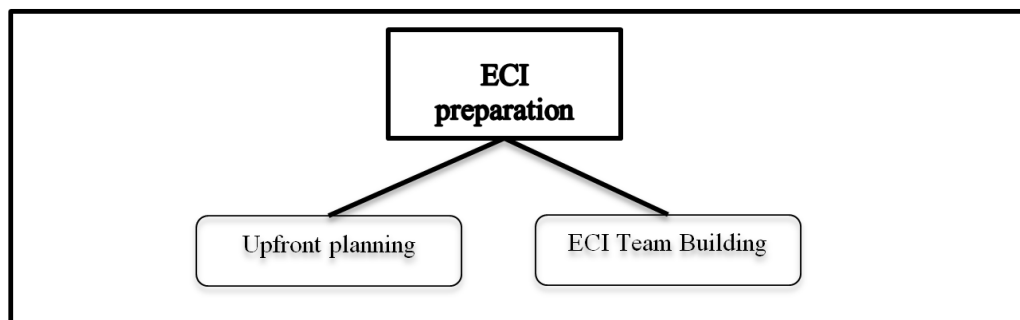
- ECI Team building

The overall structure of two categories identified under ‘ECI implementation requirements’ theme is depicted in Figure 5.3.

### ***Upfront planning***

The ‘upfront planning’ code encompasses the planning tasks the client is required to conduct before engaging a contractor in the project in order to obtain ‘adequate knowledge’ about the project upfront. Participants suggested that it was essential to invest a fair bit of energy and effort prior to getting any deliverable outcomes.

One participant identified that the reason for not achieving good value for money from some of the ECI projects they experienced before, was the lack of adequate upstream planning due to the shortage of time.



**Figure 5.3. The categories emerged under ‘ECI preparation’**

Some participants identified a better ‘awareness’ as being the outcome of a decent upfront planning about the complexity of the project and possible design variations associated with the complexity. One participant stated that despite the possibility of substantial changes in later stages of project, the planning at the front-end stage helped them to define the ‘design baseline’ and to prepare them for the ‘design alternatives’.

The majority of participants pointed out that they undertook reasonable

planning at the early stage of the project for developing a 'business case' and 'design brief' as well as leading to an 'optimal procurement strategy'. *'[When] we have had adequate planning... that's made a huge difference, because we got so much knowledge about the project upfront, that even if it's quite a radical re-design, then we know where our base-line is and we know of the alternatives and how we could prepare. So, I won't say you can't have too much planning, you can. But typically, I believe that we have underdone our planning and that has led to sub-optimal procurement strategies'* (P#7).

One participant indicated that it is the client's job in the planning of the project to make up a 'set of rules' where the contractor is rewarded for doing what is right for the client. Lastly, 'applicability of standards' was also identified as to what participants consider to be important or urgent during the planning to ensure the technical criteria from the client's point of view were well aligned to the project environment. *'You need to make sure that the standards you're setting in your scope of work and technical criteria from the principal's point of view are applicable to the site'* (P#5).

### ***ECI team building***

The 'ECI team building' codes reflect the means by which the project team members and leaders within participants' organisations are appointed to form a team in an ECI process. This includes the discussion about the 'personal capability' of the team members and leaders as well as 'team selection' process as a result of an ECI process.

The range of 'personal capabilities' indicated by participants was diverse. As demonstrated in 'interview questions development process' (see attachment C), the development of interview research questions in regards to the personal capabilities was guided by the Walker and Lloyd-Walker (2011) AM's Knowledge, Skills, Attributes and Experience (KSAE) model. The responses, therefore, were grouped into the three categories of 'required knowledge and awareness', 'required behavioural factors' and 'required experience'.

In reference to 'required knowledge and awareness', majority of participants

stated that having 'contractual understanding' was a crucial knowledge required for a successful implementation of an ECI project. *'If you want to facilitate or run an ECI, it needs to be championed by someone who knows what they're doing... you need to understand the contract... to get the best out of running an ECI'* (P#3).

For some participants 'understanding of the process' was the key knowledge that the whole team involved in the project need to have in order to run the ECI project efficiently. *'The project is not run by one person, it's not run by the project manager or the project director, but there is a whole team involved in that overall ECI process, to better manage the tender phase altogether, from the initial distribution, until the contract is awarded to one company and [the required knowledge] would be actually the knowledge of...how [the project] is getting built and what are the factors effecting. That affects how you are going to manage the whole thing'* (P#6). One participant indicated that the understanding of the ECI process led them to develop certain practices to manage the process better making sure it was streamlined although these practices were not *'documented anywhere, because it's the experience and the knowledge of us, because [we] do it all the time'* (P#3).

A small number of participants pointed out that 'understanding of commercial position' is the knowledge required for implementing an ECI process in order for the clients to not *'ask the contractor for more than he is committed to at the tender time, and from the contractor's point of view, not committing to more than [what he is] to get paid for at the end of the day'* (P#2).

One participant identified 'understanding of the contractor's motivation' as being the required knowledge in order to develop a commercial approach and engagement model that create a potential win-win situation. This was explained further as *'in complex contracts there's two dimensions: there's the human dimension [or] the motivational dimension, and there's the commercial dimension... One has to understand both of those. The client has got to make up a set of rules where the contractor is rewarded for doing what is right for the client. So, it's the job of the client to align the objectives of the two parties. ECI is a way in*

*which that can happen. The prime [knowledge], though, is for the client to understand... that paradigm, and develop an effective solution' (P#14).*

Some participants pointed out that clients need to have a clear 'understanding of the project scope' to know what they are really after because they have to guide the contractor. This can happen only when the client gets involved from the start of the project from defining scope throughout the specification and technical design and by having a good 'understanding of the project history'.

One participant indicated that the project director should have sound knowledge about the 'key persons' involved in the project, and it all comes down to 'understanding of commitments and communications' throughout an effective leadership across the project.

In terms of technical skills, participants indicated that the normal technical skills required to run ECI projects are almost similar to any types of projects regardless of the adopted procurement method. A broad range of technical skills were identified by participants *'from engineering technical people to more project-management types, to some people who are good at programming and [time frame management] to understanding community needs, just having a broad set of cross-sectional skills' (P#9).*

The majority of participants indicated that besides technical skills there was a set of skills referred to as the personal 'behavioural factors' needed for specifically an ECI process which had the higher priority over the technical skills when selecting people. *'Obviously you've got the normal skills or your technical skills and your project management skills. I think the ECI skills that are a bit different are around personality type skills' (P#4).* *'When you get into a traditional contract, you really never look at those attributes, because you don't generally assess or measure those things. What you're looking at is the price of the project' (P#1).* Nevertheless, when we are selecting people to work in an ECI team, *'we would evaluate their soft skills first, or soft attributes, and then look at skills, rather than the other way around' (P#8).*

The important mindset identified by participants was having 'non-price driven'

mentality. One participant stated that *'you can't have somebody who is just obsessed about money. I'm saying that occasionally you come across a company's contract managers who are just totally price-driven'* (P#7).

'Assertiveness' was identified as one of the attributes required specifically for project directors and key decision makers in an ECI project. One of the participants emphasised that with an ECI agreement *'you have to have somebody there who is willing to make a decision and stand by that decision no matter how tough, how unpopular. You cannot have, in an ECI, a leader who doesn't want to upset people, or doesn't want to take a brave decision or doesn't want to call the shots as they say'* (P#7).

The majority of participants identified 'transparency' as being the crucial attribute people in an ECI team should own. It is important for the team to have open and honest frank discussions without feeling intimidated by raising any issues because they know no one is going to be guarded and protects their position or protects their organisation; rather they are to help resolve the issues. *'We as a client, we have to be very open with the contractors as well. So we bear our souls on all of the different issues that we have got in front of us'* (P#9).

Some participants indicated that it is essential for people involved in an ECI process to have 'collaborative mentality' and 'culture of partnering' in order to be well suited in an ECI. *'There's no point having the best skills of anyone if you can't work with other people... because they don't have the right culture for an ECI or an Alliance, because they're not open and honest, they're not collaborative'* (P#8). Instead, they are *'looking for people that want to work in a team, be part a team and contribute, be very open, very honest; so these are the sort of attributes that you're looking for in people'* (P#1).

Another skill identified by some participants was 'interpersonal skills' with an emphasis on the communication skills particularly for those who are leading the team. The importance of negotiation was repeatedly emphasised by participants in the ECI process. One respondent indicated that *'particular capabilities that are essential in an ECI for it to be successful are effective communication skills'* (P#13). They pointed out that in a traditional contract; the communication skills

are really useful and obviously desirable but, if leaders in a traditional contract lack those skills, the consequences are not as severe as in an ECI. *'You take somebody who might be quite a hard person with poor people skills. In a traditional contract, you can drive it through the contract and you have lots of arguments, but you can drive performance through the contract, drive it in a traditional way. But you try to do the same in an ECI where you've got lots of things changing and dynamics changing [with] a complex stakeholder environment, [then] you get into a lot of trouble... If you have leaders who lack those... effective good communication skills... then the ECI is wasted. The model is compromised and the whole reason for doing this is undermined'* (P#13).

However, some participants emphasised that having good interpersonal skills did not mean that managers should be warm-and-fuzzy who just wanted to be liked, but rather a successful project manager in their project was 'solemn' and serious who *'delivered the project brilliantly and then they have respect and people look up to them'* (P#7).

Some participants stated that the people involved in their ECI projects showed some level of 'ownership and commitment' of the whole process and were willing to be part of a board or team to deliver a successful project. They held themselves 'accountable' for the project outcomes to the stakeholders. Interestingly, participants asserted that the accountability, commitment and sense of belonging to the project should be demonstrated by *'both sides of the fence, [the client and contractor]...and they need to take ownership of the project'* (P#6) and they need to be *'able to step back and say, what is best for the project, rather than what is best for the client or what is best for the contractor'* (P#10).

A small number of participants indicated that leaders in an ECI should be 'appreciative' of the whole scheme of dynamics that is current within the team because it is really important to get the team working well and optimised.

Some participants identified 'approachability' as being a key attribute of a person in an ECI leader team. For some this was described as being visible to the design team and delivery team on site in order to help resolve issues quickly. For some others, this was essential for understanding the project and the areas

of weakness for potential improvements. *'The more you're exposed to an ECI environment, [the more] you start to get a sort of a flavour for where the key areas you need to improve are, organisationally or individually'* (P#10).

One participant pointed out that people in ECI delivery teams on both sides need to be 'trustful' and willing to trust each other. For one participant, being 'liberal' was an essential attribute that ECI team should have. *'Once you go to an ECI type [contract] you can't be in control, in a normal project you have some influence through design [but in an ECI] you can't control everything. Your controls in our normal contract environment are well understood but in an ECI you've got to be a little less controlling in some aspects and be more upfront about others'* (P#4).

'Lateral thinking' and 'divergence' were also identified by some participants as important skills required for ECI teams enabling them to think outside the box and bring new ideas to the table as well as operating in very different and unusual ways, with people they wouldn't normally work with and largely outside of their normal comfort zone.

Some participants indicated that the client should have the 'emotional maturity' to realise that the job of the client is to create a win-win proposition to best achieve the client's objectives.

For several more participants, leaders in an ECI process should have particular personal characteristics including being 'decisive', a 'team motivator', 'receptive', able to 'align the objectives' of the project parties, having high levels of 'emotional intelligence' to understand why a particular approach would or would not work for the constructors, and being 'optimistic' to set a positive attitude as the main behavioural theme for the rest of the team. In addition, leaders are to be 'politically astute' in order to identify the potential conflicts quite early through 'projecting' the major problems that are arising with particular relationships within contractors and find the solutions to resolve the issues quickly. *'You've got to be able to second-guess. The ability to be able to second-guess what the contractor may be thinking, [what the] contractor may be wanting to do. You've got to have good anticipation skills'* (P#9).



Respondents' perceptions of selecting the right people for an ECI team were supplemented by their statements that those types of people would fit who are 'enthusiastic' and *'want to go the extra mile and do the extra work and learn and develop as much as they can. So these people came to be the people who want to learn, want to develop, want to try something new, want to do it better. They tend to be naturally better or more inclined to it anyway'* (P#8).

In discussing 'required experience', participants specifically highlighted the need for having some experience in 'relationship type contracts' beside the normal 'technical experience' in their own speciality field. Some participants indicated that for selecting the project team, *'we weren't just looking at their technical skills but also... the types of projects they were on and the types of contracts they were operating under and then we supplemented that with the knowledge from the selection panel about where they've come across them. In the selection team... we used people who've been involved in different ECIs or alliances'* (P#4).

Participants' discussions of 'team selection' reflected a wide diversity in measuring the personal capabilities identified earlier and how team members and leaders are selected to work in ECI amongst different organisations.

The majority of participants indicated that personal capabilities are difficult to quantify because it is not possible to measure through systematic measurement tools; rather the measurement is a product of a 'gut feeling' about them and observing the behaviour and the way they manage to conduct a conversation. *'You're looking at the way they talk with other people, you look at the way that they involve other players and you look at the way they're listening to what's been said by other people, you look at the way that they might dominate a conversation, or not dominate a conversation. So, you get used to observing the way that these people operate and from that you can make an assessment as to whether you think they can work very well as a team, or whether they are going to be dominated by one particular character and then not potentially get the best out of all the people in the team'* (P#1).

The ways in which participants described the actual selection process for team

members varied considerably. For three participants, the selecting process operated with 'no structured instruction', however they emphasised the need for reliable objective tools, which was lacking in their organisations. One participant stated that *'whilst we know that leadership counts or that people skills are really important, we don't have good tools for measuring them or good methods for assessing where they are really required'* (P#14).

A structured approach was identified by two other participants in their organisations as 'pre-selection workshops' in which the potential team members were evaluated through a number of designed assessment tasks. One participant pointed out that *'from the workshops you get a very good understanding of what people's core attributes are, or the way they would normally operate and behave when you put them under a bit of stress to make them get back to the normal sort of operating characteristics and from that you can see how it goes'* (P#1). One participant explained that during the workshops they were evaluating and selecting people based on the capabilities they demonstrated by placing them in a real-life situation and observing how they were managing the situation and what they were offering.

The evaluating mechanism was identified as a detailed 'scoring system' where each person was assessed against a number of categories and based on their performance in the workshops and other qualifications they were awarded a score accordingly, and eventually the highest scored candidates were selected to work in the team. *'You have many categories [that] you'd be ticking off, [such as] Team Engagement, Collaborative, [and] all those relationship sort of arrangements; and you'd have strong Leadership skills or poor Leadership skills; and then you mark from 1-5; and then "Works in the team", "Demonstrates good collaboration", you have statements, and then you have qualifications or qualities that you expect to see to give you a scoring. So, if you saw a poor one it should be "Doesn't listen", "Provides no clear direction, is very overstated", "Doesn't let anybody else talk" etc. and then that's probably not the sort of person that I'm looking for. Good relations could be "Works very well with the team", "Gives clear direction", "Willing to listen", "Steps in when the team is struggling and provides them with some better direction", these sort of things; and then you'd see which*

*one it is. Is [that person] a one or a five? You measure it and see that he [or she] is quite good, but not the best, probably is a four so you give him/her a four' (P#1).*

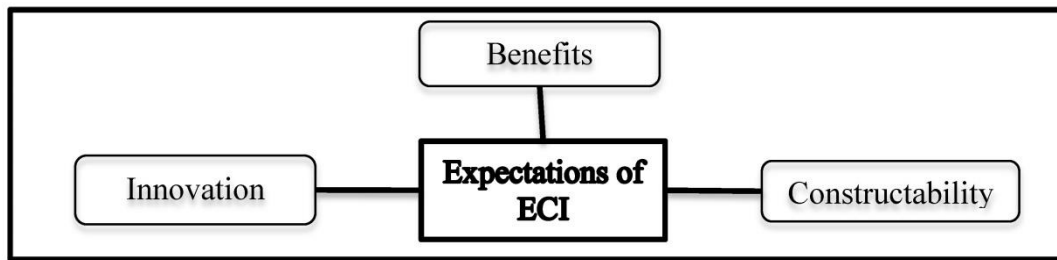
One participant described that they run a set of pre-selection workshops for shortlisted teams to select the whole team instead of individuals. *'You might have two teams that you've shortlisted, and you've got a set of workshops separately with each team, running the same types of exercises, the same types of scenarios... and you take them out and you put them under pressure, and see how they behave and from that you get a good idea of their capability, in that regard and... then you go through a fairly detailed scoring process...and from that, you pick the winner' (P#11).* The same participant indicated that beside the selection workshops, a formal 'psychometric evaluation process' was also performed by an expert psychologist who had a fixed procedure for measuring and scoring individual behaviours. *'Another thing we've done is using a psychometric evaluation as well, which is more of a formal – it's almost like a psychological profiling where you score behaviours against a set of criteria, and you put that through a bit of a model that spits out scores' (P#11).* The overall score resulting from a combination of the psychometric evaluation result and workshop result determined the best suited team.

#### **5.3.4. Expectations of ECI**

The main theme of 'Expectations of ECI' addresses the areas in which the use of ECI is expected to have noticeable influence compared to the other types of procurement methods. Three areas associated with the expectations were identified including:

- Benefits of using ECI
- Constructability
- Innovation

The overall structure of three categories identified under 'Expectations of ECI' theme is depicted in the figure 5.4.



**Figure 5.4. The categories emerged under 'Expectations of ECI'**

***Benefit of using ECI***

In discussing 'benefits of using ECI', participants identified a large number of benefits that the use of ECI can offer. These benefits can be classified into two sub categories of 'engineering benefits' and 'relationship benefits'.

The engineering benefits have positive impact on the tangible aspects of the project and the client's organisation. Participants identified the increase in the price and scope 'certainty' as one of the engineering benefits of using ECI as a result of 'joint risk management' with the help of expertise and experience of the contractor.

Participants also identified the greater certainty and better understanding of the risks as having considerable influence on the working relationship during the delivery phase. *'The principal is able to go to tender on a hard-money basis with so much less uncertainty in the job than they normally would and so even you engage in what you may refer to as an adversarial-type delivery method, most of the scope for disagreement has been taken away'* (P#14).

The factor of 'value' was identified as the other aspect that the use of ECI had significant influence on. Many participants indicated that the ECI process gave them a better opportunity to undertake value engineering. For them ECI was all about driving 'value for money' by carrying out the project efficiently and smartly with the least reworks. One participant pointed out that the competition part of the process is a good opportunity to demonstrate value for money. Some participants also stated that the refined solution caused by the constructor overseeing the design led to a better value outcome.

One of the participants identified another engineering benefit of using ECI as 'reducing the resources' required from the client side whereas another participant had completely opposite opinion and identified ECI as being 'resource-hungry'. However, their statements did not contradict one another as the first participant compared ECI with other relationship-based contracts such as Alliances while the other participant compared ECI to a traditional contract such as D&C.

'Defining standards jointly' was identified by two participants as another contractual benefit of using ECI when standards of the project were not well defined and developed. For one participant involvement of 'the same management' team in the both design development and delivery phases was a great benefit, indicating *'the benefit is definitely having similar people involved in the ECI development, the design development phases, what you're doing in D&C delivery. I'm talking about at the senior management top level'* (P#9).

In defining 'relationship benefits', participants identified establishing better 'communication' between the client and contractor as being a significant benefit of ECI to the working relationship. *'You're better able to communicate with the contractor or the joint venture early on, or the bidders early on to get; well the hope is to communicate better with them to get a more refined outcome'* (P#4).

Two participants stated that the risks allocation of the delivery phase in the ECI process established a clearer basis of 'expectations' between the client and contractor. All participants pointed out that the 'positive working relationship' built during the collaboration phase was the most noticeable benefit that the ECI process offered. This relationship was characterised as being 'open', 'honest' and 'collaborative' by which 'mutual trust' and 'understanding' prevail in the working relationship between the parties. For some participants, 'no secrecy' and 'transparency' incorporated in the relationship, generated a 'no blame environment' in which there was *'little time spent on commercial claims, or disputes, or anything like that, that you do have in normal contracting methodology'* (P#11).

## **Constructability**

The 'constructability' codes reflect the extent to which an ECI process would affect constructability issues. Except for three participants who had a different view on the constructability considerations for the clients, the majority of participants stated that constructability was significantly improved in their ECI projects as a result of all parties working together to develop the design and planning. For those three participants, it was not their concern how the contractor was to build the project. Rather, they focused on the 'project outcomes' ensuring the project objectives were met. *'The promises I have to the community about making certain marks [are] things that we need to have in the negotiation. But, in terms of the way the contractor builds and fabricates things in terms of constructability, that's where their innovation is. So, [it] is not to focus on, [instead] you focus on saving money'* (P#3).

However, the rest of participants emphasised the importance of constructability consideration in the 'project design'. One of the participants asserted that *'During that ECI phase, you've got the client or the principal, you've got the designers, and you've got the constructors, all together, working together, set up in the same office, reviewing all the designs, reviewing all the construction processes and all the specifications, making sure they're all good from a constructability point of view. You don't normally have that where the design is done separately and the constructability input is missing. Certainly one of the benefits of an ECI is to have that constructability input'* (P#11).

The majority of participants indicated that the contractor had different 'insight into the project constrains' leading them to propose a wide range of other 'options' if the initial design was not in compliance with the project objectives or had any financial and constructability issues. *'The estimator and the project team for the contractor and the design team [are] working together, the project team comes up with a proposal solution, and the designer comes up with a design, then the estimator with a price. If it is too much [then], we've got to go back and do something different. So they go back and look at another option and through that process, you can get the best constructible job'* (P#5).

Participants also pointed out that although the 'integrated solutions' in the design process may cause a slight 'deviation from the original design', the design is not developed in isolation of construction methods which eventually eliminates some of the risks for the owner. They indicated that the constructability enhancement resulting from the contractor's contribution and 'feedback' to the design, reduces the risk of undertaking designs in a way that some components of that design would not be able to be built as they are designed. This can, therefore, significantly reduce 'the waste of design efforts' and 'risk of delay' which helps the project to complete more 'economically'. This is described as a result of careful considerations of the 'safety' issues during the design development and the 'less number of claims' by the constructor where some small changes in design in the construction stage can make a big change in construction costs or time.

For two participants constructability was not only related to the design aspects but also 'setting up a clear process' to work out which construction methodology should be employed in order to achieve the overall requirements of the project.

### ***Innovation***

In defining 'innovation', responses establish 'the extent to which ECI triggers innovation' and how this may take place, and how an ECI enables or inhibits a culture of innovation. For the majority of the participants, the ECI development process 'facilitated a game breaking innovation'. Innovation was created by a 'collaborative link' between the designers and the constructors and the collaboration institutionalised in an ECI form of contract allowed the contractor to propose innovative solutions to problems that were different to what normally were done, therefore *'the ECI, in the contractual sense, is set up to encourage innovation'* (P#3).

For some participants, ECI encouraged innovation to 'some extent' but not anything significant, and for a small number of participants, ECI just encouraged 'business-as-usual' and hence innovation in a project did not occur as a result of the ECI process but the innovation was incorporated in the contractor's culture

and the company was innovative regardless of the type of contract.

In discussing how an ECI enables or inhibits a culture of innovation, the majority of the participants indicated that ECI provides an opportunity for the contractor and designers, as well as the client, to not think in traditional ways but instead to 'think outside of the box' without feeling threatened to do something innovative and different. *'We had two... ECI proponents and both of them came up with very different scenarios to our reference design, both of their designs were better as opposed to our reference design and cheaper, so then the process was really good in constructability, but the innovation was just fantastic... If you gave people enough scope to think outside of the box to know exactly what you need functionally and let them go for it...they'll come up with some very clever ideas'* (P#1).

Some participants identified 'empowering the client' during the design and planning associated with the ECI process as being a crucial enabler of innovation. The client's inputs in developing innovation ensure that their objectives are achieved and that innovative solutions can add value to the project. Of particular interest was the fact that some participants indicated that the 'completion' in the second phase of an ECI was the best vehicle for securing innovation because the proponents had to demonstrate innovation to win the job and *'If you've got competition... you get people really pushing themselves for innovative solutions'*(P#7).

One participant pointed out that the ECI process requires the client to be 'open to negotiate' about the innovative ideas but at the same time the client needs to be very clear about what it wants, or what it doesn't want and should be able to articulate that. Another participant also emphasised the importance of a 'formal innovation process' for driving innovation. *'You do need to have a sort of formal innovation process, rather than just expecting people to sit around and come up with good ideas... you just have to use a structured approach... using a variety of different methods of getting people together... the process of managing those innovations and scoring them and working out which ones are worth pursuing and which ones aren't, linking it all with sustainability and that sort of thing'*



(P#11).

One participant pointed out that the Umbrella ECI where a project is broken down to 'work packages' and each work package is contracted out separately, was an effective approach in terms of innovation because any innovation that was picked up in the D&C phase was priced and programmed for using in the ECI phase of the subsequent packages. *'That was one of the best things we did – [did] not have one ECI and end up with one D&C contract for the full [project] at the outset. It was very much a series of packages and then any wins that were discovered in the D&C phase we put in the ECI phase for the next job, and so on'* (P#8).

For one participant, the innovation took place during the design development where the collaborative form of ECI contract allowed the contractor to 'challenge the design' and propose nonconventional solutions.

Even though the majority of the participants indicated that the ECI process encourage innovation, there were some participants who had opposite opinions.

One participant asserted that since competition drives innovation, the 'lack of competition' in the collaborative phase of the ECI when only one contractor is on board, 'inhibits innovation'. *'They will want a business as usual approach for that and I don't think they'll actually push the boundaries because they'll think, once they're on board, [they] will do what [they] normally do and this is what it will cost'* (P#7). The same respondent stated that not only does ECI not trigger innovation in public projects but conversely it would 'stifle the innovation' because the client which is the government agency intend to take a conservative business-as-usual approach and do not take any risks on an unproven or an untried technique. When the client is involved in the development of design, any innovative ideas are aborted at the outset while in traditional lump sum contracts; contractor can make a commercial decision to go with a risky or untried construction technique.

Another participant also indicated that the potential incentives to new ideas only at the D&C phase, is a barrier to obtaining all of the innovation from the

contractor early in the actual ECI phase in which the contractor 'holds the innovative ideas until D&C phase' to take a competitive advantage. *'We have found it a bit harder to drive and make sure we are getting all of the innovation out of the contractor. Because it's a D&C hanging at the back end, there is potentially incentive to sort of hang on to some good ideas until the D&C phase. So that they can basically get the wins of any innovations that they implement as part of a D&C. So if it's not priced into the great scope, and then they come up with an innovation, then it's essentially a win. So one of the downsides is trying to get those innovations out early in the actual ECI phase; rather than the D&C phase'* (P#8).

While there were some answers addressing hurdles in implementing the innovation in an ECI, the responses were not specific to the ECI process but instead related to challenges to development and diffusion of innovation in general context. While one participant indicated that if the scope of the project is defined too specifically by the client, the opportunity of proposing innovative ideas by the contractor is being stifled, another participant pointed out that the client sacrifices the innovation by specifying the scope in details because of the possibility of 'opportunistic behaviour' of the contractor. *'There's nothing worse than a client who sits on the fence and goes "I don't know what...I want"... that doesn't help anybody... so, the ECI process encourages innovation [but] contractors can get pretty dirty sometimes – they want to do a simple innovation because it saves them money [but] we may not see the savings – that's the other side of the coin'* (P#3).

One participant identified 'compliance with regulations' as being one of the challenges to embarking on innovative ideas. That participant discussed that *'If there is something which needs approval for the first time, [for example] the product is made from the outside [of the country], which is a cheaper product [but] you cannot be sure that it's acceptable to Australian standards or not, then certain innovations you cannot actually bring in and put it into Australian standards in equivalent way'* (P#6).

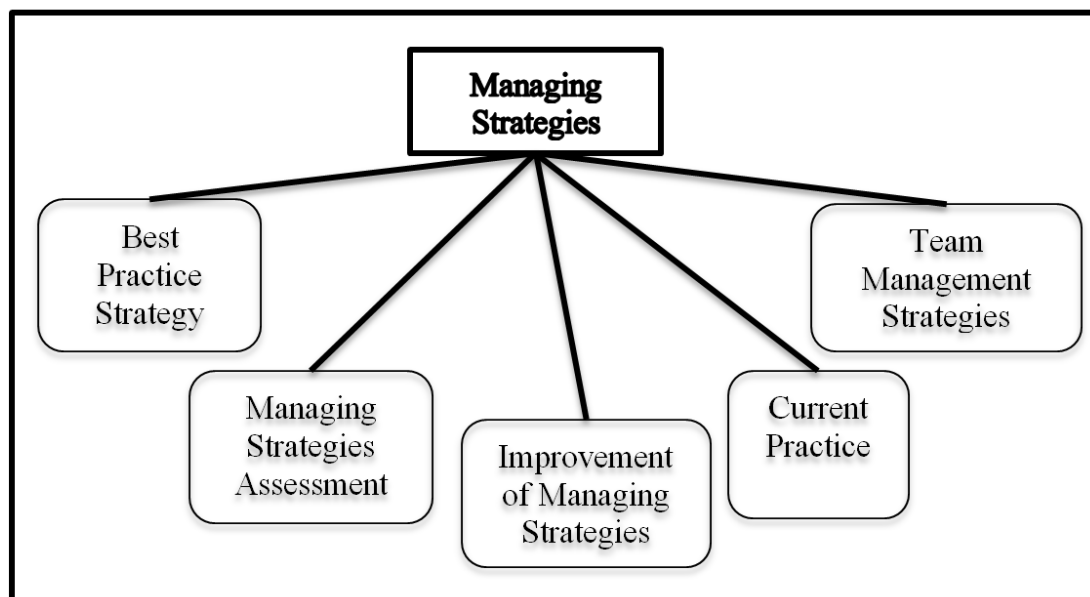
#### **5.3.5. Managing strategies**

The main theme of 'Managing strategies' defines the best practice strategy to

manage the working relationship with integration of risk management and communication management, the current strategies being practiced and the influence of ECI process on development of these strategies from the clients' perspective in order to provide a system to measure and evaluate effectiveness of ECI when selected as a delivery system. Five categories associated with 'managing strategies' were identified in interviews, including:

- Team management strategy
- Best practice strategy
- Current practice
- Managing strategies assessment
- Improvement of managing strategies

The overall structure of three categories identified under the 'Managing Strategies' theme is depicted in the figure 5.5.



**Figure 5.5. The categories emerged under 'Managing Strategies'**

### ***Team management strategies***

In defining 'project team management', some participants stated that 'training, coaching and mentoring' are the means by which the collaborative 'behaviour

pattern' can be taught and supervised within the team before the ECI process is started. In the training workshops the technical knowledge is not necessarily built but instead the *'knowledge of how we need to behave and operate...in an ECI; what sort of attributes do [we] need to [have], the conversations we need to have, how open we need to be to ideas'* (P#1) were trained and developed.

One participant indicated that for the new teams they took everybody along the journey on how to 'act in their jobs'. On the other hand, some participants had an opposite opinion on the training. They believed that the relationship building workshops are just helpful on surface but they are not very 'effective' when dealing with people's personality because *'you cannot train and change people's personalities'* (P#12). Rather, the soft skills should be 'naturally developed' through work place experiential learning. *'It's pretty hard to teach the soft skills without being in a project and using them, they're hard to learn in isolation. I think it's a great opportunity to mentor people when they're on the job. Looking at things without actually working in that environment, I don't think that speaks to them'* (P#2). For this purpose, one participant indicated that experienced people should be willing to go through some coaching with someone who has no experience of working in an ECI environment.

A similar approach has been described by one participant that they had 'pre-project open discussion' about how they are expected to work and during the discussion session they *'...talk to people about what will be expected, how they work, what the benefits are, what the dis-benefits are...and that's a huge help now'* (P#8).

Some participants identified 'understanding team dynamics' as being the area that needed to be managed and developed because there is a whole team involved in overall ECI process from the project initiation until the contract is awarded to one company. One participant pointed out that *'[We] might have had a bad experience with a contractor 10 years ago but in the meantime, all those parties from [our organisation] have left or changed and all the parties from the contractor changed, so we've got new teams coming together. So you don't want to take that old ill [relationship] because the teams are changing. So you need to*

*have that understanding of team dynamics [which] is probably the most important skill' (P#5).*

Some participants recognised the gap in the current 'communication skills' and stated that effective communication in an ECI or generally a relational contract depends more heavily on a broader type of leadership, emotional intelligence and communication skills compared to the traditional type of contract administration which does not rely on inspired leadership, hence developing that capability to be effective as leaders and communicators is where the industry finds a big gap at the moment and requires effective management.

For one participant, improving the skill to 'understand the differences in other's personalities' was vital to manage an effective ECI team. *'Understanding that we all have different personalities and that you won't get on with everyone and that's fine. But if you're finding that you're not getting on with someone, it's up to you to overcome that. It's not up to the other person because you can't change them; all you can do is [to] change yourself'* (P#5).

Interestingly, one participant indicated that in order to manage an effective ECI team, all team members need to have 'permission to be proactive' which allows them to work together as one team. *'For example, there might be that there are some decisions that need to be made. So the question is, do you need to wait until the contractor says, "Well, we need a decision" or do you start that process off your own bat, and say, "Okay, we realise that, so..." and start having those discussions with others'* (P#10).

### ***Best practice strategy***

The code 'best practice strategy' discusses the proven recognised approach for managing risk, relationship and communication that would produce satisfactory results from the participants' point of view. Some responses reflected the definition of best practice strategy in generic context whereas some other responses addressed the best practice strategy for 'risk management', 'relationship and communication management' in particular.

In discussing the definition of best practice strategy, some participants argued that it is 'not possible to define' best practice strategy in large complex projects since the adopted strategy for a project is only evaluated based on the project outcomes and hence identifying the best practice strategy is possible when *'you do that project and have an identical project and you do a different strategy then you compare. Of course, you can compare two identical projects [or if] you get projects that are fairly similar... we can compare this one that we got a good price for to the one that we didn't... But, in these bigger projects, where you are looking at ECIs, Alliances and the like, most of them are fairly unique... one-offs and there is nothing, very rarely is anything there, if at all that is similar... [so] we never define for sure what best practice is'* (P#7).

However, some other participants provided a number of definitions for best practice strategy. The majority of respondents indicated that the best practice strategy, regardless of type of contract, is the key players' understanding of the contractual rights and obligations that each party is liable for. One participant explained further that since the client sets the contractual rules and unwritten relationship rules, the ability to 'foresee the implication' of those rules is critical. Therefore, the ability to understand and foresee the impact of all those decisions is a measure of good practice.

One participant described that the process of developing strategies is fairly well understood by everyone involved but how well they are implemented for different projects, is recognised as a best practice. For one participant, the best practice boiled down to the high-performance team in which the members are highly motivated, empowered and confident in an environment that they find 'inspirational'.

In terms of best practice strategy for risk management, the majority of participants identified 'good understanding' of risks as being antecedent to an 'effective risk mitigation' strategy. This includes understanding what risks are, which party is best placed to bear the risks and also which party is 'contractually obliged' to assume and manage them as well as 'understanding the rules and regulations' impacting or being impacted by the risks. Participants

indicated that good understanding of risks is a result of 'engaging stakeholders' and establishing an 'effective communication' platform between them. The best practice strategy is to *'bring in the right level of expertise and the broad cross-section of stakeholders who might be involved in the project and doing a risk identification process up front, which is fairly detailed'* (P#9). *'By going through these issues you develop a terrific understanding that allows you to identify the best way to manage those risks and put a number of risk strategies in place, to mitigate against those risks that you've identified'* (P#1). *'By having a communication and a protocol in place, [you] ensure that all the parties, consistent with the contractual allocation of risk, are doing everything they can within the contractual parameters to support the effective mitigation, that is the effective mitigation and avoidance of those risks and 'documenting' and communicating all of that clearly with appropriate processes in place, to check the effectiveness of this system and to "learn" from mistakes'* (P#13). Some participants also complemented that statement by suggesting the 'early understanding and assessment of risk management process' by all parties that leads to a common understanding of risks, a common alignment to the risks and common understanding of the process to identify, treat, manage, mitigate, transfer or share risks.

One participant pointed out that the best practice strategy for risk management is maintaining a balance between financial risks and 'performance risks'. *'There's the tendency for buyers to be a little bit naive and think that by a hard-money contract, for instance, they can get rid of all risks whereas the reality is, while you can get rid of price risk by transferring [that risk to the constructor], for a very risky project the harder you try to push price risk to the other party the more you pull performance risk to yourself... [So] reduction in risk allocation is almost always focused on cost risk, at the expense of any thought being given to performance risk or non-cost risk... and if I enforce a hard-money contract, it will hurt me in non-financial ways – the job will be late, or the stakeholders will be unhappy etc. [therefore the best practice strategy is]... you're trying on the one hand to transfer risks to the contractor, on the other hand you're protecting the performance risks that financial-risk transfer has imposed on the client'* (P#14).

One participant suggested that risk management is a process of 'ongoing assessment' of risks from the inception stage throughout the project completion on a regular basis. For risk management there should be *'processes in place and you are diligent about following up and not just simply doing it once-off at the start of a project and being thorough with it... you need to be really conscientious that those things need to be done, ongoing, all the time, you can't take your eyes off the ball and you keep doing that on a regular basis'* (P#1).

Some participants emphasised considering the unforeseen risks that can disrupt all the planning that is set up at the beginning. The best practice strategy, therefore, is to employ a very 'clear method by which unknown unknowns' and unforeseen risks are treated between the parties and enables parties to deal satisfactorily with all of the unknown risks either by a 'risk sharing' approach or transferring risks to the party who can better manage them. However, the ability of 're-negotiation' where risks are transferred to a party needs to be embedded in the risk communication. When *'we've got a hard money contract... we don't want to compromise either party's rights, we simply want to know what's going on and be able to see things coming before they've got too big... we intend to stick to our fixed-price contract, but we also tend to give ourselves the ability to renegotiate that before it gets into too much difficulty'* (P#14). The best way for allocating risks also was described by participants as valuing the risks and working out what is 'Value for Money' and which party can best carry that risk.

In defining 'best practice strategy for relationship and communication management', the majority of participants stated that the relationship management and communication management are 'entwined' and in terms of practical application they are interlinked. Therefore, the best practice strategy for managing communication and relationships cannot be investigated separately and should be placed in one category.

Some participants suggested that a robust organisational structure in the form of a 'joint leadership team (JLT)' with strict protocols is needed for managing the relationship and the internal and external communications. Some participants likened JLT to an Alliance Leadership Team (ALT) or an Alliance



Management Team (AMT) in the 'Alliancing arrangement' in which senior-management level representatives from the contractor and the client constitute the team. *'That group is set up basically to "empower" the client's project manager and to empower the contractor's project delivery manager as well'* (P#9). *'They meet regularly, [they've] got Senior Executive review groups, and those groups are an inherent part of Alliancing. I believe in a best practice environment, in any form of contract, should have an analogous type of body'* (P#13). One participant argued that the JLT has to be very visible to the design team, and also to the on-site delivery team. They should be able to be called at any time of the day or night if there is a significant issue on-site that is not able to be resolved and has potential significant dollar implications.

Some participants identified 'understanding of people's roles and functions' as being a critical factor for effective relationship management. *'The relationship we had as an organisation influenced the relationship that we had through the ECI phase with the contractors. So for me it was very much understanding what the roles and functions were, in order to be able to have a best influence on the ECI phase'* (P#10).

For some participants communication and relationship management were linked to 'stakeholder management' and hence a best practice strategy was 'understanding the stakeholders' objectives', and 'engaging' with them about what their preferences are, rather than hoping that the utilised strategy meets their needs. Effective strategy for relationship and communication management is to *'identify who your stakeholders are, you need to communicate with them, get a very good understanding of that list of people, work with them, identify what their needs are, how they want to be approached, what their preferred method of contact is and [etc.]. If you start to get that very good understanding, you build a lot of trust with them and from that you can start to build a very good relationship. So, communications and relationships are going hand-in-hand and are very much about understanding what the stakeholder needs, what they want and how they like to receive it'* (P#1).

For some participants, working relationships and communication were

interlinked to the people involved in the project and hence a best practice strategy for managing relationships and communication were unwritten rules that were inherent to the people's personalities and attitudes. 'Building a collaborative culture' was identified as a key successor to building and nurturing an enhanced working relationship between the parties. Participants indicated that best practice from a relationship and communication point of view is having established a culture which enables everyone to have open and honest conversations with no surprise about any issues. One participant commented, *'by relationship we mean that there are no surprises; you talk openly with the other party, at the same time maintaining your contractual rights. You have the discussion first and confirm in writing what you agreed on, what you didn't agree on and how you're going to go forward rather than just lobbing endless claims... and then being agonistic or adversarial'* (P#5).

Participants also indicated that the 'best for project' mindset is an essential attitude that should be demonstrated within the teams. *'We're all here working together under one team, [the client's] people, with contractors and designers all working together with common objectives and common goals. There is little time spent on commercial claims, or disputes that you do have in normal contracting methodology'* (P#11).

One participant pointed out that even though people certainly do not agree on everything, the working relationship influenced by the culture of collaboration facilitates the 'flexibility' in accepting different opinions towards a mutual agreement. A collaborative culture encourages the 'escalation' process approach through the board of a project team as well as the organisations *'that people can agree to disagree and escalate an issue to superiors to make a decision on'* (P#8).

Some participants suggested that the best strategy for communication management should include a clear process for 'sharing information' between parties. Having requested by each party, any information provided by the client should be shared with all other parties except with the commercial in confidence issues. The client should have a probity advisor to advise on the confidentiality issues to ensure that the information sharing process is equitable

and that it is conducted with integrity.

In response to the best practice strategy for relationship management questions, one participant referred to 'BS11000' standard (Collaborative business relationship) published by British Standard Institute (BSI) in 2011 as a roadmap for the best practice strategy for managing working relationships, especially if *'you don't have trained staff who know how to argue and negotiate, and they don't have the rules to negotiate – which are the collaborative rules of negotiation'* (P#3).

### ***Current practice***

The category 'current practice' identifies the existing practices related to selecting and developing the strategies for managing risks, communication and relationships by clients for the projects procured under an ECI including formal and informal approaches. The majority of participants pointed out that regardless of the form of procurement system, the current strategies for managing risk, communication and relationships are not effective. They argued that despite a lot of efforts that have been made over the last few decades; they still fall well short of where they could and should be. For one participant, this is a result of the 'lack of real quality leadership' across all players due to over using relational contracts in recent years with an insufficient number of quality leaders to fill the leadership positions. For another participants, the inefficiency in the current strategies is caused by the frequent 'changes in resources' in the construction industry.

On the other hand, a small number of participants described the current practice in their organisations as being 'satisfactory', where one participant indicated that the prevailing culture of partnering in their organisation facilitated the understanding of relationship contracting amongst people who worked on the project that led to an effective practice for communication and relationship management.

One participant saw the current approach for risk management as very 'pragmatic' and two participants commented that the managing strategies are

evolving over time and they become more mature than what they have been in the past. *'I think it [is] a common fact over the past, if you compare where the industry is at now to where the industry was, say, 25 years ago and back in the middle of the 80s and getting into the late 80s, Management, Risk Management, Relationship Management and Communication Management are far, far better than they were back then. It's been a step-change improvement from where it used to be'* (P#13).

While the majority of participants indicated that the strategies for managing the project were determined in the head office, one participant pointed out that in the case of changes in project scopes or objectives, the decisions and amendments to the plans as variations have been made on-site by project teams. Another participant described that they deliberately embedded some people from the client's team into the contractor's delivery team in order to enhance and expedite the learning process. *'The contractor was willing to accept on their team some of our employees to, basically, work for them during delivery phase even though they were employed and paid by us. So, that gave them a greater level of learning and understanding how a contractor operates'* (P#9).

For some participants, the management strategies were a 'formal' process that followed a structured framework or instruction. This instruction was dictated by the ECI contract and the organisation's norms and authoritative standards.

In terms of relationship management and communication on the project management side, some participants indicated that there were certain parameters written in the project brief that described, in a basic way, what the 'hierarchical structure' of both the client and contractor was. For risk management, the whole process was part of the 'ECI contract', and part of the conditions of offer which was documented and was the basis of the contract.

One of the participants compared the management and leadership process of ECI to the Alliance arrangement where there are Alliance Leadership Team (ALT) and Alliance Management Team (AMT). They described there being always a 'Project Leadership Team (PLT)' consisting of leaders from all parties who drive the 'governments' of the project and deliver certain objectives for

both the contractor and the client, and a 'Project Management Team (PMT)' who drive managing risk, relationships and communication. The establishment of PLT and PMT is contracted as part of the agreement between the parties in order to manage the way the project is managed as well as 'resolving any disputes' that cannot be resolved by the team below them. *'They usually have a dispute resolution advisor so in our ECI, the strategy is [that] there is no option for dispute [and] everything has to be resolved by the PLT'* (P#4).

Some participants described there being no formal process for selection of managing strategies for risks, relationship and communication in the project, rather the managing strategies were largely based on the negotiations between the client and contractor. *'For our collaborative projects agreement back end, we've basically negotiated the risk proportionate in the tender phase. So we end up with, through research, risk benchmarking, we end up with a document that sort of mutually describes all of those risks. We actually encourage the contractor to have a go at pricing [our] risks as well as their own'* (P#2).

Another participant also commented regarding working relationships that *'relationship management, apart from the government's structures that are all already...in the contract, the rest of it is pretty much open for negotiation'* (P#3).

One participant stated that relationships with the external stakeholders who were involved in the project was mostly managed by the client's organisation with assistance from the contractor, whereas all the communications were managed by the contractor with assistance from the client once the contract was awarded and the constructor was identified. *'Nowadays...all the communications are being managed by [the contractor] only. We assist them, we go along with them to provide planned objectives... they take a [client's] personnel along with them... but most of the communication is done by them, so if there is anything that needs to be taken up to a higher level in [the client's] side, or something that needs to be smoothing, that can be done simply'* (P#6).

### ***Managing strategies assessment***

'Managing strategies assessment' category describes how clients measure and

evaluate the project performance resulted by the adopted strategies for risk, relationship and communication management described earlier. The category emerged from the participant's responses when asked how effective managing strategies can be measured. Since the project performance is a projection of the practicing management strategies, the assessment of the project performance represents the effectiveness of the practiced strategies.

Participant inputs exhibit a diversity of practices in project performance assessment, in a broad array of organisations. Participants provided complete explanations of the practices undertaken by them to measure and evaluate the project performance. The described process however was applicable to any projects generally and had very weak, if any, direct inherent links to ECI in particular or any other type of procurement method employed for the project. On the other hand, responses explicated an indirect influence of ECI in the assessment process due to a collaborative environment built as a result of the ECI process.

The majority of participants indicated that measuring and evaluating the strategies for relationship and communication management are 'challenging' due to the subjectivity associated with the assessment of the practices. One Participant suggested that there is a need for a structured 'governance mechanism' to measure and evaluate the quality of relationship and communication. *'There should be organizational/governance structures in place that pay attention to and monitor the quality of the relationship and the quality of communication, without inappropriately cutting across contractual boundaries. There should always be a high awareness of contractual boundaries, but there should be [also] groups in place with the charter to pay attention to what's happening, so that you can respond and deal with it without crossing all the contractual boundaries'* (P#13).

Some participants pointed out that the qualitative and quantitative 'Key Performance Indicators (KPIs)' developed during planning was the basis for measuring the project performance and they essentially ran through these quantitative and qualitative reviews on a regular basis for measuring the

effectiveness of the adopted strategies. *'We created an environment that, once a month, all of the senior site supervisors and management had a partnering session to check the health of the project. So we would check out safety performance, relationship performance, community performance and so on. We had a whole host of criteria that we measured'* (P#9).

Two participants stated that the effectiveness of managing strategies is demonstrated by the 'project outcomes' and therefore *'where you're delivering a project that you know you have not communicated very well if lots of risks come to bear, greater than what you had intended, then you've probably not had a particularly good risk management process. So really, the answer lies in what actually happened as a result of your processes'* (P#1).

Corresponding to the risk management strategy, some participants indicated that 'reviewing the value of risks' at the front end of the project and comparing that against the actual value at the back end of the project, was the measurement for evaluating the effectiveness of the adopted risk management strategy.

One participant indicated that since ECI was already a risk-adjusted model, the real measurement was looking at the number of variations that occurred in the project and exploring the question *'did the contractor make any savings and how?'* (P#3).

For another participant, risk management was a process of identifying, managing, communicating and handling risks. Therefore, effectiveness of risk management strategy could be measured by looking at the actual systems and processes in place to examine how they were documented, understood and communicated within the team. This included *'looking at the actual performances with evidence that the process was effective on specific cases of risk, that the system has yielded effective results and that certain risks have been avoided or the consequences of those risks unfolding have been mitigated eventually by virtue of the things that they have done'* (P#13).

In terms of relationship and communication management, some participants

indicated that since leadership practices influence the quality of relationship between the client and contractor, the relationship management strategies should be assessed through examining 'fundamental drivers of leadership'. These drivers include evidence from individuals working within the team at all levels regarding whether or not they feel 'empowered', have 'autonomy' over the work they do and have a certain sense of 'competence' and 'connectedness'. In other words, *'are they self-motivated in terms of whatever level they work in? Are they motivated to do more than just a job? Are they clear how their individual job links to the overall mission and the vision of the project? And do they feel they have clear 'accountability'?' (P#13).*

The majority of participants stated that they were conducting surveys on a regular basis amongst the stakeholders and evaluated the relationship and communication management strategies through peer reviews and feedback. *'You can do that with a survey, when you measure it, or you can get a score from 1-10; and if you get a 4 out of 10 then you might regard this as poor, if you've got a 10/10 you'd probably be pretty happy and if you get a 7/10 you'd probably work at it and regroup and say what would you like us to do to get to 10? What do we need to do? You work with them again. There you can measure any value added and you can do that on a regular basis. We've done that on numerous projects'* (P#1). For another participant, communication strategies were measured by looking at the quality of communication in the communication between team members.

### ***Improvement of managing strategies***

The category 'improvement of managing strategies' identifies the areas in which participants stated that the current practice strategy for risk management, relationship management and communication management falls short, and where there is some room for improvement towards the best practice strategies as a result of ECI. One participant argued that since the shortcomings of the current management strategies are caused not only by procurement but 'so many variable factors' in every project, it is not possible to explicate a single approach without considering all aspects of a project to make effective



improvements to the current practice.

Some participants identified 'diversity of the resources' as being critical in the project success and emphasised that there is a need for a diligent endeavour to acquire a wide variety of the skills by involving as many people with different skills and expertise as possible. *'You want your young people coming through, your graduates and that sort of thing, so they learned from that. They learned from working with designers, they learned from working with constructors, and they learned from working in those sorts of environments. Some highly experienced people as well, managing, and you also need some experts providing the right sort of inputs – whether they're estimators, or environmental people, or whatever. I think that's the secret – making sure there are enough resources in that phase, and difficult wide variety of disciplines, and a variety of different levels as well'* (P#11).

Some participants stated 'information management' is the area that needs to be improved in order to obtain 'sufficient' and 'targeted' information. One participant commented that the information requested by the client is not all utilised causing contractors to complain about the excessive amount of information that has to be submitted.

In terms of risk management, while some participants were of the view that using ECI repetitively with one contractor decreases the price of risk, one participant pointed out that it may not be possible to have many ECI projects as the scope of project needs to be appropriate for an ECI approach. Another participant asserted that the key for improvement in risk management is a 'better assessment of areas with high uncertainty' providing as an example, *'I think one area for improvement is to have a closer look at the geotechnical risks. Because most of the risks you're getting out of the ground... That's a grey area so you need to explore those sorts of issues more closely... I think we're learning that anything to do with geotechnical, you need to explore in quite detailed circumstances all the things that can happen. So if this happens the risk will be shared and if that happens not...so the geotechnical stuff is where you need to spend most of your – I would say not most but a lot of your risk management*

*studies'* (P#5).

Application of 'lessons learned' from previous ECI projects was indicated as the gap between the current practice and the best practice managing strategies. Commenting on this, one participant emphasised that *'what's the gap between what we're doing now and best-practice strategy; I think part of it is... lessons learned. I think we probably stumble into another ECI phase with a whole completely different team with none of the lessons learned'* (P#10).

For one participant, effective strategies for managing projects need to be demonstrated by both the client and contractor, which only happens in a collaborative environment where the client is well informed by the contractor and efforts to enhance the working relationship are made by both the client and contractor.

'Consistency in behaviours modelling' from top level management team throughout the team was also mentioned as an important factor in building a collaborative working relationship that the management team should focus on. *'We focus on the collaboration and working together and modelling... I think that consistency in modelling those behaviours from the top down is really important in developing those skills in our projects... I think the challenge is getting the best approach to the project operating on the client side and the contractor side. That often comes down to the personalities in the particular roles. If you have a client project manager and a contractor project manager who work tightly together and understand each other's risks and questions, you get a lot better outcome [than] when you sort of retreat to your corners and you only look out for your own team'* (P#2).

Lastly, one participant acknowledged the BS11000 as the guideline for the best practice strategy for managing the project collaborative and suggested that the current strategies should be measured and evaluated against BS11000 standard and there should be an endeavour to incorporate features of it in the ECI framework.

## **5.4. Summary and Initial Conclusion in ECI Selection and Management**

One part of this research study aims to explore how clients make a decision to opt for selecting an ECI for a project, what type of people within the client's organisation are suitable to work in a project procured under an ECI framework, and how the managing strategies for risk management, communication management and relationship management would be effectively developed as a result of ECI process. Guided by the research objectives, the analysis of participants' inputs described in this section exhibits two distinctive process models.

The first process describes the decision on selection of ECI as the project procurement strategy; the second process refers to the decision for adopting the managing practices influenced by the ECI utilisation. The following chapter (Chapter 6) presents development of theory to explain each process separately.

## **Chapter 6: Theory Development**

The purpose of the following chapter is to present the development of theory based on the analysis provided in the previous chapter. As has already been discussed, the process of ECI selection and management by the clients pertains to two separate, yet interdependent processes of ECI selection, and the adoption and development of practices for managing the project once ECI is employed.

This research was designed to explore how and under which circumstances clients decide to use ECI, what preparations are required to successfully implement an ECI approach for a project and ultimately what strategies for managing risk, communication and relationship are utilised as a result of the ECI. The study takes a grounded theory approach in order to develop theories regarding the process of ECI selection and management for a project by clients.

The theory is a structured presentation of the categories to highlight the relationship among them in an effort to articulate a coherent argument (Dick 2007). The results of this doctoral study led to the generation of two frameworks explicating each process. In order to present the frameworks clearly and understandably, each model is illustrated by a number of conceptual vignettes in the visual graphical forms.

The following sections provide an overview of the analysis that was conducted in developing the proposed models. The first section expands on the findings to explore the selection of ECI for a project and the identification of the concepts and categories that influence the core categories leading to formulating a model for selecting ECI. The second section explores the results of the process of managing ECI through the life cycle of a project leading to development of a model for managing the ECI.

The findings of the selective coding suggest a management cyclical process model at different stages of the project life time. The first stage is the 'preparation' stage in which the client undertakes a series of action for making ready or being made ready for using ECI. The second stage is identified as the 'implementation' stage where the identified practices are required to put the

plan into effect when the project is being executed. This study looks at the managing practices through lenses of relationship management, risk management and communication management. The third stage is called the 'assessment' stage when the effectiveness of managing practises are examined and evaluated. Finally practices required during the 'reflecting' stage are identified in which the managing strategies are refined and improved based upon the lessons learned from previous experiences.

## **6.1. Selecting ECI**

The process of ECI selection, described by the participants, consists of two main consecutive stages. Similar to the general procurement selection process described by Morledge and Smith (2013), Love et al. (2008) and Luu, Ng and Chen (2005), in the first stage the criteria for selecting ECI are identified and in the second stage each criterion is compared against the ECI characteristics through a selection process approach.

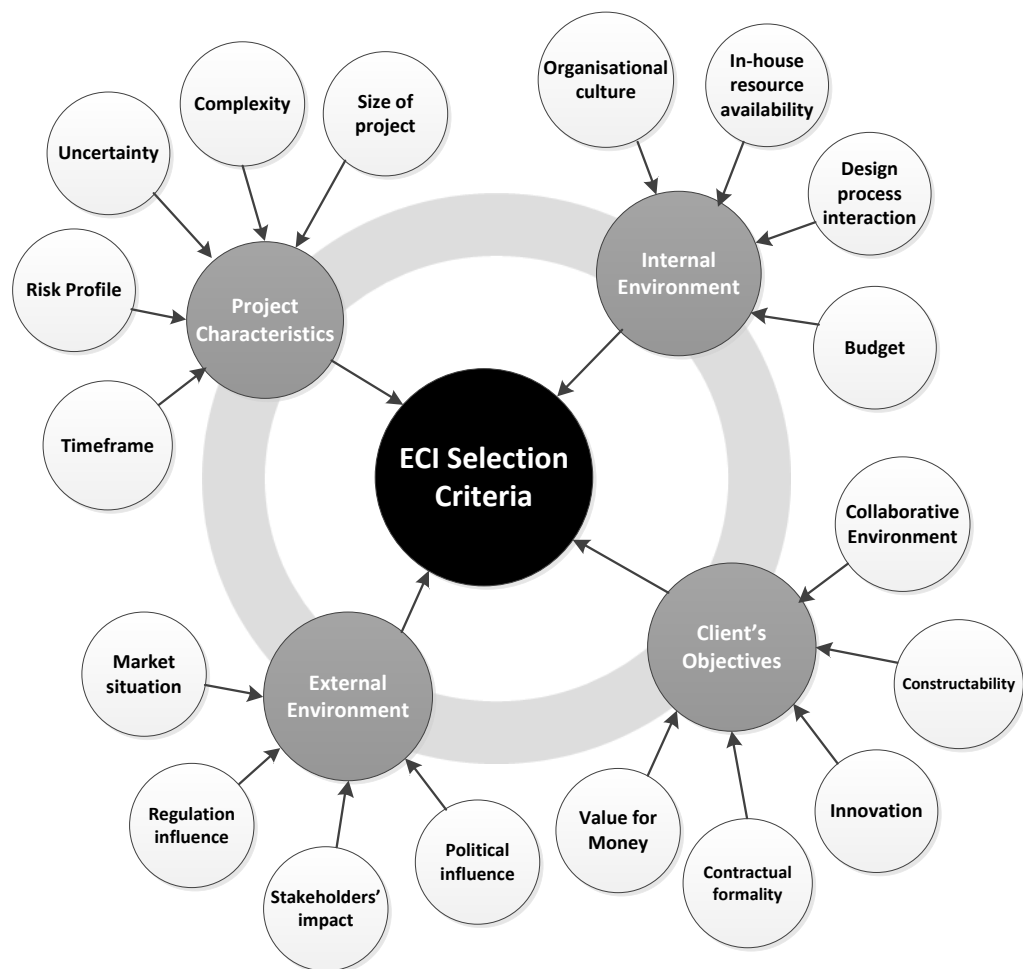
### **6.1.1. ECI Selection Criteria**

The criteria identified by participants are grouped into four separate clusters namely, 'project characteristics', 'client's objectives', 'internal environment' and 'external environment'. Unless these characteristics and requirements are clearly identified, it would be impossible to assess the benefits and weaknesses of ECI approach for a project. This classification also conforms to the underlying themes portrayed by Mohsini and Botros (1990), Ambrose and Tucker (2000) and Alhazmi and McCaffer (2000), however, an additional cluster of 'Internal environment' has been identified when clients are considering an ECI for a project.

It is noteworthy that the only criteria pertinent to the ECI in particular, have been identified in each cluster for this research study and hence the other procurement selection criteria proposed by several authors (Bennett 1985; Bennett & Grice 1990; Chege & Rwelamila 2000; Hewitt 1985; Love, Smith & Regan 2010b; Love et al. 2008; Love et al. 2011; Love, Skitmore & Earl 1998; Masterman 2002; Masterman & Duff 1994; NEDO 1985; Singh 1990; Skitmore &

Marsden 1988) are also considered during the ECI selection process.

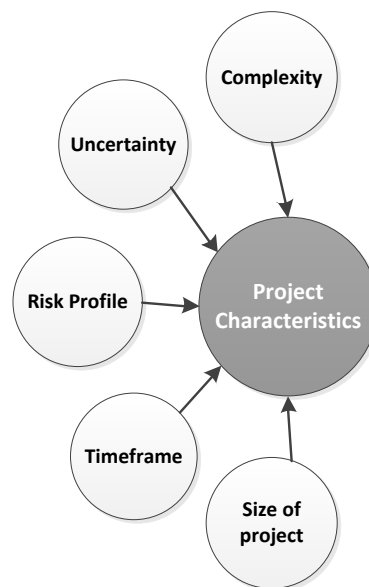
Although there was an effort to identify independent factors for selecting an ECI, it should be emphasised that an implicit interrelationship between the selection criteria exists (Luu, Ng & Chen 2005). Additionally, there are possible overlaps between some of the identified criteria. Moreover, classification of criteria is an artificial task and in reality clients use their experience and knowledge to identify these criteria. It is not possible to formulate which criteria should be considered separately by adoption of a simple set of rules due to the amalgamation of underlying factors in a construction project (Rowlinson & McDermott 1999). Figure 6.1 illustrates a conceptual model of the ECI selection criteria. The following sections explicate each element of the identified criteria cluster and incorporated elements.



**Figure 6.1.ECI selection criteria**

### ***Project characteristics***

Criteria related to the project characteristics address the factors inherent in the technical nature of the project. Participants identified a number of criteria that pertain to the project characteristics that they specifically consider when the case of ECI is an option for the project procurement method. These criteria include 'complexity', 'uncertainty', 'risk profile', 'timeframe' and 'size of project'. The ECI selection criteria related to the project characteristics is depicted in Figure 6.2.



**Figure 6.2. Criteria pertain to the 'project characteristics' cluster**

#### ***Complexity***

Complexity is identified by the participants as the main project related criterion for the selection of ECI. Complexity is the existence of interdependent variables interacting in a non-simple manner (Dörner 1996; Klakegg et al. 2010). In a complex situation, cause and effect are only known based on the experience and knowledge attained from the previous projects, with unpredictable outcomes in the future (Snowden & Boone 2007).

Participants stated that in the situation when there is a fairly high level of complexity, the use of ECI can benefit the project due to the joint risk

identification and assessment by the contractor and the client which caused substantial reduction in tender price reflecting the complexity involved in project delivery (Ma & Xin 2011). Nevertheless, participants emphasise that ECI is not suitable for projects with a very high level of complexity. Alliancing is the preferable option in this situation since there is an ongoing need for collaboration between the designer, contractor and client during construction (Edwards 2009; Ma & Xin 2011).

### *Uncertainty*

Participants asserted that the adoption of ECI is a strong option when a project is characterised by a relatively high degree of uncertainty in various forms, such as time, cost and scope. Uncertainty differs from risk in that it is an event or a situation which is not expected to happen regardless of whether or not it could have been considered in advance (Perminova, Gustafsson & Wikström 2008). Cost and time uncertainty are the situations when price and the stipulated time and knowledge of how much the client has to pay at each period during the construction phase are not clear and the project completion on the agreed date is not ensured (Luu, Ng & Chen 2005).

Scope uncertainty presents in a project when scope may be difficult to define due to the potential emerging factors unknowable at the start of the project, the possible occurrence of particular events or conditions which might affect the construction activities or the lack of a clear specification of what is required (Atkinson, Crawford & Ward 2006). In this situation the amount of works and efforts required to achieve the project objectives is not measurable and quantifiable. The use of ECI for a project with a relatively high level of uncertainty helps the client to remove or at least mitigate that uncertainty by exploiting the contractor's knowledge and experience which eventually leads to an agreeable realistic tender risk-adjusted price (AAA 2010).

It is worthwhile emphasising that uncertainty is a distinctly different concept to complexity (Baccarini 1996). Uncertainty refers to the ambiguous situations where there is probability of unexpected events (Howell, Windahl & Seidel 2010) whereas complexity is defined as 'the situation where patterns are in a



state of flux and there is uncertainty about how, why and when changes occur but highly expert people can understand the dynamics of these turbulent patterns' (Walker & Lloyd-Walker , P.47)

### *Risk profile*

Risk profile is a key factor influencing selection of ECI. Risk is the prominent criterion that will determine the selection of a procurement method (Hibberd & Basden 1996). Projects with high risk but smaller than a typical alliance project are more suited to an ECI approach. Types of risks identified by the participants are the typical project related risks affecting public sector projects including cost and time overruns, poor contract management, delays of tendering and selection procedures, and technical inadequacy (Baldry 1998; Ling & Hoi 2006). In addition, high level of complexity and/or uncertainty also creates a risk of excessive changes in the construction stage.

When risks are not initially well understood, early involvement of the contractor can assist in identifying the risks. Since risks in projects with a high risk profile have significant impacts, the knowledge and experience of the contractor is essential in early assessment of the risks in order to yield greater clarity about project risk. The fact that risk and reward go hand in hand also suggests that the contractor may be enthusiastic about securing opportunities to profit from the second stage's risk transfer regime (Li et al. 2005b).

### *Time frame*

When early completion of the project is desirable for the client, the choice of ECI is included in the potential project procurement options. Participants referred to the feature of ECI procurement method that offers better assessment of constructability and higher opportunity to select innovative methods for delivering the project. It leads to earlier completion of the project by accelerating project development and by avoiding delays in project delivery (Downer & Porter 1992; Li et al. 2005b). Time frame, therefore, is identified as one of the influencing factors in selecting an ECI. However, while ECI can be a solution for a project with a tight timeframe, there is a danger that the time

constraint forces the client to enter an ECI scheme with scant knowledge about the project resulting from inadequate upfront planning. In this situation, the client does not have the project completed earlier and the unforeseen changes by the client during construction and potential pertaining disputes cause delays in project delivery (Assaf & Al-Hejji 2006).

### *Size of project*

The project size is normally measured by its estimated value. The criterion of project size is identified by all participants. An ECI is considered for a project with a size that justifies the setup and management costs (Edwards 2009). In the scale of infrastructure projects, ECI is used for a medium value project between \$30 and \$100 million.

In most of cases the participant pointed out that the size of the project represents the extent of complexity. The larger the size of a project, the higher degree of complexity project managers expect of the project and vice versa. However, this is not always the case as some high value projects are technically straightforward and do not exhibit a high level of complexity (Baccarini 1996). On the other hand smaller projects may have a large number of interdependent variables interacting in a way that displays a high level of complexity. This is in-line with the Ludovic and Franck (2008) findings that the size of the project is a necessary condition for project complexity but not sufficient. That is the reason the criteria of complexity and the project size are separately identified, even though there might be interlinks between these two criteria.

### *Client's objectives*

The selection of a procurement system depends largely on the client objectives and requirements (Masterman & Duff 1994). In the case of ECI, participants identified a number of criteria representing the client's requirements that the use of ECI could more likely address compared to other procurement methods. These criteria include the need for demonstrating 'value for money', having 'formal contract', the need of 'innovation', 'contractability' considerations and establishing a collaborative environment. The ECI selection criteria related to the

client's objectives is depicted in Figure 6.3.

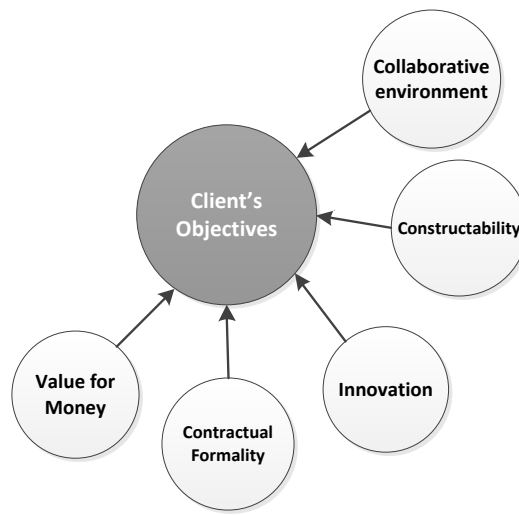
### *Value for money*

Value for Money for public sector clients is defined as interaction between system elements to improve the government policies and priorities while the best revenue for public expenditure is achieved (Bauld & McGuinness 2006). In a situation when demonstrating Value For Money (VFM) for clients is a fundamental objective, participants indicated that the use of ECI is preferred over pure non-price basis relational contracting such as Alliances. Most alliances, despite their popularity, fail to demonstrate value for money due to the lack of price competition in setting project costs (Davies 2008). Value for money is a comparative analysis of all relevant costs and benefits of each proposal throughout the whole procurement cycle (Australian Government 2015).

Clients can ensure value for money through utilising transparent approaches to price build up and the mechanisms that enable them to terminate the agreement with the contractor and obtain the prices from other contractors to complete the project (Edwards 2009). ECI is characterised by these two elements and hence even though demonstrating value for money is still a challenging step in an ECI process (Edwards 2009), it is a good procurement option for clients when value for money is one of the key criteria and a collaborative procurement approach is intended to be adopted together.

### *Contractual formality*

Despite a general belief that using a contract as the basis to manage the project activities might be counter-productive to the relationship (Ross 2003; Suprpto et al. 2015; The Secretary Department of Treasury and Finance 2006; Walker & Lloyd-Walker 2014), interestingly, the majority of participants indicated the tendency of having a formal contract as a criterion to use the ECI.



**Figure 6.3. Criteria pertain to the 'Client's objectives' cluster**

Although relationship based procurement encourages informal collaborative work relationship between parties instead of a working environment being ruled by a formal contract (Bayliss et al. 2004; Larson 1995; Ross 2003), the need for a contract is identified by participants as one of the client's objectives to opt for selecting an ECI.

When the project risks are able to be unfolded and the client is confident to obtain an acceptable risk adjusted price for the delivery stage, a lump sum contract incorporated in D&C type of procurement offers time and cost certainty (Love, Smith & Regan 2010b; Masterman 2002). Moreover, it specifies roles, responsibilities, remuneration scheme, distribution of risk, dispute resolution and conflict settlement procedure (Turner 2013; Turner & Simister 2001; von Branconi & Loch 2004). However, participants indicated that certainty resulting from a formal lump sum contract at the delivery stage is attained at the expense of undermining the quality of the working relationships initiated during the ECI phase and hence a careful trade-off is required when a decision for using ECI is made.

### *Innovation*

Participants described the instances when the client is aware of the inadequacy of the current in-house design capabilities, construction methods, process and technologies in order to meet their key objectives. In these circumstances, innovation is one of the client's objectives and hence a criterion to use the ECI

method (Nijsten, Arts & Ridder 2008). Innovation is not always desirable for clients since it is associated with a significant number of risks and extra costs as well as need for shifting to new technologies, changing the strategic methods and breaking out of practicing patterns of decision-making (Benmansour & Hogg 2002; Kuczmarski 1996). Nevertheless, when the client realises the necessity of innovation for achieving the project goals, they would seek a type of contract to facilitate the adoption of innovation. Several authors suggest that collaborative procurement methods would be more capable of delivering innovative ideas (Blayse & Manley 2004; Kumaraswamy & Dulaimi 2001; Walker & Hampson 2003). ECI, therefore, is considered by the clients when innovation is a key requirement.

### *Constructability*

The limited client's knowledge and experience of construction methods and materials, compared to the constructors (Song, Mohamed & AbouRizk 2009), draws the client's concern about constructability issues. Participants identified better constructability solutions as being the key feature of ECI due to exploitation of the project delivery contractor's expertise and advice much earlier in the construction project lifecycle (Walker & Lloyd-Walker 2012). In order to achieve overall objectives, clients need to use the construction knowledge and experience in planning, engineering, procurement and field operations effectively (CII 1986).

Participants indicated that the concern about constructability considerations becomes pivotal, when the project is characterised by a high level of uncertainty and required methods, techniques and technologies that are unfamiliar to the client. Participants also emphasised the importance of constructability considerations when innovation is required for the project and asserted that innovation improves constructability by introducing innovative methods, materials or techniques that the client's has not been familiar with. Nima et al. (2001) reinforce this view that 'Constructability will be enhanced by encouraging the constructor to carry out innovation of temporary facilities' (p.821).

### *Collaborative Environment*

Interestingly, the findings attributed to this study suggest that building a collaborative environment is one of the criteria to adopt the ECI contract for the clients who had experience of working in a type of relational contract in the past. The collaborative culture developed through engagement with a relationship based procurement approach has created a different way of working that set a collaborative ambience different to other traditional price-driven forms of project delivery. In such environment teamwork, trust and commitment is encouraged and all parties seek to overcome uncertainty through developing and nurturing the cooperation mentality (Walker & Lloyd-Walker 2014a). Admittedly, participants stressed the necessity of a collaborative working environment in which trust and transparency values dominate, when dealing with high levels of uncertainty and complexity.

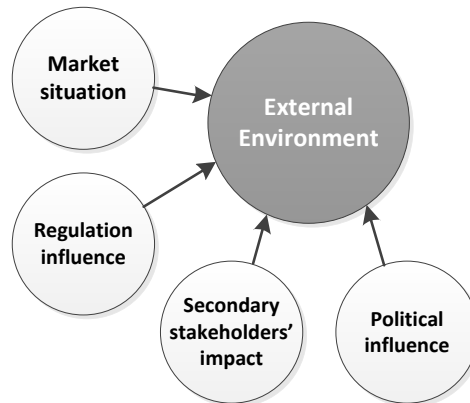
### ***External environment***

External environment refers to the factors outside the control of the project and the engaged participant organisations that influence the decision to select the ECI for a project by the clients. These surrounding factors do not directly affect the decision making process but because they have a significant impact on the project, clients also need to consider them as the selection criteria (Alhazmi & McCaffer 2000). The external environment's criteria in selection of ECI identified by participants include 'market situation', 'regulations influence', 'secondary stakeholders' impact' and 'political influence'. Figure 6.4 illustrates the external environment's criteria for selecting ECI.

### *Market situation*

Market situation refers to the demographic, economic and political factors influencing the demands for the construction projects (Parliament of Australia 2015). In a highly competitive market, contractors compete against each other to win the contract. Competitions incentivise contractors to be innovative and efficient to obtain the competitive advantage (Tatum 1987). On the other hand, in the downturn economy clients are eager to award the contract on a lowest-

bid basis which causes an increase in the danger of tendering at the cut-throat level as contractors strive to remain in survival mode and are desperate to retain some level of turnover (Hughes et al. 2001; Partnership 2013).



**Figure 6.4. Criteria pertain to the 'External environment' cluster**

Market situation is identified as one of the critical criteria that clients look at when making the decision to select ECI. Participants indicated that in a competitive market, using ECI can increase the opportunity to attain innovative solutions as the innovation is one of the qualifications that the client requires contractors to demonstrate in order to win the contract. However, consideration should be taken to appoint the most competent contractor, who is sufficiently qualified to fulfil the project objective, through a careful designed pre-qualification selection process.

#### *Regulation influences*

Selection of a procurement route for public projects is dictated by the governmental procurement regulations. In Australia, Australasian Procurement and Construction Council (APCC) is the peak council of government departments and authorities responsible for procurement, construction and asset management policy for the Australian State and Territory Governments (see <http://www.apcc.gov.au>). Their regular seminal publications provide the procurement selection guide and principles mandating the public clients to follow at the procurement selection stage. In addition, each state government

also specifically develops the procurement guides enforceable within their state jurisdiction (for example, see Procurement Guidance Series published by Queensland Government Chief Procurement Office). Participants described that, depending on the type and size of projects, the use of ECI is largely instructed by the rules, regulations, procedures, work processes and codes of practice and hence the influence of regulations is identified as one of the factors influencing the decision to adopt an ECI.

#### *Secondary Stakeholders' impact*

A stakeholder is any individual or group with the power to be a threat or a benefit (Gibson 2000). Secondary stakeholders, as opposed to the primary stakeholders, are those who do not have a formal, official or contractual relationship (Bucholtz & Carroll 2003) and hence have indirect influence on the project. However, since the secondary stakeholders still have the inherent potential to significantly affect the project and involved parties, it is essential to take their interests into account as well (Gibson 2000). The secondary stakeholders' impact on the selection of procurement is also emphasised in literature on procurement management such as Morledge and Smith (2013), Masterman and Duff (1994), Singh (1990) and Luu, Ng and Chen (2005).

Participants emphasised the need for considering the secondary stakeholders' interests such as non-governmental organisations, activists, unions, communities, the public and governments (Waddock, Bodwell & Graves 2002) when selecting ECI as the project delivery model. In a complex and risky project with a large number of stakeholders who need to be fully informed and managed, clients find ECI a chance to work with them through the design phase to satisfy the requirements, and get the job priced and programmed around the constraints.

#### *Political influences*

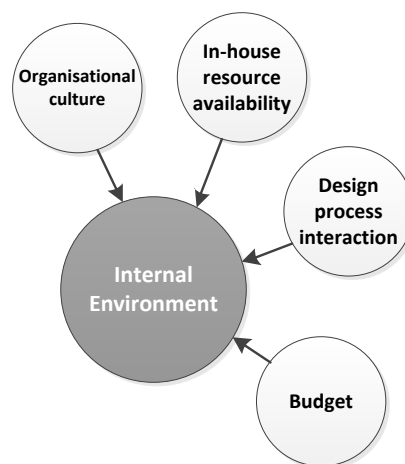
The use of ECI is largely influenced by the political climate. Participants pointed out that political issues guide the client to choose the procurement method. Many authors also recognise the pervasive impact of politicians and political



activities on the project procurement process (Hughes 1989; Murray 2009; Rowlinson & McDermott 1999; Walker 2015). The political criterion is concerned with government policies and the effect of political decisions on the projects (Gordon 1994; NEDO 1985). Political influence was seen as negative when the use of ECI is enforced based on the unrealistic project timeframes dictated by political reasons.

### ***Internal environment***

The emergence of 'internal environment' is due to the relational nature of the ECI system in which the client's engagement at the front end of the project is essential. Internal environment, as opposed to the external environment, refers to the factors within the project and involved parties' environment, both the soft factors relating to the human dimensions and hard aspects relating to the contractual and financial issues. The analysis of the interviews identified four main criteria for selecting ECI contractual model pertain to the internal environment cluster including 'organisational culture', 'in-house resource availability', 'design process interaction' and 'budget'. Figure 6.5 illustrates the internal environment's criteria for selecting ECI.



**Figure 6.5. Criteria pertain to the 'Internal Environment' cluster**

### *Organisational culture*

The procurement selection process is significantly influenced by the underlying culture of the organisation (Love et al. 2008). Interestingly, participants outlined the assessment of their own organisational culture to ensure their readiness for adopting a relational contract as important activities prior to selecting a relationship based procurement method such as alliancing and ECI. Although the benefits of a collaborative working relationship are acknowledged, the intra-organisational culture for working in such an environment needs to fit with these types of relationship. The innate culture of uncertainty avoidance and the inherent reluctance of experienced professionals in changing the working style compromise the potential benefits that a collaborative working relationship can offer (Walker & Lloyd-Walker 2014). The predominant culture of an organisation is identified as being an important influencing factor in selecting ECI that clients need to take into consideration.

### *In-house resource availability*

The factor of in-house resource availability has a key role to play when a procurement method is selected by the client. Clients should assess their capability to use their own resources to be able to accomplish their project (Luu, Ng & Chen 2005). Participants outlined that the potential for the use of ECI is higher when the clients recognise either the inadequacy in the level of competence of the staff for that particular project or the lack of required speciality and skills for undertaking the project. Although numerous procurement methods can address the client's resource inadequacy (i.e. managing-oriented methods and partnering), the use of ECI is preferable when the pre-construction service from the contractor is of the client's essential need due to the complexity and uniqueness of the project (Gordon 1994).

### *Design process interaction*

The degree to which the client wants to be involved in the design is another criterion related to the client's internal environment. The client needs to assess how much interaction they want to have with the design teams during the

design of the project. Participants pointed out that the level of the client's involvement in the design depends on the innovation in the design and the client's design capability for that particular project. According to Gordon (1994) this interaction is normally important for the clients when the design is intended to be highly creative or the ability of the design to serve a function is essential. Participants indicated that the use of ECI is their preference when they require complete interaction and control over the design; however the client's understanding of the design process is of paramount importance to ensure that their involvement leads the design to the desired outcomes.

### *Budget*

Participants asserted that the use of ECI requires the client to have sufficient funding to be able to pay the contractor on a regular basis. If the client has funding constrains the privately funded procurement methods, i.e. PPP, is preferable over ECI (Gordon 1994; Li et al. 2005a). On the other hand, for projects with a restrictive budget, participants outlined that the client is unlikely to have the project scope developed adequately through a traditional hard dollar contract. Rather, the use of ECI gives the client the opportunity to utilise the contractor experience and knowledge to develop the scope with the minimum redundancy in order to tailor the scope to meet the available budget.

Table 6.1 demonstrates the ECI selection criteria identified by the participants.

As can be seen in the table, the majority of the criteria identified by the participants are related to the project characteristics. Amongst the project characteristics criteria, the 'risk profile' criterion has been identified the most whereas 'size of project' and 'time frame' were identified the least.

'Uncertainty' and 'complexity' were identified by an equal number of participants. The criteria 'client's objectives', 'external environment' and 'internal environment' received almost the same attention from participants. 'Innovation' is the criterion that received the most attention within the client's objectives.

**Table 6.1. Underlying criteria influencing the selection of ECI**

Criteria	P # 1	P # 2	P # 3	P # 4	P # 5	P # 6	P # 7	P # 8	P # 9	P# 10	P# 11	P# 12	P# 13	P# 14
<b>Project Characteristics</b>														
Complexity	✓		✓	✓	✓	✓	✓	✓				✓	✓	✓
Uncertainty		✓	✓	✓		✓		✓	✓	✓	✓		✓	✓
Risk Profile	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓
Timeframe	✓					✓	✓	✓	✓	✓	✓	✓		
Size of Project	✓	✓	✓	✓		✓						✓		
<b>Client's Objectives</b>														
Innovation	✓	✓	✓			✓						✓		✓
Constructability	✓		✓				✓	✓						
Contractual Formality										✓	✓		✓	✓
Value For Money						✓	✓					✓	✓	
Collaborative Environment							✓		✓	✓				
<b>External Environment</b>														
Market Situation	✓		✓	✓		✓								
Regulation Influence			✓	✓							✓		✓	✓
Political Influence			✓			✓							✓	
Stakeholders' Impact	✓					✓		✓			✓		✓	✓
<b>Internal Environment</b>														
Organisational Culture			✓	✓				✓						
In-House resource availability	✓		✓						✓	✓				
Design process interaction			✓	✓							✓			
Budget			✓		✓	✓					✓	✓	✓	

This is not surprising that one of the most appealing features of ECI is perceived as improving the innovation by involvement of the contractor during the design development, which enables innovative ideas to be introduced and evaluated. In situations when innovation is required for a project, clients consider to utilise an ECI for their project. The influence of other client's objectives criteria on selection of ECI is identified almost the same.

In the case of internal and external environment, all identified criteria have been reported nearly the same. The overall results suggests that clients are prone to utilise those characteristics of ECI delivery systems that can address the project-related constrains better compared to the other criteria in different categories.

### **6.1.2. ECI Selection Practices**

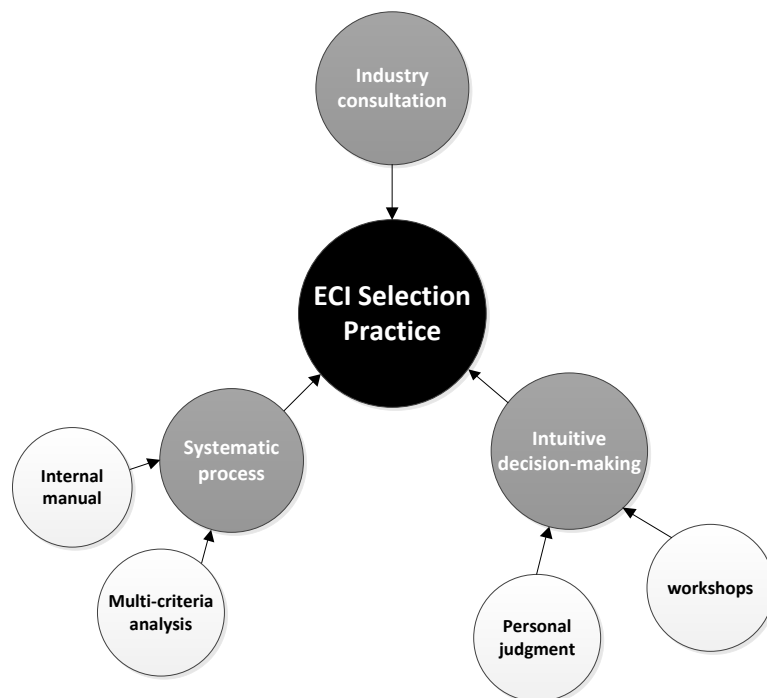
After formulating the selection criteria, clients evaluate the suitability of the ECI for the project in order to meet the identified criteria. The approach by which the selection process takes place differs in each organisation. The analysis of the participant responses led to identification of three main approaches that clients employ for selecting an ECI.

Some organisations use a systematic process when selecting their procurement method including ECI while some others rely on the key decision makers' intuitive judgment and utilise a subjective approach. The third approach is also identified when clients are not able to choose the appropriate procurement route internally and/or prefer to make the decision based on the industry consultations. It is worth noting that all mentioned approaches are acceptable and can be effective if practiced correctly. The literature on the procurement selection models also supports the findings of this study.

Some authors advocate the use of systematic approaches for selecting the procurement system and attempt to design and develop a structured process accordingly (Alhazmi & McCaffer 2000; Ambrose & Tucker 2000; Bennett & Grice 1990; Brandon et al. 1988; Chan et al. 1994; Chan et al. 2001; Cheung et al. 2001; Cook, Johnston & Kress 1993; Dell'Isola, Licameli & Arnold 1998; Franks 1990; Kashiwagi & Byfield 2002; Liu 1994; Love 1996; Love, Skitmore & Earl

1998; Luu, Ng & Chen 2005; Mohsini & Botros 1990; NEDO 1985; Newcombe 2000; Ng et al. 2002; Okunlola 2012; Ratnasabapathy & Rameezdeen 2007; Seydel & Olson 1990; Singh 1990; Skitmore & Marsden 1988; Touran et al. 2009; Zavadskas et al. 1996).

While some others recognise the subjectively driven approaches for selecting the procurement method based upon the decision makers' personal knowledge, expertise and experience (Love et al. 2008; Ng, Luu & Chen 2012). Ng, Luu and Chen (2012), Gameson and Masterman (1994) and Gordon (1994) also acknowledge the use of external consultant's advice on the selection of procurement. Figure 6.6 illustrates the selection approaches towards the adoption of ECI.



**Figure 6.6.ECI selection approaches**

### ***Systematic process***

Systematic process approaches refer to any methods where personal judgments have the least influence on the decision making process. This includes either a formal written instruction within the organisation that requires the decision makers to follow or a structured objective mechanism that normally relies on a set of numerical utility rankings. In the latter methods each criterion is assigned

a score and a weight and then through a number of mathematical-based calculations, each option finds a rank. The delivery method with the highest rank should be chosen for the project. Some participants asserted the need for such a structured process and indicated that they had a systematic formalised method in their organisations to select the ECI. It is supported by many academic and professional bodies who emphasise the need to conduct a selection process in a systematic and disciplined manner by clients (Alhazmi & McCaffer 2000; Brandon et al. 1988; Cheung et al. 2001; RICS 2000; Skitmore & Marsden 1988).

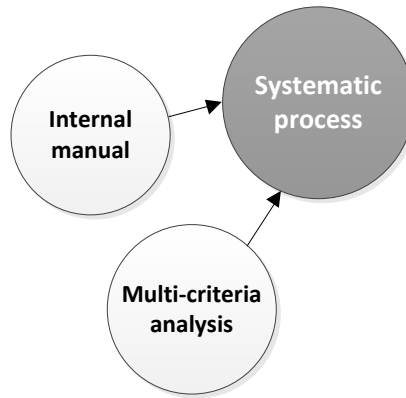
Moreover, responding to this demand, development of a plethora of models is intended to assist decision makers in selecting the most appropriate procurement method for a particular project through an objective based approach (Love, Smith & Regan 2010b). The main purpose of development of these tools and techniques is to avoid the selection of procurement methods for a project on a subjectively driven basis. The decision makers' personal bias can mislead the selection of the procurement method towards the individual's preferred method rather than the best method for the sake of the project.

The outcome worsens when it is coupled with a lack of adequate knowledge and experience of the decision makers about the differences between various procurement methods which is not uncommon within the professionals in the construction industry (Bowen, Hindle & Pearl 1997). Two approaches were identified by the participants that were employed in their organisations for selecting the project procurement method including 'multi-criteria analysis' and 'internal manual' within their organisations. The systematic approach along with the identified methods, are depicted in Figure 6.7.

#### *Multi-criteria analysis*

The multi-criteria analysis (MCA) approach is often utilised in an effort to assist decision makers to solve the selection problem or to facilitate the decision making process on selection of an alternative. "This approach often requires the decision makers to provide qualitative and/or quantitative assessments for determining the performance of each alternative with respect to each criterion,

and the relative importance of evaluation criteria with respect to the overall objective' (Kuo, Liang & Huang 2006 , p.269).



**Figure 6.7. 'Systematic process' approaches**

Having adopted the classical MCA principles in the construction industry, a plethora of tools and techniques have been developed in an attempt to simplify or to rectify the shortcoming of this method in selection of a procurement system for a project. These tools range from basic mathematical discriminant analysis (Skitmore & Marsden 1988) to more sophisticated methods such as analytical hierarchy process (Mahdi & Alreshaid 2005; Saaty 2000). Although the practicality and/or applicability of these tools and techniques is treated with scepticism (Ng et al. 2002), the finding of this study revealed that the majority of the participants have used one of the multi-criteria analysis techniques in their organisations for selecting ECI procurement system for their project.

#### *Internal manual*

Internal manual refers to published documents acting as a guideline in the organisation to instruct the decision makers to choose a certain procurement method through a defined process based upon some particular criteria. Some participants indicated that the selection of the procurement method in their organisation is largely dictated by these internal manuals. However, the internal manuals only respond to certain criteria and are only sensitive to more tangible factors, the chief amongst which are the value and the size of project. For



example, the use of a relationship based procurement (RBP) method is only considered when the project size and value is perceived as medium or high.

A project in that ballpark seems to be complex enough that it is suitable to run a relationship based procurement method such as ECI. Nevertheless, the internal manuals generally fail to address the non-tangible essential criteria such as the importance of state of the art innovative solutions (Hobday, Rush & Tidd 2000), the value of developing a mutually trusting relationship (Walker & Lloyd-Walker 2014b) and the value of knowledge sharing and exchange (Walker, Maqsood & Rowlinson 2008) when selecting a procurement method for the project.

### ***Intuitive decisions-making***

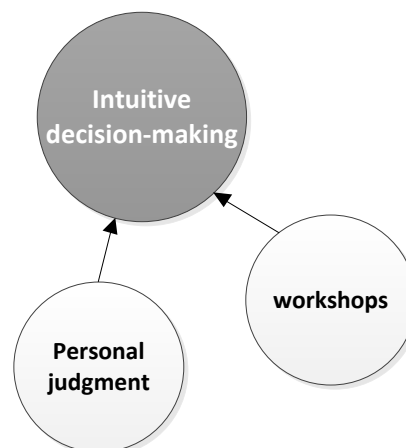
While systematic objective approaches generally fulfil their intended purpose of rationalising procurement selection decisions (Luu, Ng & Chen 2005), they fail to address the implicit subjectivity inherent in some of the procurement selection criteria. A study conducted by Ng et al. (2002) with a number of government organisations in New South Wales (NSW), Australia, shows that except for time and cost certainty, the rest of identified procurement selection criteria, including speed, complexity, flexibility, responsibility, quality level, risk allocation and price, are subject to the decision makers' perception and judgment, and hence fuzzy in nature.

Despite the diligent efforts by many researchers in an attempt to translate the subjectivity of the criteria into more objective factors (Love, Smith & Regan 2010a, 2010b; Ng et al. 2002), the final decision is a matter of decision makers' judgement and influenced by subjective views about what is important and what it is not (Love, Smith & Regan 2010a). In addition, some clients feel uncomfortable with their reliance upon quantitative decision modelling (Rowlinson & McDermott 2005). In the case of ECI, some participants pointed out that they had no 'clinical' solutions for the selection of the procurement system in their organisation. Rather, they selected ECI based on their own judgments with reliance on their knowledge, experience and/or the intuitive feeling about constraints and the environment obtained through a number of

discussion meetings and workshops. The findings of this study, therefore, identified two main approaches described by the participants reflecting the intuitive decision making approaches including 'personal judgment' and 'workshops'. Figure 6.8 illustrates the identified approaches under the intuitive making decision method for selecting ECI for a project.

### *Personal judgment*

Since it is generally argued that the key decision makers have limited knowledge about the different procurement methods (Bowen, Hindle & Pearl 1997), selection of the project delivery system is significantly influenced by the decision makers' familiarity and comfort with a method they have already been used (Mosey 2009). However, due to a proliferation of the number of methods available to enable the procurement system to be adjusted to the clients' circumstances and requirements (Love, Skitmore & Earl 1998), the selection of a procurement method in a cursory manner based on the individual's judgment or the conservative decisions of the in-house experts may give rise to the selection of a suboptimal procurement system (Ng et al. 2002; Ng, Luu & Chen 2012).



**Figure 6.8. 'Intuitive decision-making' approaches**

On the other hand, it is recommended that procurement selection decisions should be made based upon the success or failure of previous similar examples and coupled with intuition in an effort to achieve the distinctive requirements of

the current situation (Luu, Ng & Chen 2005; Masterman 2002).

The finding of this study also shows that in organisations with no systematic procurement selection process, the selection of ECI is predominantly dependent on the decision makers' personal judgment which is largely influenced by past experience. When the overall perception of previous projects procured under an ECI was reported as satisfactory, the chance of using of ECI is increased. Similarly, if the previous projects had underwhelming outcomes, decision makers opt for adopting another procurement alternative even though a compromise of some benefits is acknowledged.

### *Workshops*

Workshops are identified as another approach for selecting an ECI. When the influencing stakeholders' insights on the adoption of ECI or any other procurement methods is of paramount importance, organisations that have not implemented a structured procurement selection process run stakeholders workshops.

There are also instances when despite the existence of a structured selection process, the stakeholders' workshop is run for the purpose of identifying and analysing the key criteria. The stakeholders who influence decision-makers are to make an assessment of all the circumstances of the project, all of the risks that the project is likely to face and the opportunities, across all of the normal areas of risks including technical, environmental, political, safety, stakeholder and all the usual areas. The workshop participants share their knowledge and information and then discuss and negotiate about the project constrains, objectives and the criteria as well as value management and risk aspects (Luu, Ng & Chen 2005; Rowlinson & McDermott 2005).

There might be different opinions amongst the stakeholders which through iterative negotiations, the general consensus is taken in regards to identifying project key criteria required for the selection of a procurement method. In instances when no formalised process is utilised in the organisation a joint decision of the stakeholders ultimately leads to selection of the delivery system

for that project.

### ***Industry consultation***

The last approach described by the participants refers to the situations in which the client seeks external advice to bridge their knowledge gap due to either inadequacy of the required knowledge and experience of the in-house resources or the need for expert advice of specialists particularly for a complex and risky project (Gameson & Masterman 1994). The client appoints the expert consultants to advise on the project criteria, client's requirements and special management requirements. Their advice serves the basis for selection of procurement (Ng, Luu & Chen 2012). The client then has two options to select the procurement method for the project. The first option is continuing the external consultant services to choose the procurement system and the second option is to rely on their in-house expert's knowledge and experience to determine the most appropriate procurement system for the project.

Some participants also described that their in-house capabilities were sufficient for analysing the project characteristics, objectives and identifying the main criteria however they lack enough information about the available delivery options. The external consultation was sought in their organisations after defining the selection criteria for the advice on the weakness and strength of each procurement alternative. One of the participants explained that *'We wouldn't go to an industry with no idea of how we thought it is best delivered. We would normally have a reasonably strong opinion about which way we wanted to go in terms of procuring that utility, or we engage with [consultants in the industry]'* (P#2).

No additional decomposition could be identified for the industry consultation approach from the data, therefore it does not have its own separate diagram.

Table 6.2 illustrates the ECI selection practices identified by the participants

**Table 6.2. ECI selection practices**

Selection practice	P# 1	P# 2	P# 3	P# 4	P# 5	P# 6	P# 7	P# 8	P# 9	P # 10	P # 11	P # 12	P # 13	P # 14
Systematic process														
Multi-criteria analysis	✓		✓			✓		✓				✓		✓
Internal manual		✓												
Intuitive decision making														
Personal judgment				✓			✓		✓	✓		✓	✓	✓
Workshops						✓							✓	
Industry consultation														
Industry consultation		✓											✓	

**6.1.3. Prospect and Selection of ECI**

The theory developed so far articulates the ECI selection criteria and the ECI selection practices within the process of selection of ECI by clients. While the results presented within this chapter help identify the phenomena that emerged in exploring the ECI selection process, this component of the findings has yet to address the question as to why clients opt for adopting ECI amongst a plethora of procurement alternatives and an array of methods associated with them. Although the ECI selection criteria were necessary for selecting an ECI, they on

their own were not seen as sufficient to fully influence a decision to lead the client to selecting the ECI, since a range of delivery methods can respond to those criteria as well. In addition, when participants were asked about the core differences between ECI and other relationship based procurement methods, the majority of them stated that both methods are fundamentally similar and the rest didn't provide any solid differences. This shows that even the ECI is selected intuitively; there should be other drivers for the decision makers toward the adoption of ECI.

In this situation, if the external rules and policies do not dictate the choice of a particular delivery system, clients normally have a tendency for using the procurement method that they are more familiar with and are satisfied with the outcomes in the previous jobs (Love et al. 2008; Masterman 2002; Mosey 2009; Ng et al. 2002). However, in selecting an ECI, it was not always the case. For instance, clients with a successful track record in utilising traditional procurement methods or Alliances have made a decision to adopt an ECI for their project. The described practices clearly influence the selection of ECI, but not in all. What ultimately emerged, after a considerable period of reflection and analysis, was the concept of *prospect*.

The underlying characteristics inherent in the nature of an ECI process propose distinctive perks that attract clients, even though they may be not the essential criteria of the project. Recognising the influence of prospect was complicated by the way in which it was manifested in different contexts. There were instances in which the clients preferred the use of ECI over the other alternatives in an effort to gain tangible benefits pertinent to the financial and technical aspects of the project. In some other circumstances the intangible, relationship oriented benefits were the drivers for clients to choose ECI, and for some clients both tangible and intangible benefits were the motivation. However, prospect was identified as being limited based upon the identified selection criteria to adopt a procurement system. In other words, prospect was never the sole means by which decisions were actually influenced. While the influence of prospect was inferior, however, awareness of it as a concept was constantly present. Prospect became the substantial concept that incorporated through all of the participant

descriptions in some manner and form.

*Prospect theory* is introduced by Kahneman and Tversky (1979) as a descriptive model of decision making under risk and uncertainty that explicitly incorporates irrational behaviour in an empirically realistic manner (Kahneman 2003). In other words the theory explains the economic behaviour with less emphasis on rational assumptions.

Although generation of prospect theory was first aimed to explain the decision behaviours in the economic environment (Kahneman 2003; Kahneman & Tversky 1979, 1984, 2000), it has been applied to a variety of other fields such as political science (Levy 2003; McDermott 2004; Mercer 2005), gambling (Barberis 2012; Conlisk 1993; Law & Peel 2009; Thaler & Johnson 1990) and insurance (Dichtl & Drobetz 2011; Schmidt 2012; Schoemaker & Kunreuther 1979).

In the context of this study, the concept of prospect that is being utilised is that proposed by Kahneman and Tversky (1979), nevertheless, the theory mainly focuses on the economic analysis of the decision-makings and fundamentally relies on the mathematical calculation of probabilities and risks. While this study employs the theory for explaining the selection of ECI, the application of the theory in this study is limited to essential features pertinent to the purpose where the axioms of the theory can explicate the choice of ECI by clients. The main purpose of using the theory is to explain how the offered prospects influence the procurement decisions towards the choice of ECI when the situation is characterised by uncertainty.

#### *Explaining the rationale for adopting ECI from perspective of 'prospect theory'*

Building on prospect theory, Tversky and Simonson (1993) noted that preferences between two options are often affected by whether there is an attractive third option that might be available as well. In their description of extremeness aversion, they noted that 'the attractiveness of an option is enhanced if it is an intermediate option in the choice set and is diminished if it is an extreme option' (Tversky & Simonson 1993 ,P.281). In other words, a choice

between extreme options is less attractive than a choice between moderate options. It is easy to see how this might play out in a choice between traditional procurement methods as the extreme end of risk transfer, and Alliances as the other extreme end of the pure risk sharing but the choice of ECI as a more moderate procurement choice tends to prevail. This explanation is in line with Edwards (2009) by arguing that the creation of ECI was a response to the need for contracting strategies 'that follow a collaborative approach without moving radically from the traditional forms of contract' (p.4).

#### *Control as the potential gain in utilising an ECI*

In order to fully develop the construct of prospect, it is important to explore the drivers and factors that support the creation of it. The insights gained within this study indicate that the creation of prospect is the result of a number of the innate characteristics of ECI to moderate the risk and uncertainty for clients. Within the finding of this study, the potential effects of ECI on the clients' procurement decisions in risky and uncertain situations were explored.

Several authors such as Rahman and Kumaraswamy (2002), Voordijk, de Haan and Joosten (2000), Walker and Lloyd-Walker (2014b), Eriksson (2006); Eriksson and Laan (2007) investigated procurement and inter-organisational relationships in construction through the notion of Transaction Cost Economy (TCE) developed by Coase (1937). The client's decision on the selection of ECI, described by the participants in this study, was also well supported by the assumptions and conceptual arguments of the governance mechanism, raised by the TCE theory.

The decision to adopt an ECI is made in a condition when the project encounters fairly high complexity with prediction of noticeable alterations. In the beginning of the project, the client is not able to fully measure goal attainment, and does not know the appropriate action to achieve the goal. In such circumstances, the early collaboration of the contractor in the design development is advocated (Abrahams & Cullen 1998; Ng, Luu & Chen 2012; Walker & Hampson 2003; Walker & Rowlinson 2008) to obtain the advantages and synergies of cooperative relationships through the early establishment of trust (Aulakh,



Kotabe & Sahay 1996). However, when the project complexity is not too high and the uncertainty associated with the project can be managed and unfolded, clients are more likely to choose a more conventional procurement method. It enables them to gain greater control over the target price and the entire contractual process in an attempt to absorb uncertainty and avert dependency risks (Dekker 2004; Emsley & Kidon 2007; Van der Meer-Kooistra & Vosselman 2000). Gaining control in the entire project process, therefore, was found as the main factor that moderates an ECI procurement approach amongst the other extreme methods that focus solely on either transfer of risks to one party or sharing between project participants. To fully understand the concept of control in the ECI process, it was further investigated from the TCE perspective within three main governance mechanisms of price certainty, contract formalisation and trust in order to illuminate how different types of control are facilitated by utilising an ECI.

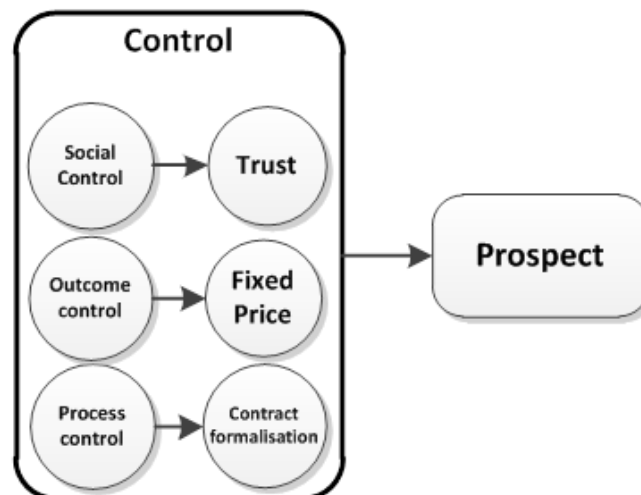
When defining the project scope is difficult due to the uncertainty associated with the project and the client lacks the necessary knowledge and skills to utilise appropriate actions to achieve the goal, *social control* through facilitating trust and commitment, is the most efficient instrument (Das 2001). If the client is able to define the project scope and possesses sufficient knowledge and skills to employ appropriate methods to achieve the goal, the use of a formal contract with more comprehensive contractual specifications and managerial arrangements, is favourable (Das 2001).

More specific clauses in a formal contract make it more legally binding with higher enforcement power (Woolthuis, Hillebrand & Nooteboom 2005). Greater control over process is obtained when the transaction is governed by authority (Hennart 1993). Therefore, clients intend to gain *process control* when the project and the target price are governed by a standardised or formal contract (Eriksson & Laan 2007).

Lastly, in projects in which the scope is able to be specified and the target goal can be defined but the client has limited knowledge to monitor the transformation process, measuring and monitoring the results or outcomes

produced by the contractor can ensure the attainment of the client goals (Aulakh, Kotabe & Sahay 1996; Das 2001). In this situation, Eriksson (2006) pointed out that clients are more likely to utilise a strategy that gives them greater control over the price which is closely related to the *output control*.

Figure 6.9 below illustrates the primary components constituting the control from perspective of the prospect construct. This is evident that the tenet of ECI that focuses on the three governance mechanisms of price, contract formality and trust together in different stages of the project, enables the client to achieve all three forms of control. The social control is facilitated at the front-end of the project by establishing a collaborative relationship based upon trust and commitment between client and contractor. Process and output control are enabled during the detailed design and delivery stage by adoption of a traditional standardised contract (i.e. D&C or C only) where the project is governed by a formal contract and a lump sum fixed price is determined. The higher control on all stages of the project process reduces the extent of uncertainty and risks, which makes the ECI more attractive to the clients as a more moderate option compared to the other procurement alternatives.



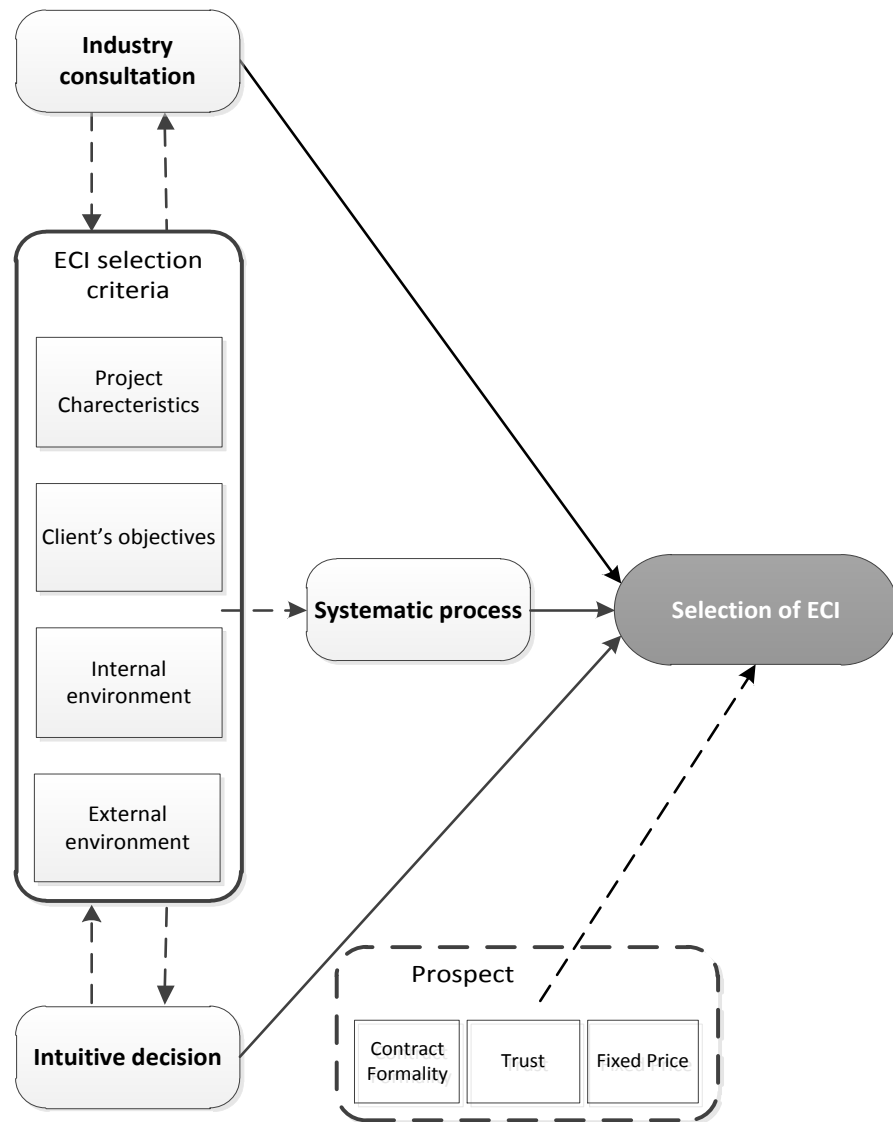
**Figure 6.9. Attainment of different types of control by using ECI**

#### **6.1.4. Formulating the model for selecting ECI**

While the individual relationships between categories have been explored in detail in the previous sections within this chapter, they are now presented as an integrated, consolidated whole. The graphical presentation helps the model become more clear and vivid (Maqsood 2006). Figure 6.10 shows the theory in form of model for easy understanding and visualisation.

The essential features of the model are as follows:

- The decision to select an ECI for a project is predominantly guided by the identified selection criteria. The main category of 'ECI selection criteria' is shown in the thick boundary representing the major influence of section criteria on the decision to adopt an ECI. ECI selection criteria consists of four main categories namely 'project characteristics', 'client's objectives', 'internal environment' and 'external environment'. These selection criteria categories are set in the 'ECI selection criteria' block. Each client organisation employs a practice for the selection of ECI. The identified practices are 'systematic processes', 'intuitive decision', or 'industry consultation'.
- The described practices are used for formulating the procurement selection criteria, comparing the identified criteria against the ECI characteristics or the combination of both throughout the process leading to selecting a procurement method. For example, a client may seek 'industry consultation' to formulate the procurement selection criteria. Once the criteria are formulated, based on the availability of the in-house resources and whether or not a selection process approach is established in the organisation, the choice is to source the selection process entirely internally through a systematic process or individual judgment, or to outsource the process to obtain industry advice again to develop the selection process.



**Figure 6.10. Model for selection of ECI**

The links between the ECI selection criteria and the selection practices are shown in dotted arrows, which intend to show exercising one of the practices and not all. The links between 'industry consultation' and selection criteria as well as 'intuitive decision' are two ways. They represent the use of these practices for the purpose of identification of selection criteria and the selection of procurement method solely. It also can be a combination of both elements. However, the link between selection criteria and the systematic process is one way that shows the systematic process is only utilised for the selection of

procurement method once the selection criteria are defined and formulated.

- The construct of 'prospect' and its constituents (i.e. Trust, Price and Formality) is shown in a dotted line and linked to the selection of ECI by a dotted arrow as well. Dotted blocks and links show that prospect does not have any direct influence on the decision to select an ECI. Rather, it can work to support the influence of selection criteria in the ECI selection process but can never override the ECI selection criteria on its own.

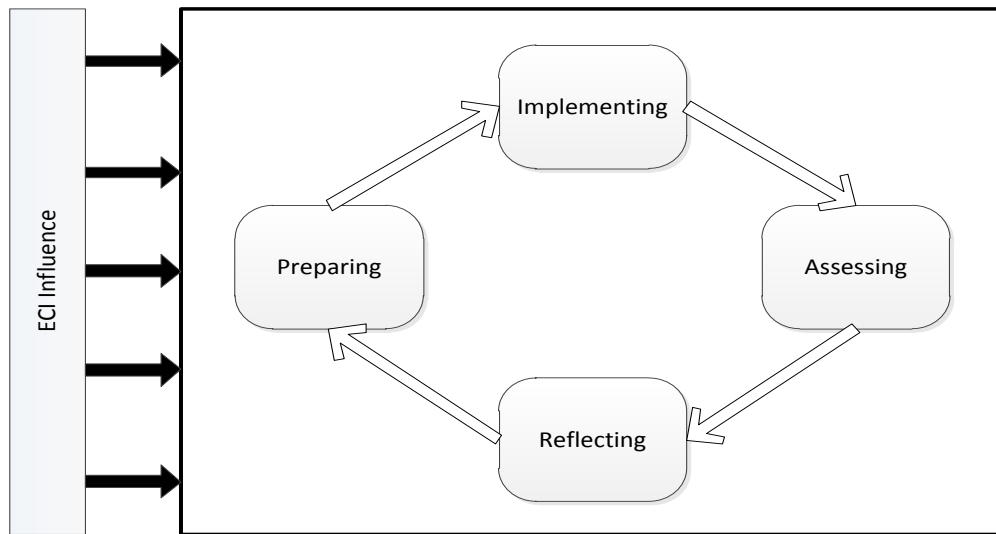
## **6.2. Managing ECI Relationship**

Detailed discussion on open and axial coding has been provided in chapter 5 regarding the strategies adopted and developed by clients to manage an ECI relationship. A further analysis of responses and comments was required to yield a rich understanding of the ECI relationship managing process. As prescribed by Corbin and Strauss (2014), the theoretical process of selective coding aims to identify the major categories that encapsulate the overall story constructed from the data.

After an intensive and lengthy review of the broad range of descriptions described by participants, a cyclical ECI relationship managing process model was developed. Under the influence of ECI utilisation, this iterative process consists of managing strategies in four stages of the project life cycle namely 'preparing', 'implementing', 'assessing' and 'reflecting'. In the field of management study, many authors also proposed a cyclical managing model such as the reflective cycle developed by Steinfors and Walker (2011) and the quality management cycle developed by Shewhart and Deming (1939) and evolved by Deming and Renmei (1952).

The preliminary version of cyclical model of ECI relationship management that emerged from the selective coding process is depicted in Figure 6.11. The ECI relationship managing process model at this stage is too general and simple. With identification of the overall managing process model, evaluation of the supporting elements through selective coding was possible. This involved a considerable period of reviewing the data to identify the constituents of each

stage. This included conducting extensive analysis of the relationships among categories, and evaluating the relationships between concepts.



**Figure 6.11. Preliminary version of ECI relationship management process model**

The following sections reports and grounds the findings of the analysis that was conducted in developing each stage of the ECI relationship managing process model.

### **6.2.1. Managing strategies in the ‘preparation stage’**

The finding of this study summarised the ECI relationship management at the preparation phase into two main clusters of ‘early planning’ and ‘project teambuilding’. Since there is a positive, quantifiable relationship between early planning and the ultimate success of a project outcomes (Gibson Jr et al. 2006; Krähmer & Strausz 2011; Turner 2014), the finding of this study investigated the early planning described by participants referring to the relationship between contractor and client in an ECI project. Similarly, since the need for well-organised and cohesive project teams is also unquestionable for building a positive relationship between the project participants and improving communication between them (Duy Nguyen, Ogunlana & Thi Xuan Lan 2004; Walker, Hampson & Peters 2000; Walker & Lloyd-Walker 2014), this study focuses on the ECI project teams building. The finding also suggests that in

order to maintain the positive working relationship, attention to the teams should be given at both the preparation and implementation stages.

### ***Early planning***

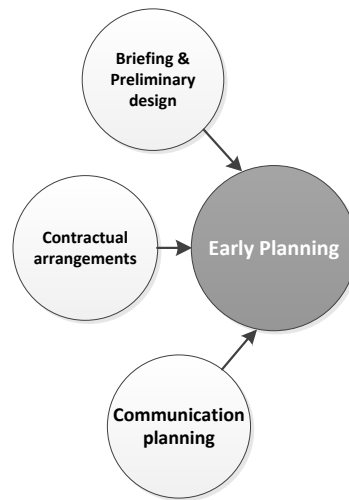
Early planning is the process of developing sufficient strategic information for owners to address challenges and requirements in an attempt to maximise the chance for a successful project outcome (Gibson, Kaczmarowski & Lore 1993). In other words, compared to the later stage of a project, planning efforts undertaken during the early stages of a project have a significantly greater contribution to project success (Gibson Jr, Kaczmarowski & Lore Jr 1995). It is also evident that there is a positive correlation between project success and the relationship between the parties (Bryde & Robinson 2005; Larson 1997).

Participants corroborated this by stressing the importance of early planning in ECI arrangement in order to align the client's expectations of contractors by defining the project effectively (Gibson Jr, Kaczmarowski & Lore Jr 1995), gain better understanding of project complexity and, to assess the uncertainty associated with the project. The role of early planning in attaining enough knowledge about the project was emphasised before appointing a contractor. One participant indicated, for example, that *'to minimise the risk on the contractor side, we need to do a decent amount of upstream work so that they've got enough information to define the scope of the work. If we don't specify what we want, and you go to market, you cannot expect the tenderers to be a mind reader and try to work out what you want'* (P#3).

The early planning or up-front planning described by the participants in this study begins after the project definition is completed and project execution approach has been decided but before the ECI contractor is appointed.

The analysis from the finding has shown that early planning for managing ECI relationship at the preparation stage entails three planning functions namely 'briefing and preliminary design', 'contractual arrangements' and 'communication planning'.

Figure 6.12 illustrates the ECI early planning and its elements. Each element is further explored and discussed in the next sections.



**Figure 6.12. Early planning in ECI preparation stage**

### *Briefing & preliminary design*

Briefing is a process to interpret the client's intentions and objectives, and present them in form of a document called the 'brief' (Ryd 2004). A construction brief is defined as a document exhibiting the background and requirements for a building project including quantities, quality, costs and times.

The brief also specifies the functions, connections, required spaces, technical systems, working environment, architectural design and budget (TNC 2000). In the past, the purpose of briefing was the development of practical methods and approaches for articulating the project specifications and writing a clear statement at the beginning of a project (MacPherson, Kelly & Male 1992; Markus 1969). However, the analysis from current studies has shown that the briefing process recently extends into the project conceptualisation and even into the design and planning phase in an effort to address the business case and re-engineering issues (Green & Simister 1999) with a focus on the management (Blyth & Worthington 2010).

The importance of briefing and undertaking preliminary design by the client before appointing a contractor in an ECI approach was frequently stated by the participants. Even though participants acknowledged the possibility of radical



changes to the preliminary design at the later stage, they believed even if it was the case, the efforts would not have been wasted as the client could formulate scope, scale, and performance expectations, gaining better understanding of the possible constraints as well as the complexity associated with the project. By better understanding the project scope, the applicability of the existing standards are also examined and ensured. Consequently, informed clients are able to engage in a genuine negotiation with tenderers about expectations and desired outcomes leading to selection of the best contractor who understands the client's value proposition. This finding is generally consistent with the view of Pernu (2000) which has argued that when the client assumes responsibility for preliminary design and function, the selection of the contractor becomes easier and the client's objectives are more likely to be fulfilled.

#### *Contractual arrangement*

Making up a set of rules where the contractor is rewarded for doing what is right for the client is identified as a critical function that the client needs to carry out at the early planning stage ensuring the objectives of the both parties are considered. An ECI contract normally does not consist of a sharing mechanism where the both client and contractor share the risks and rewards. Rather, there are distinctively contractor risks and client risks. However, in order to create a sound relationship between client and contractor and achieve the mutual success of both organisations, defining a successful incentivisation in the contract was described as the key task of the client by the participants. Amongst various forms of incentives such as mutually agreeing on targets in relation to cost, schedule, quality, safety, inventory reduction, increased sales, reduced cost, improved labour utilisation, or better technical solutions (Hughes, Williams & Ren 2012), introducing a successful commercial reward mechanism in the contract is essential for augmenting the working relationship. In addition the project performance is improved by motivating the contractor in return for enhanced reward (Bower 2003).

#### *Communication planning*

One of the interesting findings of the study is the emergence of the early

planning functions clients need to undertake for communication with all project stakeholders and the contractor. Setting up the internal communication protocols was identified as being a key function during the ECI upfront planning to ensure how the communication with different stakeholders should be carried out. Commenting on this, for example, one participant indicated *'Having a fairly robust planning process up-front, we all normally prescribed how the communication goes, as to – if you're talking about public consultation during the life of the project, we will be quite prescriptive as to what the contractor is allowed to do and what they're not allowed to do'* (p#3).

While communication is an essential components of a relationship based procurement method such as ECI (Davis & Walker 2009; Walker, Hampson & Peters 2000; Walker & Lloyd-Walker 2012; Walker & Hampson 2003), this area is the most difficult management aspect to plan due to the lack of certainty in providing the present and future information required by all stakeholders (Globerson & Zwikael 2002). The PMBOK guide offers effective stakeholder management as the only tool to manage the information and communication needs for stakeholders (PMI 2008).

Participants indicated that one of the techniques to plan for the communication before the commencement of the project is running an induction programme and having a discussion with people before they are actually put onto a team. In order to ensure the key individuals have an adequate understanding of the communication in a collaborative approach, organisations should introduce an induction programme where the principles of collaborative communication can be highlighted for those joining an ECI team. Project managers should talk to the team about what will be expected, how they work, what the benefits and drawbacks are. If the current operating structure within the team is not in line with the concepts of collaboration inherent in a relationship based procurement approach, team members may face difficulty when they are expected to operate in such an environment (BSI 2010). An induction programme can assure the organisations that appropriate communication skills are established before the team is engaged in the project and maintained as the project evolves.

### ***ECI team building***

When the projects become technically, organisationally, and contractually complex, greater team effort is required; and hence having a strong defined team is essential (Fryer et al. 2004). Team performance is closely linked to the individual's task-related skills, abilities, knowledge and experience (Ivancevich, Matteson & Konopaske 2002). The relevant human behaviour of individuals working within teams and across multi-teams in an ECI context is investigated and discussed in this section.

The aim of this section is to broaden the understanding of the kind of skills, knowledge, experience, and attributes that ECI teams as well as the project managers should demonstrate in order to deliver the project efficiently and effectively. This study has not used the terms managers, engineers or leaders; instead, the term ECI team members adopted in this study includes all experts at senior level engineering, management and leadership positions working in an ECI project.

The emerging categories from the participants' responses formed the main components essential for generating the model and the analysis of the relationship between these components had a key role in developing the model of ECI relationship management process. In order to fully understand the required organisational and individual competences, it is essential to understand what knowledge, skills and experience are really needed and expected instead of what is the minimum that can be offered to comply (Walker & Lloyd-Walker 2014b). Therefore the components constituting the model include 'ECI team composition' representing the knowledge, skills and expertise required amongst the ECI team that are sufficiently strong for achieving sustainable human capital or sound relationship building and 'Team selection practices' representing the practices being exercised to appoint the individuals within the client's organisation to work in the ECI project team.

It is worth noting that investigating the process of recruitment and employment of people required to work in the client's company is within the Human Resource (HR) knowledge domain that is out of the scope of this study. Rather,

this study focuses on appointing the employees to form an ECI team who have been already employed and working in the client's organisation. Indeed, HR has a role to play in shaping the team, according to the needs of a specific ECI team (Walker & Lloyd-Walker 2014b). However, how HR involvement can affect the ECI team dynamics and performance is a matter for further research, which is not in the realm of this doctoral study.

#### *ECI team composition*

A perfect team is made up of compatible, skilled team members who share the vision for the project (Tomczyk 2006). The analysis from the findings has shown that clients appoint the individuals within the organisation to form the team for an ECI project who are able to demonstrate a wide range of skills and behaviours essential for a high-performance team. The required skills and behaviours vary from project to project; however, participants asserted that harnessing a group of individuals with different skills and personality to an ECI team offered a great opportunity to leverage the team synergy.

This finding is supported by studies in the team management area that suggest that teams, in order to succeed, require their members to be able to cover all areas, however, it may not be necessary for an individual member to be competent in all areas (Margerison 2001). Instead, teams can operate most effectively if the right combinations of roles are present (Belbin 2012a, 2012b; Sommerville & Dalziel 1998). Arguably, there is a direct link between team role balance and team performance (Senior 1997) in a way that teams containing more of the roles are more likely to accomplish the given tasks more effectively than teams containing fewer roles (Prichard & Stanton 1999). Notwithstanding this, the link between team role balance and performance is influenced by the nature of the team and the context in which the team performs, and the presence or absence of some individual roles can actually have a positive or negative effect on performance (Partington & Harris 1999). Furthermore, the diversity of roles is peripheral to the number of team members as a few people in the team may exhibit the same sort of behaviours and hence play the same role. Similarly, some competent individuals in the team would be able to

function well in more than one role within the team (Belbin 1981).

Participants identified abundant characteristics and attributes required of ECI team members pertaining to both hard and soft skills. With respect to hard skills and soft skills, this study borrows the terminology of 'functional roles' and 'team roles' respectively proposed by Belbin (1981). Functional roles are determined by hard skills referring to the professional and technical knowledge expected of each team member in order to achieve the team's objectives. In addition to the requisite technical skills and abilities of the members of a team to be able to do the job, other factors such as personality, attitude and experience have key roles to play in a high-performance team (Prichard & Stanton 1999).

Belbin identified a range of useful behaviours that make an effective contribution to team performance and describe how the individual fits into the team regardless of the function that the person performs; and applied the term *team role* (Senaratne & Gunawardane 2015). Team roles are determined by soft skills referring to the personal attributes and values that lead to building and maintaining relationships (Walker & Lloyd-Walker 2014b). Since Belbin's Team-Role Theory as a counselling and team development tool is applicable to organisations in the construction industry (Cornick & Mather 1999; Senaratne & Gunawardane 2015; Sommerville & Dalziel 1998), this section of the study sought to answer two questions. Firstly, what roles are more important for an ECI team to be performing effectively and secondly what type of knowledge, skills, attribute and experience of the team members correspond to the identified roles.

Nonetheless, even though Belbin's model is adopted as an analysis framework, the scope of this study is not to explore the existence of team roles and their effect on team performance in ECI teams. Rather, it aims to understand and to identify the additional or different skills, knowledge, attributes or experience required of ECI team members compared to more traditionally procured construction projects. Therefore, the general concept of Belbin's role model is only utilised as a framework to expound and support the identified skills

without exploring the model constituents.

Belbin (1981) identified team roles based on the individual's personality traits, intellectual styles and behaviours within teams. Although Belbin (2012b) asserted that team role behaviour is not fixed by individual personalities, some empirical studies revealed that the individuals naturally take up the role or roles that fit with their personality and professional skills (Senaratne & Gunawardane 2015; Senior 1997).

The team roles are classified into three distinctive clusters of behaviour as underlying the success of the teams. These clusters are *action-oriented* roles, *People-oriented* roles and *cerebral* roles. In a nutshell, action-oriented roles are required where hardworking and systematic approaches toward the problem solving are needed. Individuals taking people-oriented roles have the ability to cause others to work towards shared goals and finally, cerebral roles deal with the situations where creativity and high critical thinking ability are required especially for complex tasks (Senaratne & Gunawardane 2015).

The identified hard skills and soft skills required for an ECI team were categorised in a manner that enables each functional role and team role cluster. Assigning each characteristic to relevant functional roles and team roles can lead the finding to develop the model for appointing in-house resources to form an ECI team. Despite the fact that the overall number of study participants (n=14) is typically too small to support quantitative analysis, and therefore the power of the results is relatively low, statistically significant results in relation with the required soft and hard skills for an ECI team were nonetheless obtained within this study, which are worthy of inclusion.

### ***Behavioural factors***

A discussion regarding the behavioural factors required for working in an ECI team has been provided in chapter 5. The identified traits by participants have been further analysed and 15 key ingredients to an effective ECI team were identified that team members should demonstrate. These are explained in table 6.3. The first column contains the 16 main behavioural factors derived from the

analysis. In the next column, a summary description of each factor is provided. The third column presents the number of participants who have identified that factor as one of the essential relational skills required for ECI team members.

As can be observed in the table below, the priority of the behavioural factors identified by participants in this study, vary significantly. Figure 6.13 illustrates the clustered bar chart sorted based on the top to low ranked behavioural factors. It is noteworthy that higher ranked traits do not represent the higher importance of these behavioural factors over the lower ranked ones for forming a high-performance team. Rather, the rankings help to understand which skills are of greater concern to the clients when appointing people to work in an ECI team.

**Table 6.3 ECI team behavioural factors**

Behavioural factor	Summary description	Number of participants
<b>Communicativeness</b>	<p>ECI team needs to have the ability to share a common language and communicate effectively to attain better understanding of each other as well as other participants in an effort to develop and nurture trust and commitment.</p> <p>Good interpersonal skills enhance the quality of negotiation to avoid risk of potential disputes.</p>	5
<b>Lateral thinking</b>	<p>Individuals are suited to an ECI who can think outside the box and bring new ideas to the table. Project team members need to have the skills to solve problems by using unconventional methods through innovative solutions whilst keeping a balance between innovation and standards.</p>	1

Behavioural factor	Summary description	Number of participants
<b>Optimism</b>	ECI team members, particularly project leaders, need to be positive and should set an optimistic attitude as the main behavioural theme for the team giving the team permission to behave collaboratively.	2
<b>Accountability and Commitment</b>	<p>ECI team members are to be committed to delivering a successful project. They need to take ownership and responsibility of project whilst being accountable for the consequences of decisions they make by understanding their own internal roles in team functioning.</p> <p>Long term commitment of the team is important to keep the knowledge within the team.</p>	7
<b>Non-price culture</b>	ECI team members should have a less commercially focused mindset. They need to constantly strive to deliver value for money instead of being obsessed with the cheapest price. This requires an effective collaboration toward best-for-project outcomes.	3
<b>Projection</b>	ECI team members need to have good anticipation skills to be able to potentially see a problem that is arising. The ability to detect, identify and interpret early warning signs can help prevent potential problems threatening the project.	2



Behavioural factor	Summary description	Number of participants
<b>Receptiveness</b>	ECI team members are to be good listeners and open to new ideas. They embrace innovative design and construction solutions and consider unconventional ways of thinking even though the idea or suggestion may sound inappropriate.	4
<b>Transparency</b>	It is Important for the client's ECI team to be upfront, open and honest with the contractor and to encourage the contractor to act in the same manner in return. Contractor agrees to be fully open about their real costs and delivery process whilst not intimidated by raising any issues because they trust the clients to try to help them resolve the problem and vice versa.	7
<b>Trustworthiness and Trustfulness</b>	The element of trust needs to be present in the ECI team. Project participants need to be willing to listen and trust whilst exhibiting a high level of integrity, dignity and benevolence. A balance in trust and control, nevertheless, need to be created in order to prevent potential opportunism.	1
<b>Approachability</b>	ECI team, particularly leaders, should be very visible to the design and also the onsite delivery team. They need to be easily accessible if any serious issue with significant financial implication arises. The more project participants are exposed to an ECI environment, the better understandings of the key improvement areas organisationally or individually, are obtained.	2

Behavioural factor	Summary description	Number of participants
<b>Sense of mutuality</b>	The client team needs to be able to align the objectives of the two parties. For this purpose, project leaders should have the emotional maturity to understand that paradigm and develop an effective solution to effectively collaboration through sharing common goals and best-for-project attitude in order to deliver best value to the project.	2
<b>Divergence</b>	ECI team members must have the ability to operate in something very different and unusual, with people they wouldn't normally work with and largely outside of their normal comfort zone. They need to be flexible to adapt the different way of working to business-as-usual.	3
<b>Enthusiasm and Team motivation</b>	ECI team members are inclined to put extra efforts to be part of the learning and developing process. They want to learn something new and develop their ability to work differently for the good of the project. Team leaders should have the skills to appreciate and motivate this attitude and create a motivational environment enabling the ECI team to truly focus on achieving the best possible outcome and the best possible solution.	4

Behavioural factor	Summary description	Number of participants
<b>Political astuteness</b>	<p>ECI team members need to exhibit a high level of judgment abilities to enable them to accurately assess the situation, identify the areas of conflicts, highlight the issues and respond to that situation in emotional terms as well as contractual or engineering terms.</p> <p>ECI leaders need to demonstrate sufficient emotional intelligence to recognise others' feelings and take their perspective.</p>	6
<b>Appreciativeness</b>	ECI team members should be proud of being part of the team and have a really deep appreciation of the whole scheme of dynamics that is current within the team.	1
<b>Assertiveness</b>	ECI leaders need to be courageous and firm, in the sense that they should be decisive and willing to make a decision and stand by that decision no matter how tough and how unpopular that would be. Their influence and respect is sufficiently powerful to effectively enforce the solution they offer.	3

On the 16 identified skills, what figure 6.13 illustrates is that transparency (accounts for 7), accountability and commitment (accounts for 7), political astuteness (accounts for 6) and communicativeness (accounts for 5) ranked the top 4 and thus perceived as key skills that clients are concerned with when selecting their team.

It is no surprise that transparency, accountability and commitment, identified in

this study, overlap with the key behavioural factors of relational contracting (Rahman & Kumaraswamy 2008; Walker & Lloyd-Walker 2011, 2014b; Walker & Lloyd-Walker 2012).

Müller (2009) employs the elements of transparency and accountability as the backbone for the concept of project governance and Walker and Rowlinson (2008) provide a governance framework for relationship based procurement (RBP) based upon the influence of transparency and accountability on trust and credibility. Although governance mainly refers to an institutional perspective in terms of legal and regulatory requirements (Walker & Lloyd-Walker 2014b), the concept can be also applied to a number of other perspectives pertaining to the people in project teams (Klakegg, Williams & Magnussen 2009).



**Figure 6.13. Behavioural factors- clustered bar chart**

Accounting for six mentions by participants, political astuteness was analysed as the third top ranked behavioural factor. For being politically astute, team members need to have advanced ability to understand and observe other people at work and to use that knowledge to influence others to act in ways that enhance the project and organisation objectives. They are to be adaptive to diverse social situations as well as sensitive to others, thus they are considered as intelligent and clever in dealing with others (Ferris, Davidson & Perrewe 2005). Political astuteness is closely linked to social judgment skills and emotional intelligence.

Predominantly focusing on leader characteristics and capabilities, social judgment skill is recognised as one of the core leadership skills and capabilities criteria that directly influences the quality of a leader's problem solving and subsequent performance (Connelly et al. 2000; Mumford et al. 2000). A high level of emotional intelligence was also realised as a prerequisite for developing interpersonal skills, self-regulation, personal commitment and judgment skills which are indispensable attributes of a high-performance team (Rodney Turner, Müller & Dulewicz 2009; Turner & Lloyd-Walker 2008; Turner 2007; Walker & Lloyd-Walker 2014b). Rezania and Lingham (2009) show that the development of emotional intelligence skills coupled with strong technical skills improves the project team performance.

Good communication and interpersonal skills ranked the fourth top relational skills that should be exhibited by ECI team members. While an individual can fulfil specific tasks by communication skills, interpersonal skills are inherently relational and process oriented, and focuses on the effect of communication on another person (Duffy et al. 2004). Interpersonal skill is perceived as a key factor for success and improvement in overall team performance since the interaction process between team members is an additional requirement to the individual's skill level (Richardson 2010). Competence in interpersonal skills and communication forms an integrated competence that not only enables a person to obtain and share necessary information with other team members or

project participants but also facilitates the establishment of a trusting relationship.

Next behavioural skills are related to the innate attributes and personalities of an individual such as receptiveness, assertiveness, divergence, enthusiasm and team motivation, culture of non-price, sense of mutuality, anticipation skills, approachability and optimism. While the importance of these skills are emphasised by participants and corroborated by extant literature (Black, Akintoye & Fitzgerald 2000; Rahman & Kumaraswamy 2008; Suprpto et al. 2015), fewer participants identified them as the key behavioural factors they consider when forming an ECI team.

Accounting for one mention by participants, the traits of *lateral thinking*, *trustworthiness and trustfulness* and *appreciativeness* ranked as the bottom three. The finding of this study suggests that the reason for these factors being identified by the least number of participants is that by developing one of the higher ranked skills or a combination of them, these skills are also naturally developed themselves. For instance, an individual who is open and honest (high level of transparency) and demonstrates exceptional communication and interpersonal skills, naturally becomes trustworthy and this person can trust other project participants as well.

### ***Knowledge and experience***

It is well known that the client's sophistication is essential to ensure project success (Bennett 1985; Bryant, Mackenzie & Amos 1969; Kometa 1995; Latham 1994; Walker 1998). Consequently, client's team members need to demonstrate sufficiently strong knowledge, understanding, awareness, experience and skills to have the ability to operate and fulfil the work-related objectives. The competence of a team member, however, is projection of level of knowledge and awareness of that person.

While knowledge is a body of understanding and skills that is mentally constructed through a learning process (Kannegieter 2001), awareness is defined as an understanding of the activities of others to provide a pattern for

all activities within that context. Having high level of awareness ensures the relevance of the individual contributions to the group's activity as a whole towards the groups goals and progress (Dourish & Bellotti 1992). Since knowledge and awareness are interdependent (Endsley 1995, 2000), the required project-related skills expounded as the required knowledge are also incorporated with the concept of awareness.

The concept of 'experience' also is inseparable from knowledge. As opposed to professional knowledge, which can be attained through specialised education and formal training in a discipline, experiential knowledge is learned from personal experience with a phenomenon. Therefore, gaining both professional and experiential knowledge is indispensable for performing, problem solving, decision-making, and learning and teaching (Beckman 1997). In other words, true awareness, knowing or understanding is not complete until both professional and experiential knowledge are earned.

The knowledge, awareness and experience discussed in chapter 5 of this study, were further analysed and grouped into four main areas, namely, project technical skills and experience, project internal/external environment awareness, commercial position awareness, and ECI contractual knowledge and experience. A summary of these areas of knowledge, awareness and experience with a brief explanation is presented in table 6.4 and subsequently Figure 6.14 shows the top to low ranked knowledge, awareness and experience required of ECI team members that were derived from the findings of the analysis.

**Table 6.4. Knowledge, awareness and experience required of ECI team members**

Knowledge, Awareness and Experience	Summary description	Frequency
<b>Project technical skills and experience</b>	Team members have to be technically competent for the tasks they are assigned. Depending on the position they work, the required skills and experience can vary. For managerial positions, for instance, knowledge and experience of project management process and techniques is vital, or for engineering positions, recognised qualifications may be required to ensure an adequate level of speciality in that particular profession.	4
<b>Awareness of the internal/external project environment</b>	Team members are to be aware of the internal and external environment the project. They also need to have sufficient understanding and knowledge of every single process of the way and how to get to the final result. This can happen only by having awareness of mentality and technical ability of key personnel, understanding the commitments and communication, and general process of the project's life cycle.	8
<b>Commercial position awareness</b>	Team members need to demonstrate understanding of the fundamental commercial imperatives. They have to be aware of each project participant's commercial position, motivation and obligations, and align the expectation in accordance with the determined commercial position.	2



Knowledge, Awareness and Experience	Summary description	Frequency
<b>ECI contract knowledge and experience</b>	<p>ECI team members are well informed about ECI contractual models and how they work in practice to obtain the best out of the contract. They need to understand the main differences between ECI to other relationship based procurement methods such as alliancing ensuring that the lines of legal and contractual accountability are not blurred.</p> <p>ECI managers need to be an essential repository of knowledge around ECI who learn, try and implement all legal obligations through the words of the contract and are able to facilitate the learning process for the whole project team.</p>	5

As can be seen, awareness of the project internal and external environment was ranked the highest knowledge and awareness that a team member needs to exhibit (accounts for 8). Understanding the project environment specially for the complex project had considerable influence on the project performance (Thamhain 2004).

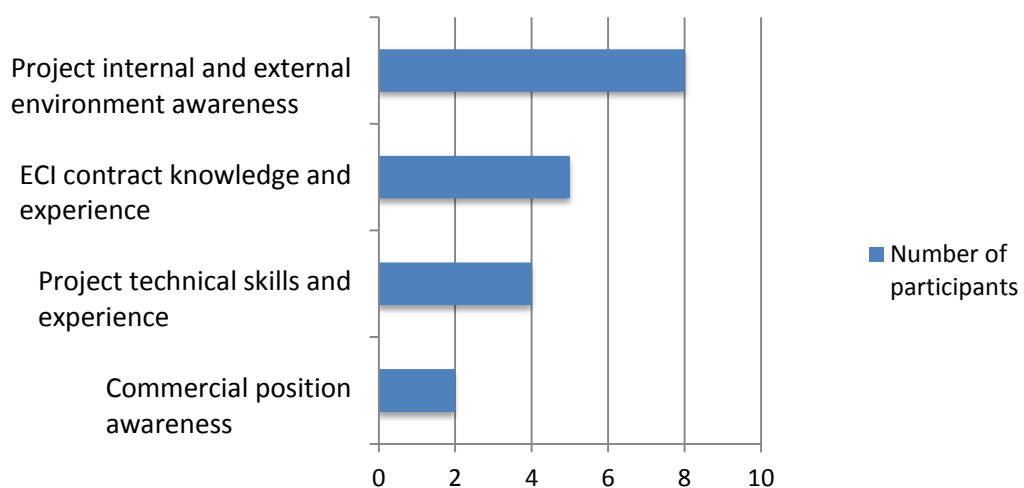
Project leaders with advanced knowledge and understanding of the key personnel's technical and social competence should be sourced to empower the team (Kirkman et al. 2004) and utilise the best project management approaches for planning, controlling and leading the team for each stage of the process towards delivering the project (Walker & Lloyd-Walker 2014b).

Understanding of the both human and commercial dimensions of the project, awareness of the prevailing organisational culture, knowing how the project is built and what are the factors affecting the team performance accompanied with

the emotional awareness of internal and external project stakeholders, enhance project managers' awareness of the project environment. Understanding of the significant factors that satisfy the personal and professional needs of the project participants guide project managers to create a project environment supportive to the team (Thamhain 2004).

ECI contractor knowledge and experience (accounts for five) was analysed as the second highest rank knowledge and experience that is required of ECI team members. Working in a collaborative environment inherent in relationship-based procurement (RBP) requires best-for-project and win-win attitudes amongst project participants which differ to the competitive nature of traditional procurement methods (Walker & Lloyd-Walker 2011). Nevertheless, despite the fact that ECI contracts are known as one of the relationship-based procurement methods, the transitional stage from a collaborative approach to a traditional D&C form of contract also requires different sort of behaviours.

All the players involved need to understand and behave appropriately to ensure that the lines of legal and contractual accountability are not blurred as they shift from the early stages of the collaborating and the open-book into an environment where it is traditional in which the risks are substantially transferred to the contractor.



**Figure 6.14. Knowledge, Awareness and Experience- clustered bar chart**

Unsurprisingly, the findings suggest the project technical skills and experience are the next core required skills and experience. While relational skills are very important in managing project under a relational contractual arrangement, sufficient technical and project management knowledge and experience are essential to deliver the project. The key skills that the project leaders need are related to the technical aspects of the project including business and project delivery skills to ensure that the project is delivered successfully with reasonable return on investment (Walker & Lloyd-Walker 2011).

Awareness of the commercial position was the last knowledge required of ECI team members identified in this study. As has previously been mentioned, knowing the commercial position of each project participant is essential for team members to understand the boundary of expectations and responsibility. Understanding the financial motivations of the project stakeholders is required for developing a commercial approach and engagement model that creates a win-win potential rather than the opposite.

### ***Comparing personality traits with team roles***

As has already been noted, a high-performance team needs a combination of individuals who play different team roles. A team consisting of competent members will not necessarily fulfil the team objectives. Instead, an optimal team composition forms a team which effectively execute their work, manage their relationships within the team's environment and maintain the team's strength in meeting the team members' social needs (Senaratne & Gunawardane 2015).

Different personalities, skills and knowledge of a team member can determine which team role/roles that person would play. Studies show that the amalgamation of personalities and the level of expertise and experience influence individual preferences for the roles they adopt in a team situation (Partington & Harris 1999; Senaratne & Gunawardane 2015). This section of the study examines the identified personality traits, knowledge and experience against the Belbin's Team-Role Theory expounded earlier in this chapter. Table 6.5 shows the summary of the analysis in relation with the relational skills,

knowledge, experience and behavioural enablers that facilitate and support each team role cluster.

Amongst the 16 analysed personal characteristics required of ECI team members, optimism, commitment, divergence, enthusiasm and team motivation, and assertiveness were found as enablers of *action-oriented roles*. Individuals who play action-oriented roles are needed to plan a practical and workable strategy, provide the necessary drives to motivate the team keep progressing towards the project goals, and constantly scrutinise the work to ensure that the highest possible quality has been achieved (Belbin 2012a).

**Table 6.5. Individual characteristics vs. team roles**

Hard and soft skills	Functiona l Roles	Team Roles		
		Action- oriented	People- oriented	Cere bral
Behavioural Factors				
Communicativeness			✓	
Lateral thinking				✓
Optimism		✓	✓	
Commitment		✓		
Projection				✓
Receptiveness			✓	
Transparency			✓	
Trustworthiness and Trustfulness			✓	
Approachability			✓	
Sense of mutuality			✓	
Divergence		✓		✓
Enthusiasm and Team motivation		✓		
Political astuteness				✓

Hard and soft skills	Functional Roles	Team Roles		
		Action-oriented	People-oriented	Cerebral
Appreciativeness			✓	
Assertiveness		✓		
Knowledge, Awareness and Experience				
Project technical skills and experience	✓			✓
Project internal and external environment awareness	✓	✓	✓	✓
Commercial position awareness	✓			✓
ECI contract knowledge and experience	✓			✓

For this purpose, they need to have positive attitude and great commitment to continuous improvement by utilising innovative, yet practical strategies. Whilst they are team motivators, they should be able to make sound and timely decisions.

*People-oriented roles* are enabled by individuals who are communicative, optimistic, receptive, transparent, trustworthy and trustful, approachable, appreciative and mutuality oriented. The main duties of team members who play people-oriented roles are to help the team function effortlessly by focusing on the team's objectives and allocating tasks appropriately. They have good communication skills to make sure the internal and external stakeholders are well informed and managed (Belbin 2012a).

*Cerebral roles* are needed to make non-emotional and impartial judgments, solve issues in highly creative ways and provide professional services by demonstrating in-depth knowledge and experience of the key areas (Belbin 2012a). Lateral thinking, projection ability, divergence and political astuteness

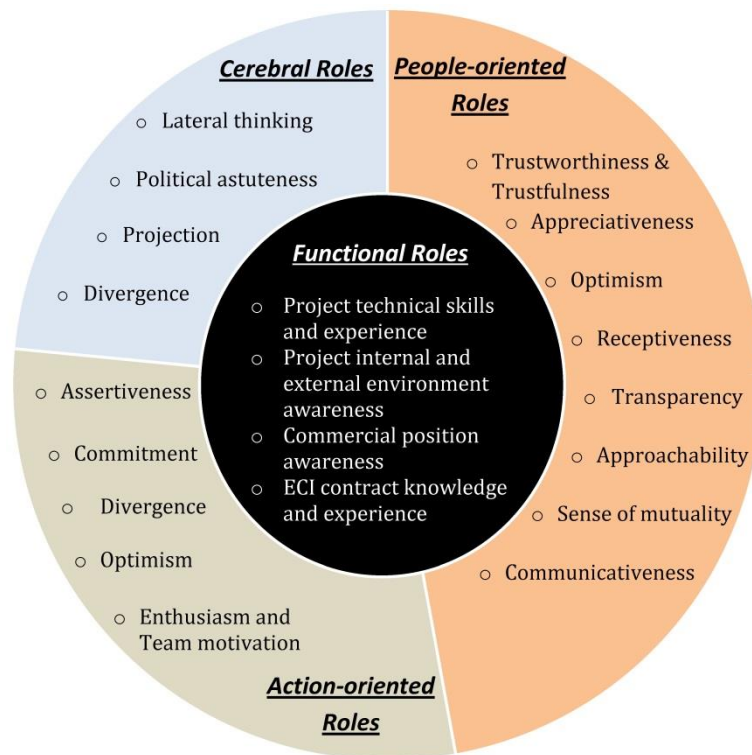
were found to be the personal traits that can facilitate cerebral roles in an ECI team. A cerebral team member is a talented and skilful professional who has good anticipation skills to detect potential issues in the project, make logical judgments and if necessary, think outside of the box for unconventional solutions.

Project technical skills and experience, commercial position awareness, internal and external project environment awareness and ECI contract knowledge and experience were found to be the knowledge, awareness and experience that would satisfy the ECI team member's functional roles. Belbin (1981) has suggested that the professional and technical knowledge of each team member determines the functional roles being performed by that individual towards achieving the team's objectives. The professional and technical knowledge of a person in the context of an ECI contract includes the technical project skills and experience, knowledge of ECI contract and awareness of the commercial position. This knowledge, awareness and experience were also found to be the enablers of cerebral roles since providing professional services requires adequate knowledge of the contract, process, business context and technical aspects of the project.

Finally, awareness of the internal and external project environment was also found as an enabler of action-oriented and people-oriented roles. A team member who is aware of the external stakeholders' requirements, in-house personnel social needs and technical capabilities, is able to better manage stakeholders and assign tasks amongst the team effectively.

Figure 6.15 demonstrates the identified characteristics required to enable the team roles and functional roles.

As can be seen the characteristics identified by participants are more related to the people-oriented roles. This finding is not surprising as team work, collaboration and communication are the core features of ECI, which pertain to the people-oriented roles and subsequently the essential characteristics required of the team members should enable these roles.

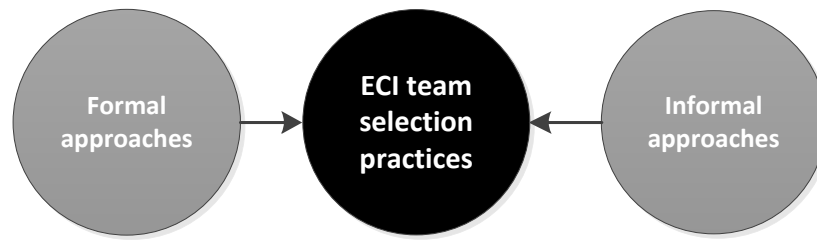


**Figure 6.15. ECI team roles enabler characteristics pie chart**

*ECI team selection practices*

As Baykasoglu, Dereli and Das (2007) suggest, the project team selection can be defined as selecting the right team members, which collectively perform a particular project and task within the project objectives. This section aims to investigate how the client selects team members to work in the ECI project. In other words, after formulating the required personal and technical competences, what practices are adopted by clients to appoint right people into an ECI team. The approaches identified through the initial analysis, have been discussed in chapter 5. Further analysis by re-visiting data has been undertaken and team selection approaches have been classified into two main categories of 'formal approaches', using a formalised decision process including various scoring methods to analyse the potential team members, and 'informal approaches' suggesting the use of unsystematic methods for selecting ECI team members.

Figure 6.16 illustrates the ECI team selection practices. Each practice is discussed in the following sections.



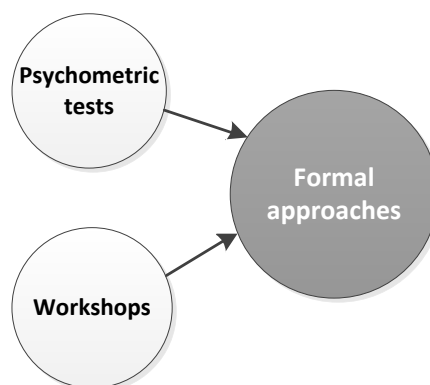
**Figure 6.16. ECI team selection practices**

***Formal approaches***

Formal approaches for selecting ECI team members are structured practices that assist project managers to assign individuals in the personnel pool who can meet the pre-determined assessment criteria (i.e. people-oriented roles enablers, action-oriented roles enablers, cerebral roles enablers and functional roles enablers) to the team.

Formal approaches identified by participants for ECI team selection include ‘selection workshops’ and ‘psychometric tests’.

Figure 6.17 shows the formal approaches that are practiced within the client’s organisations for selecting an ECI team.



**Figure 6.17. Formal approaches for ECI team selection**



### *Workshops*

During selection workshops, potential team members' characteristics are assessed and scored by the evaluation teams against the defined hard and soft skills criteria. In addition, an individual's interpersonal and non-verbal behaviours such as gaze, hand movements and physical attractiveness can be evaluated to ensure that effective managerial skills are demonstrated (Burnett & Motowidlo 1998; Hough & Oswald 2000). Selection workshop is identified as a scored method for appointing individuals to work in an ECI team. From the workshops, a good understanding of what people's core attributes are and how they would normally operate and behave is obtained. In workshops individuals or nominated teams are examined through a number of similar exercises within the same type of scenario and their performance is observed. Evaluation teams undertake a detailed scoring process and eventually the best scored persons or teams are appointed.

### *Psychometric tests*

Those clients who require a comprehensive, high-quality assessment of people and their skills and personalities, acquire psychometric tests in an effort to obtain more accurate information about the individuals' behaviour. Psychometric tests are normally run by highly experienced corporate psychologists who work with management to determine the characteristics that need to be measured, and they then design an effective testing program. A psychological profile is generated for each candidate and a score for their behaviours is awarded through the pre-designed psychological model based on the evaluation against a set of criteria. Despite a number of criticisms against the validity or reliability of psychometric testing (Jensen 1980; Wade & Baker 1977), the psychometric tests are still one of the tools used to measure individuals' personality and behaviour styles that are statistically examined, and are constructed to be objective and unbiased (Embretson 2013; Kline 2013).

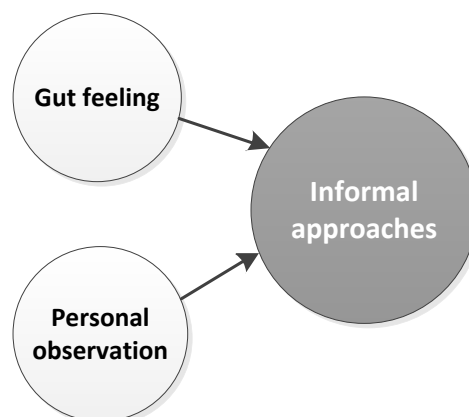
## ***Informal approaches***

Informal approaches refer to a selection processes that lack any structured scoring systems or any systematic instructions. Instead, they mainly rely on the managers' personal judgment, insights and intuition. Even though the use of a formal objective method for the selection of ECI team members is strongly recommended by participants, most of the responses reflect the lack of any structured method for the selection process. The analysis of the various unstructured selection methods described by the participant led the findings to two main approaches in these categories. The first approach is titled 'gut feeling' and the second approach is 'personal observation'. Figure 6.18 shows the informal approaches that are practiced within the client's organisations for selecting an ECI team.

Discussion in regard to these approaches is provided in following sections.

### *Gut feeling*

There is growing evidence that managers use their intuition to make decisions (Heidegger 2010; Ruelas & Briseño 2010). 'Gut feeling' or 'hunch' is the feeling or response to the intuition; however it is not just a passing subconscious thought but is a collection of beliefs, experiences, and memories (Gilovich, Griffin & Kahneman 2002).



**Figure 6.18. Informal approaches for ECI team selection**

Since quantifying soft skills and attributes is difficult, participants described that frequently they use their gut feeling to choose individuals to work in the ECI team. Making decisions intuitively is explained by Lunenburg (2010); managers are limited by time constraints, cost and the ability to process information and thus they often make decisions based on their experience, advice from others and intuition. The findings show that the participants who were relying on their gut feeling for selecting team members, were managers who possess high levels of knowledge and experience. Klein (2007) contends that effective intuition results when people have a certain amount of knowledge. This knowledge and skill is developed over years through practice, repetition and experience and hence these experts can bring a great deal of explicit and tacit knowledge to the specific situation (Gladwell 2007).

#### *Personal observation*

Observation of people's behaviours is an approach described by the participants for selecting people to work in the ECI team. For example one participant explained that *'you pick it up as you are seeing people, as you are observing people and what they are doing, but it needs to be done in a real-world sort of situation'* (P#1). In a project-based organisation, people who work in a project normally adjourn once the project is completed.

Monitoring and observing the abilities and behaviours of people working on the previous projects can enable managers to understand sufficiently about their soft skills and hard capabilities. In forming an ECI team, therefore, managers know how those people have grown up and developed their skills, knowledge and professions over the course of the project. With hindsight, managers know which people are suited to an ECI form of contract and which people are not. Nevertheless, personal observation has some limitations in which managers only have knowledge about those whom they have experience working with. Therefore, in large organisations with multiple projects concurring, managers have little knowledge about all staff and their suitability to work in an ECI team.

### **6.2.2. Managing strategies in the 'Implementation stage'**

Since the implementation of project is one of the most specialised forms of implementations in organisations (Schultz, Slevin & Pinto 1987), a successful project implementation requires carefully designed managing practices. In this section the key factors required for managing an ECI relationship at the project implementation is investigated and presented. As already noted, this study looked at the project management practices through the lenses of relationship management with integration of risk management and communication management.

While the other themes, lenses and angles of the project management practices and their impact on a project need to be explored and investigated, the findings of the preliminary trial study described in chapter 3 suggested that relationship management is the core of collaboration. It also contended that integration of relationship management with risk management and communication management influences the quality of the working relationship between parties.

Managing ECI relationships addresses the areas that should be focused for managing the relationships across teams once the potential partner or partners have been selected. Earlier studies have identified that the project performance has direct links to the management of people and technical factors of the project teams (Larson & Gobel 1989; Pinto & Slevin 1988) as well as the relationship amongst all project teams (Meng 2012), however it is difficult to measure project performance due to cultural and philosophical differences of each organisation (Cleland & Ireland 1999).

Managing teams' relationships, therefore, may not be similar in all types of projects (Dvir et al. 1998) and should be tested in each context. The ECI teams' relationship management practices indicated in this section were found to be the management approaches essential to establishing the right environment to support the ECI working relationship. The themes reflect the strategies to manage relationships required to make the project teams perform effectively in an ECI contractual context.

Based upon the findings of the trial study, amongst identified managing practices, this study concentrated further on two managing areas of risk management and communication management as the essential elements of relationship management

The risk management practices focus on the managing process of the ECI risks. The success of a collaborative programme depends on the ability of the organisations involved in the project to develop a joint risk management approach and to accept responsibility for managing an integrated risk mitigation process with mutually agreed objectives (BSI 2010).

Communication management reflects the practices to establish and maintain effective communication across all stakeholders. Effective communication is essential to ensure the full comprehension of everyone involved about the rationales and the changes that collaborative working can introduce (BSI 2010).

### ***ECI relationship management***

The practices in managing relationships in an ECI project are tools and techniques to direct the use of diverse resources toward establishment and improvement of collaborative relationships in involved organisations across the project teams.

The participants have identified numerous practices for managing relationships. The finding has classified relationship management practices into two levels of engagement within the context of client's organisation and the project teams.

The following sections provide details of the identified practices essential for managing relationships at the organisational level and project team level.

#### ***Relationship management strategies at organisational level***

Relationship management practices at the organisational level are conceptualised as external to the team but internal to the client's organisation. In other words, these strategies are decided, developed by project managers and supported by the key players within the organisation who are not directly

part of the project team, yet have significant influence on team performance. Scott-Young and Samson (2008) stated that despite the fact that project teams are independent within the organisation they are embedded, the organisational context has a critical role in the team performance (Cohen & Bailey 1997). The following sections provide details of the practices in regards to the relationship management practices at organisational level.

### ***Acquiring diverse resources***

Acquiring diverse resources refers to utilising different people with a wide range of skills and experience. It is critical to acquire a wide variety of skill sets and levels of experience in the ECI. Young people and recent graduates can offer creativity to the project and gradually learn from the environment. Highly experienced experts are also required to manage the project and provide the right sorts of inputs.

Using a combination of experienced and less-experienced members is found as a strategy for project managers at organisational level to overcome the challenging task of assembling the right quantity and variety of skills and experience for the project team. In terms of financial implication, acquiring a combination of experienced and less-experienced individuals in a project team can help project managers to achieve the project's goals in a less costly manner (Kloppenborg 2014).

While the skills and knowledge of experienced members are essential to accomplishing the project requirements, the different ways of thinking of young and inexperienced members can introduce innovation and creativity into the project. In addition, young people are generally more technology savvy and can help the organisation to facilitate the implementation of knowledge based tools (ICT, BIM etc.). However, it is important to set expectations for senior persons to mentor and supervise juniors (Kloppenborg 2014).

### ***Creating Joint Leadership Team (JLT)***

The need for setting up a joint leadership team that consists of representatives

from contractors and clients is emphasised by the majority of the participants. All of the joint leadership team members are at senior management level. The responsibility of the team is to formulate how the project is to manage and how project teams are to operate. They are to empower the client's project managers and to empower the contractor's project delivery managers.

Establishment of a joint leadership team (JLT) including the key decision makers who have sufficient authority to set, structure and apply standards across and within the project delivery teams, is advocated in collaborative project procurement arrangements (BSI 2010; Mosey 2009; Ross 2003; The Secretary Department of Treasury and Finance 2006; Walker & Lloyd-Walker 2014b).

The JLT share a common understanding of goals and values and jointly define key performance indicators (KPI). They share concepts, approaches, and language and get engaged in joint problem solving activities (Walker & Lloyd-Walker). One of the responsibilities of the JLT is empowering the project delivery. Commenting on this, one respondent explained that 'JLT was basically there to support and empower the delivery people' (P#9).

### ***Communication management***

The participants' responses showed that collaboration between project parties is largely influenced by the quality of communication and hence should be carefully managed. Communication was recognised as a concept that is incorporated within the relationship, and their understanding of it was over and beyond the literal definition of communication that is an act of exchanging information. Rather, communication was perceived as the means to engage teams in transmitting knowledge, expressions and feelings as well as technical information.

This point of view is generally consistent with Heath (1994) that communication can have different meaning depending on how the definition addressed the ability for organisations to interact. The finding, therefore, suggests that the practices for managing communication and working

relationships are interlinked in terms of practical application. The sections below provide details of the identified practices for communication management.

#### *Effective communication platform*

Organisations involved in the project need to develop and maintain a free-flowing communication between teams and external actors. An effective joint communication strategy across teams, internal and external stakeholders should be established to facilitate sharing of necessary information. Clients should identify key stakeholders, communicate with them on a regular basis, and meet with them frequently to attain a very good understanding of their needs and their preferred method of contact. Effective communication leads to a better understanding of the stakeholders' needs and engaging with them about what their preferences are.

One participant emphasised the engagement with stakeholders and its significance for the relationship. He explained, '*...that engagement process is really important. So it's very much engaging with them, standing in their shoes and understanding what exactly they are trying to achieve and working through their issues in the way they want to have them worked through...If you start to get that very good understanding, you build a lot of trust with them and from that you can start to build a very good relationship*' (P#1).

The need for an effective and effortless joint communication protocol in managing collaborative relationship is recognised by this study. Communication is realised as an essential element of team effectiveness, organisational effectiveness and the integration of work units across organisational levels (Love , Gunasekaran & Li 1998). By establishing effective joint communication strategies, team members fully comprehend the changes in behavioural patterns that collaborative working requires as well as necessary information that should be shared across the teams and organisations (BSI 2010; Moore & Dainty 2001).

In order to achieve free flowing communication between and within the project



teams, organisations and key stakeholders, Jørgensen and Emmitt (2009) assert that facilitation and leadership technique are vital. Izam Ibrahim, Costello and Wilkinson (2013) further added that organisations are to have a strategy to organise the project teams in an effort to ensure the consistency of the communication flow within project teams. Clients have to evaluate methods of communications to identify which method should be utilised in an ECI project and specific consideration should be given to the remote locations (BSI 2010).

#### *Jointly information sharing process*

Jointly information sharing process should be developed to evaluate and determine what information needs to be shared and what information cannot. The process should ensure that all parties receive sufficient information required for delivering the project. However, parties should respect the confidentiality issues regarding commercial/political sensitive information. Each organisation is required to acquire a probity advisor to advise the fairness of information sharing.

Information sharing is exchanging existing or new information between people or organisations whilst working together (Ford & Staples 2010; Lilleoere & Holme Hansen 2011; Lindsey 2006). Despite the fact that sharing information within project participants is key to the project success (Love et al. 2009), the level of openness should be defined by partners from the outset to make sure their information strategy is in compliance with the organisations' regulations (BSI 2010).

#### ***Modelling collaborative behaviour***

Working in a collaborative environment requires behavioural patterns established within the organisational norms and supported from the top down to legitimise a collaborative culture in the ECI project teams. This needs a commitment to collaboration from top managers in order to permit teams to be proactive and to establish a culture that enables them to have open conversations about their respective rights and obligations.

Implementing a cultural change that enables a collaborative working environment needs support from top senior management at organisational level. Such an environment can be created and maintained when high level corporate support and commitment to the spirit to collaboration is demonstrated (Rahman, Kumaraswamy & Ling 2007). While participants acknowledged the need for a collaborative environment within the project teams where people are open and honest toward each other to deliver a project successfully, they emphasised that such an approach should be encouraged through the organisations and the board of the project teams as well.

In addition, having systems and processes in place that allow project team members to collaborate is also important and significant (Boedker et al. 2011; Lawrence & Scanlan 2007). In this environment team members are permitted to be proactive when a problem is required to be managed instantly on site before going through a formal bureaucratic procedure. It is, therefore, essential that the client organisation establishes appropriate governance systems and processes to support the collaboration required for an ECI approach (BSI 2010).

### ***Risk management***

Amongst the abundant reasons relational approaches are adopted by organisations, generating an effective basis for reducing risk is acknowledged by many studies (Alsagoff & McDermott 1994; BSI 2010; Rahman & Kumaraswamy 2004; Walker, Hampson & Peters 2000; Walker & Hampson 2003). However increasing interdependency between the project parties in a relationship based procurement method can introduce new types of risks (BSI 2010). Therefore, the focus for adoption of collaborative working should be on development and enhancement of the existing risk management process that is already established in organisations.

In the context of ECI, participants were asked to indicate the best practices for managing risks to enhance the relationship between involved parties. A wide range of practices were identified and explained. The sections below expound the identified practices to manage the risks associated with a project in an ECI

contractual environment. Each identified strategy is then explained and supported.

#### *Setting a joint risk management mechanism*

Best practice for risk management would engage all of the key-players involved in project delivery to share their joint understanding of risks associated with the project. In a wider sense, those from the designer's side, the owner's side, the contractor's side and other specialist's areas, through a collaborative approach, assess project risks jointly, regardless of which party eventually takes the risk.

Participants suggested that the best practice strategy for risk management is to bring in the right level of expertise and the broad cross section of stakeholders who will be involved in the project to collaboratively manage risks and uncertainty, and potentially gain advantage from turning risks to opportunity. Jointly managing risks may also reduce or avoid the risk premium that contractors add in their pricing process when risks are meant to be managed only by them (Mosey 2009).

Creation of a joint management team is important for identifying, evaluating and responding to risks within the collaborative team. BSI 11000 (2010) further instructs that a competent personnel also should be appointed as the joint risk manager to be responsible for the overall risk management process. The position and authority of the joint risk manager is established through a joint risk management process in the governance of the collaborative arrangement.

#### *Understanding of risks within contractual obligation*

Effective risk management strategy ensures that all the parties are consistent with the contractual allocation of risk, and endeavour within the contractual parameters to support the effective mitigation and avoidance of risks.

Even though relational contracts are predominantly ruled by non-legal enforcement mechanisms, legal mechanisms take precedence if any problems materialise (Rahman & Kumaraswamy 2002). Therefore, despite the fact that risk management is undertaken collectively in an ECI arrangement,

understanding which party is contractually obliged to deal with the risks, if eventuated, is essential. All team members should be aware of the risks and recognise their team's responsibility for the risks that they are contractually obliged to deal with.

*Exchanging necessary information by creating communication platform*

A communication protocol should be created that gives all parties the ability to be able to have conversations about the common and specific risks including identification of risks and a clear statement of which party can better manage the risk. An effective communication between the project's parties is essential to promote greater transparency, better management of risks and reinforce trust that enables parties to share their information in relation to the analysis of jointly identified risks and adoption of a jointly agreed approach (BSI 2010; Cheng et al. 2010). Chapman (1994) also asserts that it is important for the project participants to move from a traditional isolated management style toward a collaborative shared information management approach in order to effectively manage their risks.

*Integrated process in place to manage unknown risks*

A transparent joint risk management process for the collaborative operations should be developed to enable parties to deal satisfactorily with unknown risks. The ability of negotiation and renegotiation should be embedded in the process to identify the party who is best able to manage risk in compliance with the project's best value and objectives.

Development of an integrated risk mitigation strategy by clients is perceived as another practice toward the best risk management strategy. Many risks have the same impact on the integrated project team as they effect a single organisation and thus an integrated approach can address these challenges (BSI 2010). Participants commented that the absence of an integrated managing process in a risky project transfers commercial risks to the contractor and performance risks to the clients.

Segregated risk management by each party has a significant negative influence on the working relationship between client and contractor. This finding is generally consistent with the Suprpto et al. (2015) point of view that risks have to be managed jointly to maintain positive working relationship between owner and contractor. Also, in the RBP taxonomy model developed by Walker and Lloyd-Walker (2014b), the extent to which an integrated risk mitigation strategy is organised by the client, is identified as one of the element of platform foundational facilities to examine the level of collaboration in different procurement approaches.

#### *Documenting risks and disseminating risk register*

Generating a jointly identified risk profile and documenting the risks are the crucial risk management tasks in an ECI arrangement. A joint risk register should be created and disseminated across all parties with appropriate process in place to enable all parties understand the risks, the party responsible for the risk and the potential consequences of the risk if eventuates. A risk register also enables the checking process of the effectiveness of the system during the 'assessing phase' and learning from mistakes in 'reflecting phase'.

Conchúir (2011) defined the risk register as the central database for the project where identified risks as well as mitigation measures are recorded. The risk register is the only output of the risk management process and hence must be kept updated from the beginning of the project to the end. Recording the identified risks in the risk register is part of the project risk management process regardless of the type of contract the project is governed by. However, there should be a good understanding of risk management when dealing with any aspects of collaboration (BSI 2010). A risk management culture that accepts a joint responsibility of risks between the client and contractor can be established by having a clear understanding of the risk and the responsibilities. In an ECI arrangement, therefore, the risk register is identified as the means by which the risk communication between parties is facilitated in order for them all to be consistent with the same understanding of the project risk aspects.

### *Relationship management strategies at project teams level*

Since a project is defined as a temporary endeavour undertaken to create a unique product or service with a definite starting and ending point (PMI 2008), project teams need to be temporary, heterogeneous, cross-functional and highly skilful; they need to perform one-off tasks that are generally discretionary in nature (Scott-Young & Samson 2008). It is generally accepted that the success of a project depends of the teams and their performance as to what extent they are able to meet the defined quality, cost and time objectives (Campion & Higgs 1995; Cohen, Ledford & Spreitzer 1996; Hoegl & Gemuenden 2001). The managing team is thus realised as an essential project management task and duty (Thamhain, 2004).

Relationship management strategies at the project team level reflect the strategies identified by the participants that project managers need to utilise to ensure a successfully engagement of the team in improving the working relationship in an ECI project. The following sections explicate and support the managing practices at project team level derived from the findings

#### ***Coaching and mentoring***

Managers should add coaching processes to the program to take everybody on the journey. It is developed along the way to train people as to how act in their roles. Although the coaching arrangements do not necessarily build the team members technical knowledge, the essential patterns for behaviours and operation in an ECI environment are instructed.

Project teams require coaching and direction otherwise the system would be out of control (Johns 1999). Coaching and training the project team is necessary to enable the team members to contextualise learning and add value through that knowledge by sharing experience and insights of project managers in a formalised manner (Walker & Lloyd-Walker 2014b) .

Project managers should provide continued and consistent support throughout the project and conduct coaching at critical points in the project cycle and at the

key points in the project delivery process (Johns 1999). The findings of this study suggest that, in the context of ECI, the engagement of project managers in the mentoring and coaching process can help to focus on the behavioural patterns that team members need to work within rather than technical knowledge.

### ***Natural development of the team***

The findings of this study suggest that project managers should let the team development happen naturally. It is quite hard to encapsulate the nuances of motivation and all aspects of business in a classroom environment. While the importance of the pre-project induction programme at organisational level and coaching throughout the project was indicated by the participants, it is emphasised that some sort of soft skills and essential attributes to work in a collaborative environment cannot be developed quickly without being in a real-life situation.

Walker and Lloyd-Walker (2014b) reinforce this by stating that many of the characteristics required for collaborative project procurement arrangements are beyond university education and job based trainings, and thus cannot be classroom taught. Rather, team members can learn the knowledge and develop required skills from experience and the path by which improvement takes place (Bohn 1998; Fiol & Lyles 1985). It is far lively when team is developed in a real-life situation. Teaching soft skills is hard in isolation without being in a project and using them. It is necessary also that managers mentor people when they are on the job to support the development of the required skills and knowledge.

### ***Awareness of personality differences***

Managers have to understand the different personalities of people in the teams. Managing strategies should be developed to enable managers to deal with people of different backgrounds, professions, personalities and experiences. Considering the fact that the project teams consist of heterogeneous people with a mixture of personality traits, project managers need to understand the

differences and develop a strategy to manage the teams accordingly.

Depending on how successfully project managers utilise the diverse background and characteristics of team members, project team effectiveness can be measured and evaluated (Lorsch 1987; McGrath 1997). Existing research findings regarding the impact of diversity of personality on team outcomes suggest that while the role of context in which team is expected to perform must be carefully considered (Barrick & Mount 1991; Barrick et al. 1998; Driskell, Hogan & Salas 1987), heterogeneity/homogeneity of individual trait differences also has significant influence on team performance (Mohammed & Angell 2003). Therefore, it is important for project managers to carefully explore and understand personality differences while developing a strategy to manage the team.

### ***Understanding team dynamics***

Participants stressed the need for allocating more time in the ECI phase to focus on teambuilding and some of the formal structured innovation processes. It is important to ensure that all team members are involved in the overall ECI process and their effort to work together as one team is recognised.

Team dynamic is a general term to denote the quality and quantity of interactions among team members and determine the success of the project team (Gelbard & Carmeli 2009). Besides an awareness of each project member's personality traits, project managers need to integrate knowledge of the personalities within the team to manage the direction of the team's behaviour and performance towards the intended outcomes. Project managers can create positive team dynamics by providing support and valuing the project team members and should be aware that managing teams in collaborative environments requires different types of leadership skills and hence the dynamics of collaborative team may need to be altered (BSI 2010).

### **6.2.3. Managing strategies in the 'Assessment stage'**

In this section, findings in relation to the identified strategies for measuring and



evaluating the relationship performance are presented. Measuring relationship performance to examine the effectiveness of current management strategies and to identify shortfalls and stagnation is a vital task in the relationship management process (BSI 2010; Conchúir 2011; Medlin 2003). Relationship performance measurement is also important to guide steady advancement toward established relationship goals by indicating the status and direction of the working relationship between project participants (Hillman Willis & Willis 1996; Rose 1995). All parties involved in a project are to agree on the assessment process including defining the relationship success factors and how those factors are monitored and measured over time against jointly defined measurable values (i.e. KPIs and KRAs).

As noted before, this study focuses only on relationship management in an ECI project and hence the performance implications pertaining to the relationship between involved parties have been focused. However, in order to ensure the collaboration is sustainable and continues to deliver value to the partners, an effective process to monitor, measure and review performance in terms of the project outputs should be also established (BSI 2010).

In the following section approaches to measure and assess the relationship performance in an ECI project are identified. The described assessment approaches were grouped into three categories of 'formal', 'informal' and 'combination of formal and informal'. Discussions are provided to produce a greater understanding and insight into the identified approaches

#### *Formal assessment*

Formal assessment is the process of gathering information of the relationship performance from different resources in a systematic manner in order to measure the effectiveness of the strategies in use. The findings of this study suggest the following practices based on the participant descriptions to assess the effectiveness of relationship management strategies in an ECI project.

### ***Regular review on quality of communication***

An ongoing regular review around the communication management during the ECI phase was indicated as a strategy to measure and evaluate the quality of communication between client and contractor as well as other project stakeholders. This process engages the stakeholders to give their feedback on the effectiveness of the communication through a questionnaire or survey at different intervals throughout the project. Feedbacks are reviewed and areas of weakness are identified to put some actions in place to improve them for the next round in the 'reflection stage'. It is necessary to establish interim milestone measurements to ensure that quality of communication can be monitored and corrective action taken where required.

### ***Checking the health of project***

Project management is all about achieving specific goals and meeting project requirements through application of knowledge, skills, tools and techniques to project activities (PMI 2013). Measuring project outcomes against the defined Key Performance Indicators (KPIs) demonstrates how the project management strategies in place are effective towards achieving the project goals.

Relationships in the project are not the end itself but the project or the delivery of the services is the point of the exercise. Therefore measuring the performance of the project can act as a leading indicator of how the relationship between project parties is established and developed. If the project is running smoothly, all of the standards are being hit, and the quality and functionality is being met, that is probably a good indicator that the relationships are being managed effectively.

### ***Reviewing risk and its eventuation***

Another indicator of effectiveness of relationship is risk and its eventuation. Managers should look at the actual systems and the processes that were the basis for identifying, managing, communicating and handling risk. Actual performances with evidence should be monitored to examine that the process

has been effective on specific cases of risk, that the system has yielded effective results and that certain risks have been avoided. The ECI model itself is already a risk-adjusted model. The model is normally a lump sum, or guaranteed maximum price and the real measure is whether the contractor makes any savings.

Comparing the value of risk at the front end of the project against its value at the back end of the project also indicates the extent of trust development between client and contractor. One participant, for example, explained how risk value trend represents the quality of trust and relationship: '*...we started off on the order of the first ECI, we had under the ECI package, and we had about 10% of total cost was risk. By the last package, we were down to about 1.5% of the price being risk.*' (P#8)

#### *Informal assessment*

In informal assessment the information gathering does not follow a structured process dictated by a certain set of rules and procedures instead information is obtained through unregulated approaches and the judgments strongly rely on the intuition and feeling of the assessor. The following sections report the findings regarding the informal assessment practices for measuring and evaluating relationship management strategies in a project.

#### ***Regular open discussions***

Analysis showed that some clients assess the relationship by looking at the communication through open discussion workshops with project teams and other stakeholders to get them to talk about how open and honest they perceive the communication between them to be. In order for them to monitor the strength and quality of the relationship, it is important to run the discussion workshops on a regular basis to enable the project managers to compare the trends and feedback over time. Once the areas of weakness are detected, project managers can implement a process of continual improvement to remedy those areas.

### ***Relationship observation***

Observing individuals working within the team at all levels can manifest the quality of relationship. Project managers can evaluate the effectiveness of a relationship by assessing some of the fundamental leadership drivers such as whether team members feel empowered, whether they feel they have autonomy over the work they do and whether they feel a certain sense of connectedness, in other words, do they think that what they are doing is important? For comprehending the atmosphere that prevails in the project, project managers are required to be sufficiently experienced in similar types of projects and be able to immediately recognise or perceptively sense without the use of rational processes (Forsberg, Mooz & Cotterman 2005).

### ***Combination of formal and informal assessment***

The findings suggest that project managers employ formal and informal assessment practices together to evaluate the relationship in the project. They intuitively feel the project ambiance while undergoing a structured relationship assessment process. Sharaborova (2014) argued that in a project with a considerable level of complexity, formal assessments fail to address all elements of the project and it is essential to use a combined formal and informal assessment by project managers to identify and manage both visible and invisible issues.

### **6.2.4. Managing strategies in the 'Reflection stage'**

The managing strategies in the 'reflection stage' entail the strategies that project managers need to employ to reflect on the outcomes of the evaluation during 'assessment stage' and post-project review. This includes corrective measures whilst the project is being carried out and application of lessons learned after completion of the project. It is important for organisations to appreciate the invaluable knowledge produced in the project management process and absorb the knowledge from lessons learned and project reviews (Eppler & Sukowski 2000; Schindler & Eppler 2003). Past mistakes are to be reviewed, analysed and

documented and a process to transfer lesson-learned knowledge across projects needs to be designed to ensure the lessons learned are utilised appropriately (Walker & Lloyd-Walker 2014b).

However, the participants asserted that this is the area of management that needs improvement. One participant for example narrated that *'the use of lesson learned is the gap between what we are doing now and best practice strategy. Organisationally, we probably do not do that particularly well as what we would like'* (P#10). Klakegg et al. (2010) and Szulanski (1996) acknowledged this difficulty and highlighted that organisations often cannot learn from many identified lessons due to the lack of capacity to value the knowledge attained from the past experience. Williams (2007) continued that the organisational culture is the biggest barrier against application of lesson learns from past mistakes.

Lessons gleaned from previous ECI projects should be not only infused in the project team of a new project but also applied to the client organisation (Walker & Lloyd-Walker 2014). Kotnour (2000) indicates that a lesson learned can be beneficial for project teams and organisations in two ways. First, the project team is given an opportunity to comprehend the project results through the process of developing a lesson learned. Second, lesson learned functions as a documentation mechanism to facilitate the sharing of learning with others.

Analysis of the participants' descriptions suggests the practices in the 'reflection stage' are in three reflection loops. The first loop involves corrective measures based upon the mistakes detected throughout the project by evaluating team performance and reviewing the relationship. The first reflection loop is, therefore, effective when applied in the 'implementation stage' of the managing process model to make immediate actions, remove weak members as soon as possible (Sanvido et al. 1992) and fix the problems rapidly while the project is in progress. Commenting on this, one participant indicated that *'we try to look at trends with individual criterion, if the criterion is trending down over time that highlights that we need to do something about it. We would then really scrutinise those areas and try and put some actions in place to improve them'* (P#9). The

effectiveness of the first reflection loop is quick but temporal and generally limited to the project life time.

The second reflection addresses the managing strategies based upon documenting the experience gained from past projects and draws upon the lesson learned. Conducting post-project reviews is advocated to enhance the value of lessons learned and enrich the organisation's legacy in terms of best practice strategies to manage the project (Williams 2007).

One of the participants discussed the effect of learning from the past projects on managing strategies: *'you look back at everything you have done, well if I did it this way, I probably could do it quicker and I could do it easier, or if we did it like this, it might be cheaper. That would be through lessons learned, at the end of the day, at the end of your project, you would sit as a group, and you would do a lesson learned, where you would go back and look at steps. Where what worked well, and what didn't work well'* (P#12). The second reflection loop is to implement in the 'preparation stage' of the managing process model when the strategies for managing the project are defined and formulated. Analysing feedback and learning from mistakes helps project managers to critically examine the strategies and reframe them.

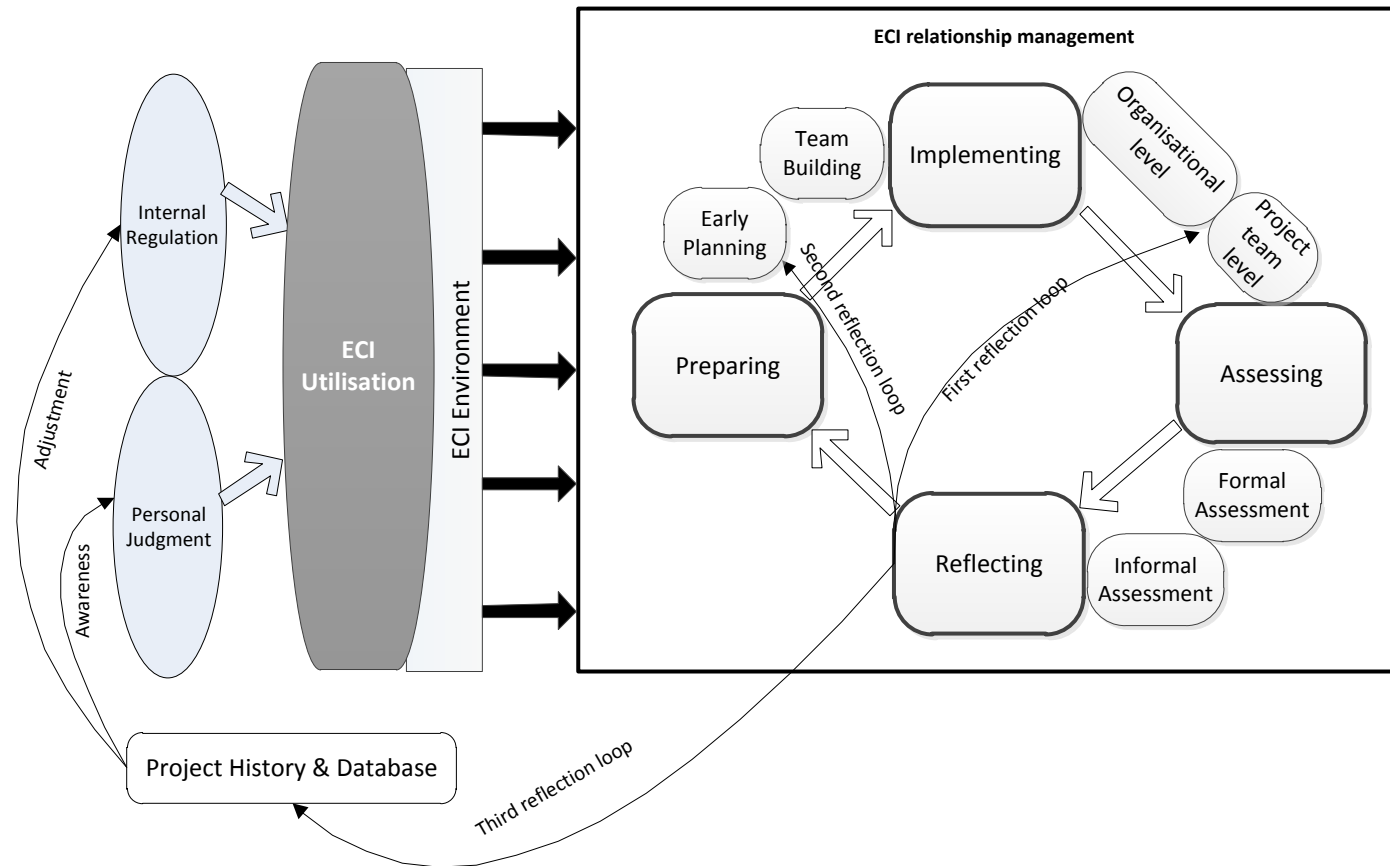
The third loop reflecting on strategies at organisational level for the decision making process is on adoption of a collaborative procurement method based upon lessons learned. The past mistakes in this stage require a wider analysis to detect the areas in which the current procurement selection regulations are ineffective and need changing. Reflecting on the lessons learned helps clients to re-frame and critically examine the strategy for selecting a procurement method including ECI and to make essential adjustments on internal policies and instructions if necessary. The third reflection also influences the decisions when the procurement is decided based on a personal judgment. The experience from past projects develops the decision maker's awareness (Endsley 1995) which directs the process towards a more educated decision. How ECI is selected subjectively or systematically has already been discussed in detail in the ECI selection practices section.

As noted before the experience of previous projects has a significant impact on the decision to use a procurement route for projects. Comments like *'[in the decision making process], you use your experience based on your knowledge of how you delivered projects in the past'* (P#1) or *'[use of ECI is] really starting to be considered by people who have had experience delivering this work'* (P#2), indicate the effect of the third reflection loop on overall internal regulations and personal perception over procurement methods. Maqsood (2006) pointed out that the knowledge attained from this learning process is accumulated in the project history and database which contains strategies, policies and procedures to use for future projects.

#### **6.2.5. Finalising the ECI managing process model**

The ECI relationship management model was evolved and developed while the analysis progressed and the theory was developed.

What has been developed in conducting the analysis for the ECI relationship management is a conceptual framework of the cyclical managing process through four stages in the project life cycle including preparing stage, implementing stage, assessing stage and reflecting stage. Further analysis also has resulted in articulating the strategies within each stage that need to be practiced. These strategies include early planning and team building in preparing stage; managing relationship at organisational and project team level during the implementing stage; formal assessment and informal assessment in assessing stage and three reflection loops in the reflecting stage. Figure 6.19 illustrates the final version of ECI relationship management process model.



**Figure 6.19. Final version of ECI relationship management process model**



### 6.3. Summary

This chapter seeks to move beyond phenomenological description to the development of theory. The result of this chapter is the development of two substantive theories of selection of ECI and management of the client-contractor relationship in an ECI project. The resulting theories provide frameworks presented in forms of two conceptual models.

In developing the model for selecting ECI, the selection criteria for using ECI in a project by clients are extensively explored. This involves elaborating on how clients make a decision on choosing an ECI over other delivery alternatives. The analysis identifies four separate selection criteria clusters for selecting ECI by clients. These clusters include 'project characteristics', 'client's objectives', 'internal environment' and 'external environment'. These clusters are further expanded upon through defining the selection factors belong to each cluster. Complexity, uncertainty, risk profile, time frame and size of project are identified as the factors in the project characterises selection criteria cluster. In the client's objectives criteria, value for money, contractual formality, innovation, constructability and collaborative environment are identified. The factors related to the external environment include market situation, regulation influences, secondary stakeholders and political influences. Finally the selection factors associated with the internal environment are identified as organisational culture, in-house resource availability, design process interaction and budget. In addition, in order to augment the richness of the proposed framework, the practicing approaches to assist the clients in the ECI selection process are identified. Subsequently three approaches are identified by which the clients formulating the selection criteria and/or evaluate ECI against the defined criteria. These approaches include systematic process, intuitive decision-making and industry consultation. In developing the model for selecting an ECI, the construct of prospect also emerges to complement the reasons as to why the clients choose ECI over other options in which the identified selection criteria can be equally address. The concept of prospect is further explored upon through defining the influence that social control, outcome control and process control combine to support its development.

The development of a model for managing client-contractor relationship in an ECI project is a result of the selective coding analytical procedure. The model is originated and developed as a cyclical process framework consisting of the managing strategies at different stages of an ECI project cycle that assist the clients to effectively manage their relationship with contractor. These managing strategies are formulated at the preparation stage, implementation stage, assessment stage and reflection stage. Furthermore, this chapter looks at the essential knowledge, skills, attribute and experience required of the client organisation to form an effective ECI team. These soft and technical skills are investigated in conjunction with Belbin's (1981) team role theory. The result is the development of ECI team roles enabler characteristics model.

Finally, the chapter constantly revisits the data collected for this study to ground the theories and brings literature in to support evolving theory while they are being shaped and developed.

The next chapter will conclude the thesis and will address the research questions and objectives envisaged at the onset of the research in chapter 1. Discussions about contribution made by this research to the body of knowledge and the recommendations for future directions will be provided.

## **Chapter 7: Conclusion and Recommendations**

This chapter presents a conclusion to the thesis by developing a discussion about the findings of this research from chapter 5 and chapter 6 in order to answer the research questions and to achieve the research aim and objectives posited in chapter 1. The chapter starts by reiterating the research questions to enable comparison followed by highlighting the key findings. It then discusses the contributions to knowledge and finally, the chapter terminates with a discussion on the limitations of this study and future research opportunities.

### **7.1. Main Research Findings**

The main foundation behind this research is that the literature and research on the relationship based procurement methods is in abundance with adequate discussion on the governing selection structure, project participants' competency and the project management practices. However, there are a small number of researches undertaken in the context of ECI specifically focusing on the clients.

The core of this research addresses four main questions:

- 1- What is ECI and what are its characteristics?
- 2- How and under which circumstances should ECI be adopted for a project?
- 3- How can an effective strategy for relationship management be developed as a result of an ECI process?
- 4- What are the personalities required of the key people in the client's organisation to enable an ECI process?

#### **7.1.1. What is ECI and what are its characteristics?**

This research question is partly answered through a rigorous cross disciplinary literature review as presented in Chapter 2 and specifically addressed in Section 2.3, and partly answered by individual semi structured interviews with senior managers in the clients' organisations who had first-hand experience in utilising collaborative procurement approaches such as Alliancing and ECI. Through the

observation of the literature and analysing the interview responses, the findings of Chapter 5 addressed this research question.

ECI is defined in two ways. First, it is seen as a label for a two-stage formal contractual process in which the contractor is normally appointed based on a non-price pre-qualification selection for the first stage in order to develop the scope, assess risks, introduce innovative ideas into design, advise on constructability considerations and price the project in conjunction with the client. The first stage typically is contracted under a cost-reimbursement mechanism and the contractor is compensated in accordance with the actual times they work.

During the first phase, the working relationship between contractor, designer and client is comparable to that in Alliancing where the collaborative culture dominates. At the end of the first stage the contractor submits a 'risk adjusted price' (RAP) offer for Phase 2 in a lump sum payment. If the client accepts the offer, the contractor moves on to Stage 2 and develops the detailed design and construction documentation, and continues the construction activities of the project. If the offer does not meet the project budget or fails to demonstrate value for money, the client has the prerogative to terminate the contract and owns the intellectual property rights to the design to complete the design and take the project works to the market and appoint a contractor through a competitive tender process. Typically, the type of contract for the second stage is a traditional Design and Build (D&C) if the RAP is accepted but if the RAP is not approved by the client, design is completed by the designer and the project is taken to the market for Construct only type of contract during the delivery stage.

The second way in which ECI is perceived pertains to understanding the ECI as an overarching concept that embraces a range of procurement methods and contractual forms. ECI represents the involvement of the delivery contractor at the early stage of the project where the sources of the client join the contractor's team for the project design and planning developments; and when the focus is on exploiting contractor's expertise to introduce innovation and constructability

solutions at the front-end of the project. Depending on the stage of the project life cycle in which the client requires the contractor's expertise, the contractor is involved in the project. This process is the tenet of relationship-based procurement (RBP) methods such as Alliance, Partnering and Joint Ventures.

Similar to most procurement methods, there are multiple alternatives to the ECI contract. The chief amongst which are Early Tender Involvement (ETI), double ECI (dECI), and strategic ECI.

In ETI, the design has been developed before the contractor is involved and the contractor is then appointed to advise on value engineering without any inputs into the design. dECI is designed to encourage contractors to instil their innovative ideas by creating a competitive environment. In this model two groups are conditionally appointed to develop a concept design and offer their most competitive price for the project. One of these groups is appointed to complete the detailed design and construction. Strategic ECI is most widely used for large scaled projects where a client breaks down the project to several ECI work packages and considers each package as an ECI sub-project. The contractor is awarded the next ECI work packages if the previous ECI work package is completed in accordance with the plan. The client can keep the learning and innovation from each work package to improve the working strategies for next ECI work package.

The ECI is also practiced differently in different countries. For instance, the ECI being used in the UK is based on a pain share and gain share process while the ECI in Australia strictly has the contractor's and owner's risks, and the New Zealand version of ECI consists of a three-stage contractual process with a lump sum fixed price for each stage.

ECI is distinguished from other forms of procurement methods from contractual and relationship perspectives. The risk transfer regime incorporated with the ECI contractual process is a distinctive contractual characteristic of ECI where the contract transitions from a collaborative arrangement to a traditional D&C. This transitional characteristic affects every aspect of the working relationship and project governance. The working relationship during the ECI phase requires

cooperation between contractor and client in a collaborative environment while the D&C phase of project dictates each party to follow a cut and dry procedure regulated in a typical traditional D&C contract. Nevertheless, interaction between project participants, internal stakeholders and external stakeholders, has been reported to be significantly greater compared to conventional procurement methods, and the information exchanged between parties is profound.

Findings suggest that using the ECI method delivers a number of advantages in two ways, namely engineering and relationship advantages. Implementing ECI also encounters some challenges in two categories: business-relation challenges and relationship-related challenges.

The engineering advantages of using ECI method have been observed to be greater certainty in the project scope definition, better understanding of risks and better opportunity to capture constructability and innovative solutions during design development. The input from the contractor to the design and undertaking value engineering before commencement of construction activities, drive value for money as the project is likely to be run more efficiently and smartly with less reworks requirements. Engagement of the same management teams from the beginning of the project when the scope is defined and the concept of the project is shaped, throughout the completion of the project, also facilitates the creation of the necessary collaborative culture.

Relationship advantages have been reported to be open, honest and transparent as a result of mutual trust, free-flow communication and better understanding of parties during the ECI phase. Although the detailed design and construction phase is delivered through a traditional D&C or C only contract, the essence of collaboration conceived in the ECI phase does not vanish completely and it tracks up the delivery phase to some extent. The presence of collaboration in the working relationship coupled with a fair risk allocation generates a no blame environment with less commercial claims and disputes.

In terms of challenges in implementing ECI, one of the main business-related challenges has been reported to be difficult in demonstrating value for money

(VFM) to the government by public sector clients due to the lack of price competition. Despite the fact that the D&C phase of the ECI contract is a price competition process, the non-competitive establishment process of the early phase, in fact, cannot satisfactorily respond to the government or auditors general requirements of the actual value achieved for the tax-payers' money. Other challenges such as deficiency in remuneration mechanism in the ECI phase, misusing the relationship by contractor and unrealistic time frame dictating by the government have been realised as a result of the unfamiliarity of the parties with ECI process due to ECI being in an embryonic stage.

Implementing ECI also creates some challenges related to the relationship between parties. The change in relationship protocol between the delivery phase and the early phase, a culture shift within parties to empower teams to make decisions unanimously and share information, encouraging the designer to put time and effort into working with contractor, and striving to have balanced leadership, have been reported as the relationship-based challenges in implementing an ECI.

Both advantages of utilising ECI and challenges in implementing ECI broadly conform to the literature on ECI contracting as provided in Chapter 2, such as Scheepbouwer and Humphries (2011a, 2011b), Song, Mohamed and AbouRizk (2009), Eadie et al. (2012), Mashiah (2008), Rahman and Alhassan (2012) and Whitehead (2009).

### **7.1.2. How and under which circumstances should an ECI be adopted for a project?**

Selection of a procurement system is generally undertaken through a two-stage interdependent process (Love et al. 2008; Luu, Ng & Chen 2005; Morledge & Smith 2013). The first stage is the analysis of the priorities and the second stage is examining different procurement options and selecting the best option. In this process, the most challenging task is identifying and formulating the selection criteria. In case of ECI, this study aimed to explore the factors that drive the clients to opt for the ECI method for their project. From Chapter 5 section 5.3.2, quite a few criteria have been identified. In Chapter 6 section 6.1.1, these

criteria have been categorised in four main categories of project characteristics, client’s objectives, external environment and internal environment.

Project characteristics criteria include complexity, uncertainty, risk profile, timeframe and size of project in terms of the value. Client’s objective criteria include innovation, constructability, contractual formality, value for money and collaborative environment. External environment criteria refers to the market situation, regulation influence, political influence and stakeholders’ impact, and finally internal environment addresses organisational culture, in-house resource availability, design process interaction and budgets. Table 7.1 below provides a summary description of the identified criteria

**Table 7.1. Summary description of ECI selection criteria**

<i>Criteria</i>	<i>Summary</i>
<b>Project Characteristics</b>	
Complexity	The use of ECI is stronger for the projects with a fairly high level of uncertainty and complexity when collaboration with contractor is required to help define the scope and reduce the uncertainty before the construction activities are started. However ECI is not advocated for very complex project with high level of uncertainty in which the impact of uncertainty cannot be evaluated in the delivery phase due to the nature of project and hence an ongoing contribution of the contractor throughout the delivery stage is required.
Uncertainty	
Risk Profile	ECI is considered when the project risks including cost and time overruns, poor contract management, delays of tendering and selection procedures, and technical inadequacy are high. Joint risk assessment process by the client and contractor is essential to evaluate and manage the risks at the early stage.



<i>Criteria</i>	<i>Summary</i>
Timeframe	<p>Projects with time constraints require accelerated scope and design development to enable an early start of the project and avoid delays in the delivery stage. Adoption of ECI in this situation offers better assessment of constructability and opportunity to utilise appropriate methods for delivering the project, which leads to more efficient performance, less required reworks and hence earlier completion of the project. Time constraints, however, should not force the client to rush the project into an ECI without adequate planning. Lack of enough knowledge about the project generates a higher possibility of unforeseen variations during the delivery stage and delay in completion of the project.</p>
Size of project	<p>The value of the project represents the project size. Project size should justify the setup and management costs. In addition, size of project indicates the level of complexity. However, in some cases some high value projects do not exhibit complexity as the project is technically straightforward and on the other hand some small projects can incorporate a number of interacting variables and thus the project exhibits a high level of complexity.</p>
<b>Client's Objectives</b>	
Innovation	<p>When the in-house capabilities including design, construction technology and process cannot adequately satisfy the project objectives, innovation is required. Using contractor's input when the design is being developed and the project scope is being defined can introduce innovation to the project. Examining and evaluating the proposed innovation at the early stage can ensure the constructability and practicality of the idea that can save costs.</p>

<i>Criteria</i>	<i>Summary</i>
Constructability	For projects in which the client's knowledge and experience of construction methods and materials cannot address the constructability issues, the choice of ECI offers better constructability solutions due to use of the project delivery contractor's construction knowledge and advice much earlier in the project. Constructability considerations become more critical when complexity and uncertainty is associated with the project and the client lacks the required knowledge and skills.
Contractual formality	The delivery stage of the project is governed by a formal D&C contract in the ECI scheme. When risks can be identified and assessed to an acceptable degree, it is possible to accurately price the project with an acceptable contingency for risks. In this circumstance, a formal contract can be more beneficial to the client due to the time and cost certainty incorporated with a lump sum contract, and the presence of solid establishment of roles, responsibilities, remuneration scheme, distribution of risk, dispute resolution and conflict settlement procedures in a formal contract.
Value for Money	Value for money (VFM) for public clients refers to achieving the best return and performance for the tax payer money being spent while the government policies and priorities are being advanced. Therefore, for public clients, demonstrating VFM is a fundamental objective. Clients should beware that the lowest price cannot ensure VFM, rather value is delivered if the contractor is adequately competent and project can benefit from their skill and expertise. The price competition inherent in the ECI to select the delivery contractor is a way to demonstrate value for money to some degree while the collaborative environment caused by the cooperation of contractor and client creates the common best-for-project mindset and facilitates the delivery of value for money. ECI, hence, is the preferred choice over Alliances when the uncertainty and complexity of the project require a collaborative working relationship and the VFM is also of the client's concern.
Collaborative Environment	
<b>External Environment</b>	

<i>Criteria</i>	<i>Summary</i>
Market Situation	Market situation has a profound impact on the decision to choose an ECI for a project by clients. In a highly competitive market, clients should be selecting ECI more wisely since while the market situation can drive competitors to be more innovative, the risk of cut-throat tender price to just win the contract is higher.
Regulation Influence	In Australia, choice of procurement method in the public sector is directed by the administrative procurement policies and regulations. Based on the type and size of projects, the utilisation of ECI is, to a great extent, dictated by the regulations, systems, work procedures and codes of practice, and consequently the external regulation is recognised as one of the element affecting the choice on adopting an ECI.
Political Influence	The utilisation of ECI is significantly affected by the political atmosphere. Political issues direct the client to pick the procurement strategy. The impact of the project outcomes on the political environment is of the government's concern and hence the choice of procurement approach is influenced by political considerations. Political impact is perceived as negative when an unrealistic time frame directed by political reasons imposes the utilisation of ECI.
Secondary stakeholders' Impact	Although secondary stakeholders including non-governmental organisations, activists, unions, communities, the public and governments have no formal, official or contractual relationship in the project, their influence on the project should not be overlooked and their interests should be analysed and considered when choosing the procurement strategy. If numerous stakeholders are involved in the project, ECI is a preferable option to reduce the pressure imposed by stakeholders and manage their potential impact in the future. Keeping stakeholders informed throughout the project from the front-end towards the delivery phase in complex and risky project is only possible when a joint stakeholder management plan is generated by the client and contractor.
<b>Internal Environment</b>	

<i>Criteria</i>	<i>Summary</i>
Organisational Culture	<p>Clients need to have appropriate organisational culture to adopt an ECI. A culture of collaboration, openness and transparency is essential to work in a collaborative environment. Traditionally, the construction industry has been dominated by a culture of segregation between contractor and client. ECI requires a close cooperation between the project participants. The evaluation of organisational culture is vital before adopting an ECI to ensure everyone within the organisation is able to work in such an environment.</p>
In-house resource Availability	<p>Possibility of the use of ECI is increased when the client suffers from inadequacy in proficiency and skills within the in-house resources required for a project. Despite the fact that clients have a wide array of procurement alternatives to address the lack of their in-house resource capabilities, application of ECI is preferable when the complexity of the project requires the constructor's skills being acquired in the scope definition and design development.</p>
Design process Interaction	<p>In complex projects, it is needed to promote innovation and produce atypical performances. Most of the innovation should be applied while the design is being developed to be more effective. The client's interaction is important when the highly innovative ideas and non-standard components are associated with the design in order to ensure the functionality of the design. ECI provides the clients with the opportunity to be involved in the design development process and have control over the design to assess the innovation against their objectives.</p>
Budget	<p>In traditional procurement approaches, the scope and design should be sufficiently developed to the tender point. For clients who have limited budget and do not intend to privately finance their project, the use of ECI is a preferable procurement option as they are able to develop the scope within their available budget and with the minimum redundancy.</p>

Apart from the four main selection criteria categories that clients consider in evaluating the suitability of ECI for a project, one of the outcomes of this study was the emergence of the construct of prospect when clients are meant to make a decision to choose a procurement method in a risky and uncertain situation.

The prospect theory developed by Kahneman and Tversky (1979) perfectly describes the selection of ECI by client organisations as a result of the extreme aversion inherent in behavioural economics where the psychological and emotional factors influence individuals' and institutions' economic decisions. The further analysis also revealed that the hybrid characteristic of ECI in which the contract begins with a trust-based relationship in the scope and design development and then switches to a formal D&C contract at the detailed design and construction phase, reduces the risk and uncertainty through gaining greater control over the behaviours, process and the project output. Building trust and commitment in the front-end of project facilitates the social control, and utilising a standardised D&C contract with a lump sum fixed price in the delivery stage enables the process and output control.

After addressing the circumstances in which an ECI should be selected, this study explored the approaches that clients make to choose the ECI.

Three main approaches along with the practices related to each approach were reported by participants. The first approach refers to the practices that follow systematic processes. The objectivity incorporated with systematic process assists the clients to limit the degree of personal judgments of decision makers in selecting a procurement method. A systematic selection process can be a structured ranking process (referring to Multi-Criteria Analysis) or prescribed written internal rules and policies that decision makers are to follow.

Unlike a systematic process, the second approach to make a decision on selecting ECI heavily relies on the decision makers' intuition and personal judgment in an effort to address the subjectivity of the procurement selection criteria. The subjective selection process discussed by participants requires sufficient competence of the decision makers in terms of knowledge and experience about the project constraints and procurement routes to

comprehensively analyse the essential factors that need to be achieved and the procurement method that can best facilitate the achievement of those factors.

For projects with a large number of stakeholders involved, clients run a number of workshops comprising the key stakeholders who have significant influence on the project. These workshops enable the client to gain better understanding about the stakeholders' expectations as well as the key project criteria. Obtaining knowledge about the stakeholders' objectives facilitates the negotiation process in order to align the expectations of the project, and assists the client to reach to an agreement with stakeholders on utilising the delivery system that can best accomplish them. Since choice of ECI is generally made when the level of complexity is perceived as fairly high, the number of influencing stakeholders or the impact of stakeholders on the project is noticeable. Undertaking stakeholder workshops is, therefore, a useful means to ensure that the use of ECI can fulfil stakeholders' expectations and satisfy their needs.

Seeking external advice through the industry consultation is the other selection process to address the lack of necessary knowledge and experience of the client to assess the project objectives and match them with the best available delivery system.

In selecting an ECI, it was found that depending on internal capabilities, clients utilise industry consultation in two ways. If clients have sufficient knowledge and experience about the weakness and strength of available procurement options, they seek industry advices only for formulating the project objectives and special management requirements as the basis for selection of procurement. On the other hand, when clients lack the required expertise in analysing the procurement alternatives, they continue the external consultant services to select the procurement system for the project.

### **7.1.3. How can an effective strategy for relationship management be developed as a result of an ECI process?**

This research question is answered through analysis of the semi-structured

interviews with 14 professional practitioners at the senior managerial level from the local government and leading private professional consultant organisations who were involved in ECI projects as high ranked project managers or key decision makers, resulting in formulating a cyclical managing process model presented in Figure 6.19.

The model has been developed by combining elements from the Grounded Theory analytical procedure prescribed by Corbin and Strauss (1998). The model is first of all a conceptual framework to summarise the different practices that constitute relationship management in ECI procurement development. It is also meant to be used as a prescriptive tool to prepare, implement, evaluate and improve strategies to manage the relationship in the ECI project development.

As a result of the interview data analyses, the management model considers a cycle that consists of four stages in the ECI management process and for each stage different managing practices were identified. These stages along with the related practices are listed below. Each stage has a short description followed by the explanation of the managing practices within that stage.

**The preparation stage** focuses on the managing practices required for preparing the implementation of ECI.

- **Early planning:** early planning is identified as the result of this study for managing an ECI relationship at the preparation stage. The process begins after completion of project definition when the project execution approach is decided and before the ECI contractor is appointed. It consists of preparation of the brief and developing preliminary design, formulating the contractual arrangement, and communication planning functions.
- **Team building:** Developing a project team that consists of competent members who can satisfy the project objectives is important for any project regardless of the type procurement method used. However, team effort in collaborative project procurement arrangements for complex projects with a high level of uncertainty is essential. From the analysis of interviews it appears that building an ECI team is one of the core planning functions at the preparation stage that has significant influence on the relationship

between client and contractor at later stages. This study investigated the team development further when exploring the answers to the third research question, which is presented later in this chapter.

**The Implementation stage** addresses the managing practices for an ECI relationship after involvement of the project participants. The relationship management practices explored in this study pay extra attention to the risk management and communication management since the findings of the preliminary trail study suggest that risk arrangement and communication are the cores of working relationship between the client and contractor. The ECI relationship management practices were investigated at two levels of engagement:

- **Relationship management at organisational level:** Relationship managing practices at the organisational level are the strategies that are established within the client organisation and supported by senior members who are not involved in the project directly. The analysis of the interviews identified a number of managing strategies that need to be considered at the organisational level. These strategies include: acquiring diverse resources to enable the organisation to make use of different people with a wide range of skills and experience; creating a Joint Leadership Team (JLT) comprising of senior managers from the both contractor's and the client's organisations to jointly establish key performance indicators (KPI), problem solving procedures, and align goals and values across the teams; and modelling collaborative behaviour by establishing culture of partnering and behaviour patterns that allow teams to be proactive, open and transparent.

Managing risks and communications also needs to be planned and implemented at the organisational level down towards the project team.

In managing risks, the mutually agreed process for risk management within the relationship should be formed at organisational level by:

- Setting a joint risk management mechanism to assess project risks by utilising the right level of expertise of diverse key stakeholders who are



capable to not only manage risks but also turn risks to opportunity. This would be only possible by forming a joint management team directed by a component joint risk manager who is appointed through a joint risk management process and responsible for the overall risk management process.

- Understanding of risks within contractual obligation to ensure that all the parties are fully aware of their contractual responsibilities in dealing with risks. Unambiguous understanding of the contract terms and parameters helps the parties to avoid disputes by knowing who would be responsible for risks when they eventuate.
- Exchanging necessary information by creating a communication platform that enables parties to openly converse in relation to the general and specific risks and who would best manage them. The communication between the project participants should be established in a way that encourages trust and transparency to share important information in order to jointly assess risks more effectively.
- Integrated process in place to manage unknown risks to calibrate risk management strategies based upon the values and objectives of all project participants when developing managing approaches. Integrated risk management process in complex projects improves working relationships by reducing the possibility of unfair commercial risk transfer to the contractor which causes lifting the performance risks and compromising the quality.
- Documenting risks and disseminating the risk register amongst teams to enable all parties to understand the risks, the responsibilities for the risk and the potential consequences of the risk when materialised. Risk register should be kept updated throughout the project life time. In an ECI arrangement when risk communication has a key role to play, risk register is to ensure all participants have the same understanding of all aspects of the project risks.

Communication management at the organisational level also affects the quality of working relationship between stakeholders. Clients should pay extra attention to the communication with key stakeholders since establishing and maintaining effective communication management across stakeholders is the key to project success. The following approaches are found to assist the clients to facilitate and improve the communication between project stakeholders:

- Establishing an effective communication platform in an effort to develop and maintain free-flowing communication between teams and stakeholders. It is important to engage with key stakeholders and communicate with them on a regular basis to understand their expectations, needs and preferences. Formulating an effective joint communication plan, explicates the type of information that should be exchanged across the stakeholders, the preferred method of contacts and the communications protocol to set the rules defining the format of communications.
- Developing a joint information sharing process to ensure the right person receives the right information at the right time. The process facilitates the evaluation of necessary information that needs to be shared across the project participants. The process should enhance the information flow between project teams ensuring the consistency of information about the project and the necessary access of each participant to the same information in the project.

○ **Relationship management at team level**

Relationship management strategies at the project team level reflect on the approaches that project managers need to make at the project team level in order to improve the client-contractor working relationship in an ECI project. Various approaches were identified that essentially focus on the improvement of relationships including: team training in the behavioural pattern and operational style required for working in an ECI environment; appreciating the natural development of the team in a real life situation to

gain experience, skills and attributes essential for working in a collaborative environment; being aware of the team members' personality differences to enable managers to deal with people of different backgrounds, professions, personalities and experiences; and understanding of team dynamics to advance the quality and quantity of the interactions among project teams.

**The assessment stage** refers to phase that relationship performance is measured and evaluated to examine the effectiveness of the relationship management strategies in place. The described assessment approaches are grouped to three categories as below:

○ **Formal assessment**

The assessment process is formal when the process of gathering information from different resources to measure the effectiveness of the relationship management strategies is undertaken in a structured and systematic manner. Three main functions were identified to formally assess the relationship including:

- Regular review on the quality of communication with stakeholders by collecting and analysing feedback from stakeholders on the communication status through a designed questionnaire or structured survey on a regular basis throughout the project.
- Checking the health of the project represents the health of working relationships. Evaluating the project outcomes against the Key Performance Indicators (KPIs) is a way to examine the quality of relationship between parties and effectiveness of the management strategies.
- Reviewing risk and its eventuation indicates the developed of the relationship between client and contractor. In an environment in which the relationship is strictly based on transaction, the cost of risks at the beginning of the project is noticeably high. The development of trust between the client and contractor gradually reduces the cost of risk since the contractor considers lower contingency for relationship-oriented risks. Reviewing the cost of risks and comparing them with the early

stage of the project can be considered as a sign about the quality of trust in the relationship.

- Informal assessment is the evaluation process that relies on the personal judgment of the assessor. In informal assessment approaches the required information is gained through unregulated and unstructured process and the assessment is subjective to a great extent. Two approaches were identified to assess the relationship in an informal manner. The first approach is running regular open discussion workshops with stakeholders to enable the project managers to evaluate the quality of the relationship by comparing trends and feedback over the life of the project. Corrective measures can be timely and effectively taken when deficiencies in communication and relationships are spotted. The second approach is to keep close observation over the relationship by assessing team members' feelings. Culture of collaboration between project teams engenders feelings of empowerment, autonomy over work and a sense of connectedness within the team members.
- **Combination of formal and informal assessment**  
Generally, formal or informal approaches are not sufficient by themselves in assessing the quality of ECI relationships and evaluating the effectiveness of relationship management strategies in use. The combination of formal and informal practices is essential for project managers to feel the project atmosphere and conduct a structured assessment process together.

In the **reflection stage**, managers reflect on the learning period using the outcomes of the evaluation to firstly refine and correct the strategies in place and secondly to avoid carrying the past mistakes into the future. A mechanism of loop reflection was identified as the basis for learning process. The reflection on the learning is to be implemented at three different points of the managing process as below:

- **First reflection loop**  
The first reflection loop is to fix the detected deficiency in the current strategies based on the evaluation of team performance and the relationship whilst the project is progressing. The corrective measures are applied to the

strategies in the implementing stage as the remedies need to be immediate and fast acting.

- **Second reflection loop**

The second reflection loop is challenging managing strategies based on lesson-learned and feedback loops learning from previous project. The experience gained from past projects helps managers to advance the strength and rectify the weakness of the managing strategies.

- **Third reflection loop**

The third reflection loop feeds decision makers at organisational level for the procurement selection process. Lessons learned from previous mistakes assists in exploring the areas in the procurement selection process that need to be reframed or customised in order to align the choice of procurement with the organisation's visions on relationships. The outcome of the third reflection loop needs to be kept in the project history and database to be used for refinement of the current internal policy and regulation in regards to the procurement selection and development of the decision makers' awareness about the benefits and challenges they would envisage by utilising a collaborative procurement approach such as ECI.

#### **7.1.4. What knowledge, skills, attributes and experience are required of the client to enable an ECI process?**

A high performance team consists of suitable individuals who demonstrate sufficient capabilities in two different aspects of team development. The first aspect is the personal capability of an individual in terms of soft skills (personal traits) and hard skills (technical skills). The second aspect relates to the role that the team members can play within the team. Belbin (2012b) team role theory supports this finding that the presence of the right combination of roles is required to enable a team to operate effectively. It has been inferred that a high performance team comprises of members who are equipped with the sufficient personal and technical skills and contains more of the roles together.

In order to explore the required personal capabilities of people for an effective

ECI team, the participants' responses were analysed to firstly identify the knowledge, skills, attributes and experience required of the team members to form an ECI team. A number of personal traits and capabilities were identified under two main categories of behavioural factors and knowledge, awareness and experience. Behavioural factors represent the personal traits essential of the client's employees to fit in an ECI team, and knowledge, awareness and experience refer to the skills and abilities of the members to be adequate enough to enable the individual to function towards meeting the project objectives. The results of the findings are presented in table 7.2 below.

**Table 7.2 Required personal behaviours and capabilities of ECI team**

Behavioural Factors	Knowledge, Awareness and Experience
Communicativeness	Project technical skills and experience
Lateral thinking	Project internal and external environment awareness
Optimism	Commercial position awareness
Commitment	
Projection	
Receptiveness	
Transparency	
Trustworthiness and Trustfulness	
Approachability	
Sense of mutuality	
Divergence	
Enthusiasm and Team motivation	
Political astuteness	
Appreciativeness	
Assertiveness	

Secondly, the identified behaviour factors and knowledge, awareness and experience were further analysed through the notion of the Belbin (2012b) team role theory in an effort to define which characteristics enable each role. Senaratne and Gunawardane (2015) synthesised Belbin's team roles into three clusters, namely action-oriented roles, people oriented roles and cerebral roles.

The analysis was undertaken to understand the ECI team composition including the analysis of the essential roles required in an ECI team and identifying the knowledge, skills and expertise of team members that respond to those roles. The analysis also sought more insight into team selection approaches which clients exercised to select individuals and appoint an ECI team.

The identified behavioural factors, knowledge, awareness and experience were examined against the three team role clusters based on Belbin's team roles. This has led to the development of the ECI team roles enabler characteristics pie illustrated in Figure 6.14, which depicts the personal characteristics of ECI team members that enable each team role. The findings suggest that team members who play action oriented roles have to be pragmatic and critical by being committed, divergent, enthusiastic, team motivator, optimistic and assertive.

Action-oriented people are to be positive who can bring inspiration to the team. Nonetheless, they need to make strategic decisions in a timely manner to ensure steady progress towards achievement of the project goals.

People-oriented roles are played by those who have strong inter-personal skills and can communicate effectively with the project stakeholders, both internal and external. The identified personal traits required of a person to be a people-oriented role player in an ECI team, therefore, are found to be communicative, optimistic, receptive, transparent, trustworthy and trustful, approachable, appreciative and mutuality oriented.

Belbin's team roles theory also emphasises the need for cerebral people who can make judgments unemotionally and provide sophisticated advice and

innovative solutions when needed. Amongst the identified behavioural factors of ECI team members, the analysis of the participants' responses suggest that lateral thinking, projection ability, divergence and political astuteness are key personal traits for those who play cerebral roles in an ECI team.

And finally, team members need to have sufficiently strong knowledge, awareness and experience to meet the technical requirements of the project by undertaking their functional roles. The hard skills required of ECI team members include project technical skills and experience, commercial position awareness, internal and external project environment awareness and ECI contract knowledge and experience.

Unsurprisingly, it has also become evident that an ECI team requires more people-oriented roles followed by action-oriented roles and lastly cerebral roles. The functional roles cluster is located in the central core reflecting on the fact that project objectives cannot be fulfilled if the project team members lack the sufficient technical skills and experience.

This study also investigated the process of appointing people within the client's organisation to be part of the team when the ECI team is being shaped and developed.

The analysis of the participants who were responsible for forming ECI teams has shown that generally, ECI team members are assigned to the team through formal approaches or informal approaches. Formal approaches are systematic processes instructed by the internal organisation's authoritative rules or directions. Two formal approaches including team selection workshops and psychometric tests were identified that client's project managers utilise for appointing people to an ECI team.

In the workshops, employees are assessed through analysing their responses to a set of pre-designed assessment tasks comprising of hard and soft skills together. Candidates then are awarded a score based upon their performance in the workshop and those who earn a minimum score requirement are selected to be part of the ECI team. If the client requires more sophisticated personal assessment, the psychometric test is undertaken by psychometric experienced



specialists. Prior to running the test, psychologists along with the management team shape the testing program in a manner that the assessment process can address the required personal skills and characteristics. Upon the completion of the test, a psychometric profile for each candidate is generated that contains the results of the test and the score awarded to each person. Managers can select the suitable candidates by reviewing their psychometric profile.

On the other hand, in the informal approaches, the appointment of ECI team members is undertaken through a non-systematic process mainly based upon the manager's personal intuition and judgement. The two informal approaches described by the participant are selecting ECI team members through gut feeling and personal observation of the senior managers who are responsible for the selection process. It was argued that the beliefs, knowledge and memories obtained from the experience of previous projects equip the managers with the ability to acquire knowledge intuitively for assigning an individual into the ECI team. This seemingly illogical judgment and decision making is derived from unconscious recognitions of a deeper knowledge and thus the more experienced managers the better 'gut feeling' results. Therefore, while selecting the ECI team members through gut feeling can save time, cost and efforts, relying on intuition needs a certain amount of knowledge and experience otherwise it can be misleading.

Personal observation of the people working in a team is also described as the other informal selection approach which is utilised by managers to select and appoint the ECI team members. Since construction is the primary business of the construction clients, the same human resources involved in a past-completed project might be allocated to a new project. The knowledge of individuals obtained through the personal observation from the previous projects can assist the managers to have better understanding of those people's personal capabilities and characteristics. Nevertheless, this knowledge is limited to those who the managers were working with directly in past projects.

## **7.2. Research Contribution**

There have been two conceptual models developed as a result of this research. This research makes a number of contributions to the project management body of knowledge on both theoretical and empirical grounds since the models are based on theory and aimed for use in practice.

The first model proposes a process for clients to formulate their essential criteria to evaluate their needs and examine them against the innate characteristics of ECI procurement methods to ensure the attainment of best value when an ECI is selected in appropriate circumstances as the delivery system for a project. The second model provides a cyclical process for clients to manage the client-contractor relationship in an ECI project.

The contribution of these models to the project management body of knowledge is ensured by pursuing the research directions in the field of project management as recommended by Winter et al. (2006). The new concepts in the project management disciplines and research agenda need to ensure that the research will 'enrich and extend the field beyond its current intellectual foundations, and connect it more closely to the challenges of contemporary project management practice' (Winter et al. 2006, p.639).

Grounded Theory methodology was employed to develop conceptual models in order to provide a new process to the existing approaches outlined in the literature on selecting procurement routes and managing client-contractor relationships, in particular, ECI delivery systems. This study is the first empirical research to develop such selection and management tools for ECI delivery systems. The following sections discuss the contribution of each model to the theory and practice in details.

### **7.2.1. Theoretical contribution of ECI selection model**

The development of the ECI selection model drew on a number of theoretical foundations that collectively helped to define the dimensions of the ECI selection criteria, ECI selection approaches and attainment of different types of

control as potential gains for the client under the notion of prospect theory. In particular, the model was shaped by an understanding of the procurement selection process (Gordon 1994; Love et al. 2008; Love, Skitmore & Earl 1998; Love, Smith & Regan 2010b; Luu, Ng & Chen 2005; Masterman & Duff 1994; Ng, Luu & Chen 2012; Skitmore & Marsden 1988), parameters governing the procurement choice (Luu, Ng & Eng Chen 2003; Seydel & Olson 1990; Skitmore & Mills 1999), and procurement selection methods and techniques (Alhazmi & McCaffer 2000; Touran et al. 2009).

As development of the model progressed, the role of control as governance mechanisms from the perspective of Transactional Cost Economy (TCE) theoretical framework (Eriksson & Laan 2007) and particularly in the context of prospect theory (Kahneman & Tversky 1979) also became apparent.

The model has provided a set of conceptual tools for client organisations to evaluate the effectiveness of an ECI delivery system for their project by formulating their needs and requirements as well as utilising an approach to assess whether the use of ECI can fulfil those needs properly. Furthermore, it is a significant contribution to knowledge by combining several theories in procurement selection process and developing a model for selecting the ECI procurement method. The model is a guide in itself.

### **7.2.2. Practical contribution of ECI selection model**

The ECI selection model developed as a result of this thesis can be used as a selection tool by the practitioners in client organisations. The model describes dealing with the ECI selection process in a simple, practical and useful way. Despite the plethora of research in procurement selection process and methods, there rarely exists a systemic analysis of procurement selection in the context of ECI that considers the procurement selection criteria and procurement selection approaches collectively.

The procurement selection criteria – as a part of the ECI selection model – mainly revolve around project characteristics, client's objectives, external environment and internal environment. This study therefore provides construction client organisations wishing to use an ECI with a sense of

awareness of the necessary criteria required to take into account when considering the ECI as a procurement choice.

One of the key issues that this research attempted to address was to explore different approaches that the client organisations utilise to select an ECI. This is because, currently, there is no consistency within different clients' organisations to employ an ECI for a project. Some clients possess a structured systematic process to select their procurement methods including ECI whereas some adopt more subjective process which are mainly based on individual judgments and intuition and some others rely on external advice from industry consultation.

Introducing the concept of control as a driver for clients to adopt ECI for their projects also provides a new insight for practitioners in the client organisations when making comparisons between ECI and other procurement alternatives. The use of Grounded Theory as the analytical procedure to develop the model laid the groundwork for future researchers and practitioners who seek to refine and expand the ECI selection model developed as a guide in this study. Also, by having a better understanding of the selection process, project stakeholders can develop better strategies for adopting and utilising an ECI.

### **7.2.3. Theoretical contribution of ECI relationship management model**

Prior to this research, there had been no comprehensive study that explicated a process to manage the client-contractor relationship in the content of ECI. The ECI relationship management model developed in this study has filled a gap that existed in the body of knowledge concerning the development and maintenance of client-contractor relationships in an ECI contract. The research has added depth to existing theory by providing a cyclical management process model including a series of theoretical and pragmatic practices that show how relationships may be maintained and nurtured within an ECI project's life cycle.

The model, in particular, provided an additional theoretical dimension for managing client-contractor relationships by integrating (in a single conceptual model) important areas of project management in the preparation,

implantation, assessment and reflection stages. The model specifically delved into the various practices in managing risk and communication as the most influential elements in client-contractor working relationships.

The model also consists of a novel approach for building and managing ECI teams by exploring the knowledge, skills and expertise required of the ECI team members from perspective of Belbin (1981) team role theory. The ECI relationship management model has therefore contributed towards the creation of new knowledge in project management as a basis for developing theories for establishing sound, effective, client-contractor working relationships in an ECI arrangement.

#### **7.2.4. Practical contribution of ECI relationship management model**

In addition to a number of theoretical contributions, the ECI relationship management model has a significant amount of practical applications to offer for project managers in the client organisation who are involved in the managing process of the projects procured under an ECI. The model has demonstrated, in a practical way, how clients can prepare themselves to manage the working relationship with the contractor effectively once the ECI is decided as a delivery system for a project.

The model also provides guidance to the managers about the management practices they may employ in the preparation, implementation, assessment, and reflection stage of the project lifecycle. One of the cardinal practical contributions of the ECI relationship management model is the guidance for selection of the ECI team members in order for clients to form a high-performance project team and to maintain the productivity of the team throughout the project delivery.

In particular, the model identifies the required knowledge, skills and experience expected of an ECI team member in conjunction with the required role that each member needs to play within the team. As already noted, the majority of the challenges in the client-contractor relationship are related to the project risks arrangement and the communications between client and contractor. ECI

relationship management model proposes a number of practical approaches to enhance the relationship and prevent potential conflict in the project. Finally, three reflection loops within the reflection stage developed as a result of this study, assisting managers to take remedial actions at the project and organisational level through both immediate corrective measures when the project is progressing, and refinement and adjustment of the managing strategies after the project has been completed by application of the lessons learned.

### **7.3. Recommendations for further research**

This study was consciously designed to support the development of theories of how an ECI procurement method should be selected as a delivery system for a construction project, and once it is adopted, how the client-contractor relationships need to be managed by the clients. Diverse research directions can give continuity to the work initiated in this doctoral thesis. This research can be the basis for further research from different dimensions focusing on the ECI procurement method. It is suggested that future research efforts could concentrate on the following aspects and also address the limitations inherent in the present study, which are presented below:

- 1- The scope of this qualitative research is limited due to the resource constraints. All of the research participants performed at the highest managerial level within their organisations. They had full authority in selection of procurement methods for a project over others as well as the strategies for managing the project. Since this study solely adopted a qualitative methodology (Grounded Theory in particular), all the responses represent a subjective view of one person reflecting on the individual's view of the reality and interpretation of the facts.

For greater objectivity, a more diverse audience in different levels of power and authority within the hierarchical organisation is needed to gain more insight into the process of selection and management of ECI from lower ranked participants' perspectives collectively.

- 2- This research only focuses on the client organisations and explores the dimensions of selection and management of ECI only within that context. Consequently, the development of both models was based upon the client representatives' point of views. Since the contractors and designers are also main components of a construction project's delivery team, there is a need for future research concentrating on contractor and designer organisations in order to refine, improve and extend the ECI selection and management models.
- 3- As a result of this research, two conceptual frameworks for selection of ECI and management of the client-contractor relationship have been modelled. The frameworks modelled the whole lifecycle of a project from the point a client is considering the use of ECI throughout the completion of the project where the post-project reviews are recorded in the project history and database for use in future similar projects. However, transition of ECI from the first phase into the D&C phase is associated with a typical tendering process to select the main delivery contractor.

Due to the time constraints of this study, it is decided that the scope of the tendering process is too wide to fit within this research. Nevertheless, a longitudinal study investigating the tendering process for ECI projects might be worth further investigation in order to expand the ECI selection and management models to encompass the entire stages of a project lifecycle. This expansion would improve the ability of the models to yield insight into the implications of ECI adoption to the tendering process and into the appropriateness of alternative strategies to manage this critical process.

- 4- This research has focussed on relationship development and management that occurs between clients and main contractors. Since subcontractors play a crucial role in delivery of a construction project, they should not be ignored in creating a complete view of development and management of working relationship in an ECI project. Using a similar methodology to examine the impact of subcontractors on the working relationship would be appropriate.

- 5- Development of the ECI selection and management conceptual models merely relied on the theoretical grounds. While the models can be useful to propose effective practices for selecting and managing ECI abstractly, as a client representative pointed out, clients would need more tangible and pragmatic tools to implement within their organisations. It is therefore recommended to use these conceptual models as the basis for development of more practical tools. Such work could ultimately result in tools for helping the clients to adopt an ECI by considering all other procurement options before selecting such an approach, and to advance their people management skills. These tools can be in forms of formal published applicable standards or computer-based tools based on the elements of the conceptual models proposed in this study.

#### **7.4. Summary**

This chapter provides a conclusion to the research by addressing the research questions identified in Chapter 1 and summarising the research findings. This chapter also explains the contribution of this research to the body of knowledge. Section 7.2 of this chapter presents an argument that two conceptual models developed in this study for clients to select ECI delivery system and manage the client-contractor relationship enhance the body of knowledge in the area of project management specifically in construction procurement management. The contribution of both models from theoretical and practical point of view is outlined. Finally, the chapter presents recommendations for further research in the future.



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## Appendix A: Research Strategies/ Methodologies Review Table

Year	Author(s)	Title	Theme and area	Research Question/Aim	Research methodology	Type of data	Relevance to the subject
2005	(Cullen et al.)	The application of Lean Principles to in-service support: a comparison between construction, the aerospace and the defence sectors	Relational contract	What is the symbiosis between Lean Thinking and Relational Contracting at the product introduction phase of procuring original equipment?	Literature Review	Qualitative	High
2005	(Matthews & Howell)	Integrated Project Delivery an example of relational contracting	Relational contract	developing a contractual model to promote a true teamwork to maximise value while minimising waste throughout the contractual process	Case study	Qualitative	Medium
2005	(Lichtig)	Sutter Health: Developing a Contracting Model	Lean Design and Construction	Developing a commercial strategy employed by Sutter Health in moving	Case Study	Qualitative	Medium

<b>Year</b>	<b>Author(s)</b>	<b>Title</b>	<b>Theme and area</b>	<b>Research Question/Aim</b>	<b>Research methodology</b>	<b>Type of data</b>	<b>Relevance to the subject</b>
		to Support Lean Project Delivery		toward a relational contracting model to promote lean project delivery			
2008	(Ballard)	The Lean Project Delivery System: An Update	Lean design and construction	How the definition and design phases of projects can be managed to deliver value within constraints?	Literature review and case study	Qualitative and Quantitative	Medium
2004	(Gil , Tommelein & Ballard )	Theoretical comparison of alternative delivery systems for projects in unpredictable environments	Lean construction	How to best structure the delivery system and to involve specialty contractors early on in high-tech projects unfolding in unpredictable environments?	Literature review-interview	Qualitative	Medium

<b>Year</b>	<b>Author(s)</b>	<b>Title</b>	<b>Theme and area</b>	<b>Research Question/Aim</b>	<b>Research methodology</b>	<b>Type of data</b>	<b>Relevance to the subject</b>
1994	(O'Connor & Miller )	Barriers To Constructability Implementation	Constructability	<p>-To identify potential barriers to constructability and assess the relative frequency or severity of these barriers in industry</p> <p>-To characterize the prevalent barriers to constructability</p> <p>-To describe any significant differences in barrier frequency across sectors of the industry</p>	In-depth Interview	Qualitative	Medium
1997	(Fischer & Tatum)	Characteristics Of Design- Relevant Constructability Knowledge	Constructability	Formalising specific constructability knowledge relating to design decisions and	Literature Review	Qualitative	High

Year	Author(s)	Title	Theme and area	Research Question/Aim	Research methodology	Type of data	Relevance to the subject
				demonstrating the feasibility of using expert system technology to integrate design and construction during early project phases			
1997	(Mendelsohn)	The Constructability Review Process: A Constructor's Perspective	Constructability	To develop the 'constructability Review Process' model	Conceptual model	Qualitative	High
1998	(Uhlik & Loes)	Assessment Of Constructability Practices Among General Contractors	Constructability	-How the contractors are participating during the preconstruction phase of the project?  -What is prevalence of common barriers to constructability perceived by general	Literature review - Survey	Qualitative	High



Year	Author(s)	Title	Theme and area	Research Question/Aim	Research methodology	Type of data	Relevance to the subject
				contractors?  -How and when constructability should be implemented?			
2006	(Pocock et al.)	Constructability State of Practice Report	Constructability	To assess the current state of constructability practice in the United States	Web-based Survey	Quantitative	Medium
2007	(Molenaar et al.)	Early Contractor Involvement and Target Pricing in U.S. and UK Highways	ECI	To investigate the implementation of Target Pricing in the US infrastructure projects	Literature review	Qualitative	High

<b>Year</b>	<b>Author(s)</b>	<b>Title</b>	<b>Theme and area</b>	<b>Research Question/Aim</b>	<b>Research methodology</b>	<b>Type of data</b>	<b>Relevance to the subject</b>
2008	(Van Valkenburg et al.)	Early Contractor Involvement: A New Strategy For 'Buying The Best' In Infrastructure Development In The Netherlands.	ECI	What lessons have been learned regarding challenges and practical problems, pitfalls and consequences for the tender strategy of early contracting?	Literature Review-Case study in the Netherlands	Qualitative	High
2009	(Song, Mohamed & AbouRizk)	Early Contractor Involvement in Design and Its Impact on Construction Schedule Performance	ECI	To gain intuitive understanding of what a contractor can bring to the design table and how this early involvement effort influences construction schedule performance	industrial case study and a simulation study	Qualitative and Quantitative	High

Year	Author(s)	Title	Theme and area	Research Question/Aim	Research methodology	Type of data	Relevance to the subject
2010	(Lahdenperä)	Conceptualizing a two-stage target-cost arrangement for competitive cooperation	ECI	To find a novel process paradigm to avoid the mutual exclusion of early involvement and reasonable pricing and to harness the potential of effective joint development to really benefit the project	Conceptualisation	Qualitative	Medium
2011	(Scheepbouwer & Humphries)	Transitional Issues In Adopting The Early Contractor Involvement (ECI) Project Delivery Method	ECI	What are problems associated with implementing ECI which are held by the various parties involved	Literature review – questionnaire and structured interview	Qualitative	High

Year	Author(s)	Title	Theme and area	Research Question/Aim	Research methodology	Type of data	Relevance to the subject
2012	(Rahman & Alhassan)	A contractor's perception on Early Contractor Involvement	ECI	To evaluate the perception of a contractor on early contractor involvement (ECI) in terms of its benefits and drawbacks.	Questionnaire Survey ( Structured)	Quantitative	High
2009	(Touran et al.)	Decision Support System for Selection of Project Delivery Method in Transit	Procurement selection	To develop a decision support system to help transit agencies evaluate and choose the most appropriate project delivery method for their capital projects	Literature review and interview	Quantitative	Medium
2002	(Ng et al.)	Fuzzy membership functions of procurement selection criteria	Procurement selection	to establish the membership functions (a membership function represents the	empirical study	Quantitative	Medium

<b>Year</b>	<b>Author(s)</b>	<b>Title</b>	<b>Theme and area</b>	<b>Research Question/Aim</b>	<b>Research methodology</b>	<b>Type of data</b>	<b>Relevance to the subject</b>
				fuzziness degree of linguistic variables) of fuzzy procurement selection criteria			
2011	(Love et al.)	Participatory Action Research Approach to Public Sector Procurement Selection	Procurement selection	To develop a selection process that accounts for the complexity associated with choosing an appropriate option	participatory action-based research approach	Qualitative	Medium

## Appendix B: Participant Information Consent Form



**School of Property,  
Construction and  
Project Management**

GPO Box 2476  
Melbourne Vic 3001  
Australia

### Organisation Name

Tel. +61 3 9925 2230  
Fax +61 3 9925 1939  
[www.rmit.edu.au](http://www.rmit.edu.au)

### *INVITATION TO PARTICIPATE IN A RESEARCH PROJECT*

#### *PARTICIPANT INFORMATION*

#### *Project Title:*

Conceptual models for selecting and managing Early Contractor Involvement (ECI) for a project.

#### *Investigators:*

Tayyab Maqsood, Associate Professor, [tayyab.maqsood@rmit.edu.au](mailto:tayyab.maqsood@rmit.edu.au)  
(03) 99253916

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(03) 99251724

Malik Khalfan, Dr., [malik.khalfan@rmit.edu.au](mailto:malik.khalfan@rmit.edu.au)  
(03) 99251936

Date .....

Dear .....,

You are invited to participate in a research project being conducted by RMIT University. Please read this sheet carefully and be confident that you understand its contents before deciding whether to participate. If you have any questions about the project, please ask one of the investigators.

***Who is involved in this research project? Why is it being conducted?***

My name is Farshid Rahmani , a PhD candidate at the school of Property, Construction and Project Management (PCPM).The research that is being conducted by me aims to develop new knowledge about the Early Contractor Involvement (ECI) procurement system. The research topic is titled '**A conceptual model for selecting and assessing Early Contractor Involvement (ECI) for a project**'.

This research is conducted as part of a PhD degree. My first supervisor is A/Professor Tayyab Maqsood and second supervisor is Dr. Malik Khalfan.

This study has been approved by the RMIT Human Research Ethics Committee and will provide a picture of the state of play in ECI and your participation is crucial and valued.

The data collection and analysis will be undertaken by Farshid Rahmani and Dr Malik M.A. Khalfan who is an experienced researcher.

***Why have you been approached?***

In order to successfully gauge the trend in ECI, this research requires some qualitative data from respondents such as you.

You have been identified as a senior manager/key player who has been involved in ECI projects, and is therefore able to provide me with very useful data. Your details were obtained from contacts provided on your organisation's website.

***What is the project about? What are the questions being addressed? If I agree to participate, what will I be required to do?***

This study aims to define and establish ECI concept from different parties point of view and to gain a consensus on when ECI is appropriate which helps to provide a system to measure and evaluate effectiveness of ECI when it is used in appropriate conditions leading to provide better understanding of soft skills needed of parties to utilise ECI for a project.

This research phase seeks to interview approximately 5-7 people on ECI projects from Alliancing Association of Australasia. The research only requires

60-90 minutes of your time to conduct a face-to-face interview about your completed or ongoing ECI projects.

The interview schedule is attached for your information. The research would ideally like these details on all ECI projects your organisation may have completed and that you have intimate knowledge about as a senior manager/key player involved in an ECI completed within the last five years.

***What are the possible risks or disadvantages?***

There are no perceived risks associated with participation in this research outside your normal day-to-day activities. Nevertheless, if you are unduly concerned about your responses to any of the questionnaire items or if you find participation in the project distressing, you should contact A/Professor Tayyab Maqsood as soon as convenient. Tayyab will discuss your concerns with you confidentially and suggest appropriate follow-up, if necessary.

***What are the benefits associated with participation?***

The advantage to participating is that this study will help us all better understand the current state of ECI and you will have subsequent access, on request, to published reports stemming from the research via industry magazine sources and the professional websites as well as indirectly through academic sources.

***What will happen to the information I provide?***

Your responses will not be directly attributable to you or your organisation. Your responses will only be revealed in form of summary data which will have no reference to persons, organisations or projects, and as such will ensure anonymity of data. The data and analysis will be used to present and publish the findings through research papers and industry magazine or similar publications as well as PhD thesis published on Appropriate Durable Record (ADR) in the RMIT Online Repository that this is a publically accessible online library of research papers. The research data will be kept securely at RMIT for 5 years after publication, before being destroyed. Whereas the final research paper will remain online.



***What are my rights as a participant?***

You may withdraw at any time, and any unprocessed data may also be withdrawn and destroyed at your request. You have the right to have any questions answered at any time and request that any recording cease.

***Whom should I contact if I have any questions?***

If you are willing to participate in this research, kindly complete and return the attached consent form by email (farshid.rahmani@rmit.edu.au). You will be given a photocopy of this PICF after it has been signed

*Yours sincerely*

*Tayyab Maqsood, A/Professor*

*Farshid Rahmani, PhD Candidate*

*Malik M. Khalfan, A/Professor*

*If you have any concerns about your participation in this project, which you do not wish to discuss with the researchers, then you can contact the Ethics Officer, Research Integrity, Governance and Systems, RMIT University, GPO Box 2476V VIC 3001. Tel: (03) 9925 2251 or email [human.ethics@rmit.edu.au](mailto:human.ethics@rmit.edu.au)*

## CONSENT FORM

1. I have had the project explained to me, and I have read the information sheet
2. I agree to participate in the research project as described
3. I agree:  
To be interviewed and/or complete a questionnaire that my voice will be audio recorded
4. I acknowledge that:
  - (a) I understand that my participation is voluntary and that I am free to withdraw from the project at any time and to withdraw any unprocessed data previously supplied (unless follow-up is needed for safety).
  - (b) The project is for the purpose of research. It may not be of direct benefit to me.
  - (c) The privacy of the personal information I provide will be safeguarded and only disclosed where I have consented to the disclosure or as required by law.
  - (d) The security of the research data will be protected during and after completion of the study. The data collected during the study may be published, and a report of the project outcomes, an Appropriate Durable Record (ADR), will be provided to the RMIT Online Repository. Any information which will identify me will not be used.

Participant Consent

Participant \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)

## **Individual expert Interview Guide- Organisation Name**

Note: Being an interview guide, the interview is in the form of Semi-Structured Interview, the questions are brief and will require some explanation when presenting them to interviewees and they may change depending on interviewees' responses.

Context: From what context is this interview undertaken?

Demographics: experience; no. of years in type of business(es), position(s), types of projects.

### **Fundamental concept questions**

How do you define Early Contractor Involvement (ECI) delivery system?

What are ECI characteristics?

To what extent its principles are different to other relationship-based procurement methods?

### **Selection Criteria**

Under which circumstances, an ECI should be adopted for a project?

What is the decision making process to choose ECI for a project?

Is a systematic process utilized for the selection of ECI for a project?

What are criteria to select an ECI for a project?

How these criteria would be measured?

If an ECI project begins with design alliance and ends up being delivered as a traditional method such as D&C, what would the rationale for that decision be?

### **Fundamental performance questions**

What is the definition of a best practice strategy for risk management, communication management and relationship management?

How to ascertain that an effective strategy for risk management, communication management and relationship management has been developed as a result of an ECI process?

How this strategy can be measured and evaluated?

What are drivers and barriers in implementing an ECI for a project?

### **Skills, knowledge and Attributes**

What specific skills, attributes, knowledge or experience do you think is needed for ECI projects that are different to business as usual projects you have

experienced of?

How would the parties involved in an ECI demonstrate required knowledge, skills, attributes and experience?

How can knowledge, attribute, skills and experience be measured and evaluated?

**Specifically About constructability on the project**

One of the benefits an ECI offers to a project is improvement in constructability.

Can you explain how constructability is improved as a result of ECI process?

**Specifically about Innovation on the Project**

It is often said that ECI spur more innovation than business as usual projects.

Can you provide 3 examples of how innovation was encouraged and facilitated on ECI projects you were involved?

**Possible Improvements**

How do you think management team can improve their performance in terms of drivers and barriers in implementing an ECI?

How can knowledge, attribute, skills and experience be best developed?

## Appendix C: Interview questions development

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
<b>Fundamental concept questions</b>			
How do you define Early Contractor Involvement (ECI) delivery system?	What is ECI and what are its characteristics?	<ul style="list-style-type: none"> <li>- Exploring the different definitions of ECI from interviewees' point of view.</li> <li>- Potential deviations in the core principles comparing to the theory</li> <li>- Finding the gap in the current understanding amongst different parties</li> </ul>	(Rahman & Alhassan 2012) (Alliancing Association of Australasia 2010) (Scheepbouwer & Humphries 2011b) (Song, Mohamed & AbouRizk 2009) (Walker & Lloyd-Walker 2012)
What are ECI characteristics?	What is ECI and what are its characteristics?	<ul style="list-style-type: none"> <li>- Gaining more in-depth insights onto current state of ECI following the given definition</li> </ul>	(Scheepbouwer & Humphries 2011b) (Walker & Lloyd-Walker 2012)
To what extent its principles are different to other relationship-based procurement methods?	What is ECI and what are its characteristics? How and under which circumstances, an ECI should	<ul style="list-style-type: none"> <li>- Finding the current understanding of differences between ECI and other delivery systems and what are</li> </ul>	(Scheepbouwer & Humphries 2011b) (Walker & Lloyd-Walker 2012)

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
	be adopted for a project?	the reasons that clients select ECI for a project amongst other alternatives	
From your point of view, what are realised drawbacks of ECI	What is ECI and what are its characteristics?	- Identifying the benefits and drawbacks of ECI from the client's perspective	(Whitehead 2009) (Rahman & Alhassan 2012) (Bundgaard, Klazinga & Visser 2011) (Eadie et al. 2012) (Ma & Xin 2011)
From your point of view, what are realised benefits of ECI			
<b>Selection of ECI</b>			
Under which circumstances, an ECI should be adopted for a project?	How and under which circumstances, an ECI should be adopted for a project?	- Finding the conditions which an ECI is more appropriate for a project	(Edwards 2009) (Whitehead 2009)
It is generally argued that the type of project should dictate at what stage the contractor should be involved. Can you explain at what stage the contractor should be involved in different types of projects	How and under which circumstances, an ECI should be adopted for a project?	- Better understanding of involvement of the contractor at different stages of project.	(Whitehead 2009) (Schoevers,2009)
What is the decision making process to choose ECI for a project?	How and under which circumstances, an ECI should be adopted for a project?	- Realising the current decision making process in place to select an ECI for a project	(Edwards 2009) (Love et al. 2008; Love , Skitmore & Earl 1998; Love , Smith & Regan 2010a, 2010b)

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
Is a systematic process utilised for the selection of ECI for a project?	How and under which circumstances, an ECI should be adopted for a project?	- Finding the current frame work or tools which are used for the selection process	(Masterman 2002; Masterman & Duff 1994; Morledge 1987; Morledge, Smith & Kashiwagi 2006)
What are criteria to select an ECI for a project?	How and under which circumstances, an ECI should be adopted for a project?	- Finding the main criteria which interviewees believe to be determinant in selecting an ECI	(Edwards 2009) (Luu, Ng & Chen 2005; Luu, Ng & Eng Chen 2003; Ng et al. 2002; Ng, Luu & Chen 2012)
How these criteria would be measured?	How and under which circumstances, an ECI should be adopted for a project?	- Identifying the measurement mechanism once the criteria are identified	(Rowlinson & McDermott 1999)
If an ECI project begins with design alliance and ends up being delivered as a traditional method such as D&C, what would the rationale for that decision be?	How and under which circumstances, an ECI should be adopted for a project?	- Investigating the reason of choosing an ECI over Alliancing	(Edwards 2009)
<b>Fundamental management questions</b>			
What is the definition of a best practice strategy for risk management,	How an effective strategy for relationship management can be developed as a result of an ECI process?	- Finding the definition of a best practice strategy for relationship management with a focus on risk management and	(Jergeas & Van der Put 2001)
What is the definition of a best practice strategy for			(Gil et al. 2002) (Pocock et al. 2006)

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
communication management? What is the definition of a best practice strategy for relationship management?		communication management from the client's perspective	(Arditi, Elhassan & Toklu 2002) (Jergeas & Van der Put 2001)
What is the practice at the moment?	How an effective strategy for relationship management can be developed as a result of an ECI process?	- Finding the current strategies for managing relationship in an ECI project	(Pocock et al. 2006) (Jergeas & Van der Put 2001) (Arditi, Elhassan & Toklu 2002)
How to ascertain that an effective strategy for risk management has been developed as a result of an ECI process?			Schoevers,2009) (Jergeas & Van der Put 2001)
How to ascertain that an effective strategy for communication management has been developed as a result of an ECI process?	How an effective strategy for relationship management can be developed as a result of an ECI process?	- Investigating the effective strategy for relationship management, risk management and communication management that have been developed as a result of an ECI process?	(Gil et al. 2002) (Pocock et al. 2006)
How to ascertain that an effective strategy for relationship management has been developed as a result of			(Arditi, Elhassan & Toklu 2002) (Jergeas & Van der Put 2001)



<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
an ECI process?			
How this strategy can be measured and evaluated?	How an effective strategy for relationship management can be developed as a result of an ECI process?	- Identifying the measurement mechanism for an effective strategy based on the answer to the previous question	(Song, Mohamed & AbouRizk 2009) (McDermott et al. , 2012)
What are drivers in implementing an ECI for a project?	How an effective strategy for relationship management can be developed as a result of an ECI process?	- Understanding the ECI impacts on the management skills to introduce the personal capabilities	(Gil et al. 2002) (Bundgaard, Klazinga & Visser 2011)
What are barriers in implementing an ECI for a project?			
<b>Client's competence</b>			
What specific skills, attributes, knowledge or experience do you think is needed for ECI projects that are different to business as usual projects you have experienced of?	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	- Better understanding of the personal competence required of the clients to best fit within an ECI team	(Walker & Lloyd-Walker 2011) (BSI 2010)

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
How would the parties involved in an ECI demonstrate required knowledge, skills, attributes and experience?	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	- Better understanding of the personal competence required of the clients to best fit within an ECI team	(Walker & Lloyd-Walker 2011) (BSI 2010)
How can knowledge, attribute, skills and experience be measured and evaluated?	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	- Better understanding of the personal competence required of the clients to best fit within an ECI team	(Walker & Lloyd-Walker 2011) (BSI 2010)
Comparing knowledge, attribute, skills and experience for other relationship based procurement methods such as alliancing and framework agreement to the ones required for ECI. Can you explain which ones are the same and which ones are different? why?	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	- developing a model for ECI team required hard and soft skills	
<b>Specifically About constructability on the project</b>			
One of the benefits an ECI offers to a project is	What is ECI and what are its characteristics?	- Understanding the benefit of using ECI in constructability	(Martin Fischer 1997)

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
improvement in constructability. Can you explain how constructability is improved as a result of ECI process?		improvement from the client's point of view comparing to the theory	(Pocock et al. 2006) (CII,1986) (Jergeas & Van der Put 2001) (Mashiah 2008)
<b>Specifically About constructability on the project</b>			
It is often said that ECI spur more innovation than business as usual projects. Can you provide examples of how innovation was encouraged and facilitated on ECI projects you were involved?	What is ECI and what are its characteristics?	- Understanding the benefit of using ECI in implementing innovation from the client's point of view comparing to the theory	(Nijsten, Arts & Ridder 2008) (Van Valkenburg et al. 2008)
<b>Possible Improvements</b>			
How do you think management team can improve their performance in terms of	How an effective strategy for relationship management can be developed as a result of an	- Exploring the potential management skills to improve the current state of ECI which	(Walker & Lloyd-Walker

<i>Interview Question</i>	<i>Addressing Research Question</i>	<i>Description/Purpose</i>	<i>Literature Reference</i>
drivers and barriers in implementing an ECI?	ECI process?	can be added to the other factors in the ECI team building	2011)
How can knowledge, attribute, skills and experience be best developed?	What knowledge, skills, attributes and experience (KSAE) are required of the client to enable an ECI process?	- Following the previous question, this question provides in-depth insight to the development of ECI	(Walker & Lloyd-Walker 2011)

## Appendix D: Nodes Tree

Nodes			
Name	Sources	Referen	
ECI-conceptual selection and management model	0	0	
1.ECI Realisation	0	0	
1-1.Definition of ECI	9	22	
1-1.1. as a concept	10	27	
1-1.2.as a framework	2	2	
1-1.2.1.Umberlla ECI	3	8	
1-1.2.2.Early Tender Involvement (ETI)	3	3	
1-1.2.3.Double ECI	1	2	
1-1.2.4.Maintenance ECI	1	1	
1-1.2.5.Collaboration Project Agreement(CPA)	2	2	
1-2.ECI characteristics	11	42	
1-2.1.Contractual structure	9	19	
1-2.1.1.Transitional process	9	16	
1-2.1.2.Risk transfer regime	3	4	
1-2.1.3.Competitive environment	3	3	
1-2.1.4.Compensation mechanism	2	2	
1-2.1.5. Preliminary design development	3	3	
1-2.2.Relationship-related charactersitics	6	11	
1-2.2.1.Interaction with stakeholders	4	8	
1-2.2.2.Involvement of client	5	7	
1-2.2.3.Information sharing	4	7	
1-3.Challenges of implementing ECI	0	0	
1-3.1.Business challenges	0	0	
1-3.1.1.Demonstrating Value For Money(VFM)	4	10	
1-3.1.2.Resource hunger	1	1	
1-3.1.3.Lack of adequate resources	2	4	
1-3.1.4.Motivating contractors to participate	3	6	
1-3.1.4.1.Stage1 remuneration	3	4	
1-3.1.5.Unfamiliarity to the industry	3	4	
1-3.1.6.Political time-frame	1	1	
1-3.2.Relationship challenges	0	0	
1-3.2.1.Misusing relationship	2	3	
1-3.2.2.Change in relationship protocol	6	12	
1-3.2.3.Cultural barrier	6	8	
1-3.2.4.Designer's contribution	1	1	
1-3.2.5.Imbalanced leadership	1	1	
1-3.2.6.Empowering team in decision making	1	1	

Nodes			
Name	Sources	References	
1-4.ECI outcomes	0	0	
1-4.1.Successful outcome of using ECI	2	4	
1-4.1.1.Continuity of work	1	1	
1-4.1.2.Financial award	3	4	
1-4.2.Dissatisfaction outcome of using ECI	1	6	
1-4.3.Reluctance to use ECI	5	18	
2.ECI expectations	0	0	
2-1.1.Engineering benefits	12	32	
2-1.1.1.Control over contract	3	3	
2-1.1.2.Greater certainty	6	13	
2-1.1.3.Joint risk management	9	24	
2-1.1.4.Value adding	6	10	
2-1.1.5.Optimising resources	1	2	
2-1.1.6.Jointly standards definition	2	3	
2-1.1.7.Constructibility	5	5	
2-1.1.7.01.Cost-effective	3	4	
2-1.1.7.02.Setting up clear process	2	3	
2-1.1.7.03.Optioning	4	4	
2-1.1.7.04.Deviation from the original design	3	3	
2-1.1.7.05.Integrated solution	7	15	
2-1.1.7.06.Reducing design resource waste	1	1	
2-1.1.7.07.Less number of claims	1	1	
2-1.1.7.08.Reducing risk of delay	2	2	
2-1.1.7.09.Insight into the project constraints	2	2	
2-1.1.7.10.Feedback from constructor	2	2	
2-1.1.7.11.Economic efficiency	2	3	
2-1.1.7.12.Safety	2	2	
2-1.1.7.13.Constructibility in the design	4	4	
2-1.1.7.14.Constructibility vs. project outcomes	3	6	
2-1.1.8.Similar management involved in both stages	1	1	
2-1.1.9.Innovation	0	0	
2-1.1.9.1.ECI enables innovation	0	0	
2-1.1.9.1.1.Work packages- umbrella ECI	1	1	
2-1.1.9.1.2.Competition	2	3	
2-1.1.9.1.3.Looking outside the box	4	4	
2-1.1.9.1.4.Empowering the client	3	6	
2-1.1.9.1.5.Open to negotiation	1	1	
2-1.1.9.1.6.Formal innovation process	1	2	
2-1.1.9.1.7.Challenging the design	1	4	
2-1.1.9.2.ECI inhibits innovation	0	0	
2-1.1.9.2.1.ECI stifles innovation	1	1	
2-1.1.9.2.2.Holding the innovative idea until D&C phase	1	1	

Nodes			
Name	Sources	References	
2-1.1.9.1.3.Looking outside the box	4	4	
2-1.1.9.1.4.Empowering the client	3	6	
2-1.1.9.1.5.Open to negotiation	1	1	
2-1.1.9.1.6.Formal innovation process	1	2	
2-1.1.9.1.7.Challenging the design	1	4	
2-1.1.9.2.ECI inhibits innovation	0	0	
2-1.1.9.2.1.ECI stifle innovation	1	1	
2-1.1.9.2.2.Holding the innovative idea until D&C phase	1	1	
2-1.1.9.2.3.Too specified scope	1	1	
2-1.1.9.2.4.Contractor's opportunistic behaviour	1	1	
2-1.1.9.2.5.Compliance with local standards	1	1	
2-1.1.9.2.6.Lack of competition	1	1	
2-1.1.9.3.The extent to which ECI encourages innovation	0	0	
2-1.1.9.3.1.ECI encourage business as usual	2	3	
2-1.1.9.3.1a.Culture of innovation- notwithstanding the contract	1	2	
2-1.1.9.3.2.ECI encourage innovation to some extent	3	4	
2-1.1.9.3.3.ECI facilitates innovation	6	6	
2-1.1.9.3.3a.Contractual collaboration links	2	2	
2-2.2.Relationship benefits	1	1	
2-2.2.1.Clear expectations	2	3	
2-2.2.2.Building partnering relationship	8	11	
2-2.2.2.1.Collaborative	8	12	
2-2.2.2.2.No blame environment	5	6	
2-2.2.2.3.Transparency	5	11	
2-2.2.2.4.No secrecy	1	2	
2-2.2.2.5.Mutual trust	1	1	
2-2.2.2.6.Mutual understanding	3	5	
2-2.2.3.Communication	2	3	
3.ECI selection	0	0	
3-1.Selection criteria (SC)	0	0	
3-1.1.Project characteristics	0	0	
3-1.1.1.Uncertainty	10	31	
3-1.1.2.Risk	12	44	
3-1.1.2a.Design variations	3	3	
3-1.1.3.Time frame	8	16	
3-1.1.4.Size of project	6	17	
3-1.1.5.Complexity	10	30	
3-1.2.Client's objectives	0	0	
3-1.2.1.Having formal contract	4	6	
3-1.2.2.Constructibility	4	7	

Nodes			
Name	Sources	References	
3-1.2.3. Innovation	6	8	
3-1.2.4. VFM	4	5	
3-1.2.5. Collaborative behaviour	3	6	
3-1.3. External environment	0	0	
3-1.3.1. Market situation	4	5	
3-1.3.2. Stakeholders impact	6	19	
3-1.3.3. Political influences	3	6	
3-1.3.4. Regulation influences	5	10	
3-1.4. Internal environment	0	0	
3-1.4.1. In-house resource availability	4	13	
3-1.4.2. Budget	6	10	
3-1.4.3. Design interaction	3	3	
3-1.4.4. Culture of organisation	3	3	
3-2. Selection practice	0	0	
3-2.1. Systematic selection framework	2	2	
3-2.1.1. Internal manual	2	2	
3-2.1.2. Multi-criteria analysis (MCA)	5	9	
3-2.2.1. Pair-wise analysis method	1	5	
3-2.2. Industry consultation	2	3	
3-2.3. Subjective process	5	6	
3-2.3.1. Experience	3	5	
3-2.3.2. Workshops	2	8	
3-2.3.3. Personal judgments	7	22	
3-2.4. Opinion about the current selection frameworks	0	0	
3-2.4.1. Negative attitude towards the current selection framework	1	4	
3-2.4.2. Need for a selection decision making framework	1	2	
3-2.4.3. Educated decisions	2	3	
3-2.4.3.1. Being objective	1	2	
3-2.4.3.2. Deliberate behaviour	1	1	
3-2.4.3.3. Right project characteristics	1	4	
4. ECI preparation	0	0	
4-1. Upfront planning	6	20	
4-1.1. Reward mechanism rules	1	2	
4-1.2. Awareness of alternatives	1	1	
4-1.3. Defining base-line	1	2	
4-1.4. Selection of optimal procurement strategy	1	1	
4-1.5. Upfront knowledge about the project	4	8	
4-1.6. Business case	1	2	
4-1.7. Design brief	1	2	
4-1.8. Awareness of complexity	1	1	
4-1.9. Applicability of standards	1	1	



Nodes			
Name	Sources	References	
4-1.9a.Planning the communication	4	4	
4-1.9a.1.Pre-project induction	1	1	
4-1.9a.1.1.Expectations	1	1	
4-1.9a.1.2.Practices	1	1	
4-1.9a.1.3.Benefits	1	1	
4-1.9a.1.4.Dis-benefits	1	1	
4-2.ECI team building	0	0	
4-2.1. personal capabilities	1	1	
4-2.1.1.behavioural factors	1	1	
4-2.1.1.01.Accountability	2	4	
4-2.1.1.02.Appreciation	1	1	
4-2.1.1.03.Assertiveness	3	10	
4-2.1.1.04. Political astuteness	5	6	
4-2.1.1.05.Collaborative mentality	6	17	
4-2.1.1.06.Decisive	2	2	
4-2.1.1.07.Emotional intelligence	2	6	
4-2.1.1.09.Interpersonal skills	5	10	
4-2.1.1.10.Lateral thinking	1	1	
4-2.1.1.11.Liberal	1	1	
4-2.1.1.12.Non price-driven	3	3	
4-2.1.1.13.Optimism	2	4	
4-2.1.1.14.Ownership and Commitment	6	11	
4-2.1.1.15.Projection	2	2	
4-2.1.1.16.Receptiveness	3	4	
4-2.1.1.17.Transparency	7	18	
4-2.1.1.18.Team motivator	1	1	
4-2.1.1.19.Trustfulness	1	2	
4-2.1.1.20.Approachability	2	3	
4-2.1.1.21.Culture of partnering	2	4	
4-2.1.1.22.Divergence	2	4	
4-2.1.1.23.Emotional maturity	1	1	
4-2.1.1.24.Enthusiasm	3	4	
4-2.1.1.25.Objective alignment of parties	2	2	
4-2.1.1.26.Solemnity	2	2	
4-2.1.2.Experience	0	0	
3-2.1.2.2.technical project experience	2	2	
4-2.1.2.1.relationship type contract experience	9	14	
4-2.1.3.Knowledge and awareness	0	0	
4-2.1.3.1.Technical skills	4	5	
4-2.1.3.2.Understanding the contractor's motivations	1	1	
4-2.1.3.3.Commercial position awareness	1	3	
4-2.1.3.4.Understaning of contract	5	9	
4-2.1.3.5.Understaning of process	6	11	

Nodes			
Name	Sources	References	
4-2.1.3.6.Key personels awareness	1	1	
4-2.1.3.7.Understanding of the scope	2	3	
4-2.1.3.8.Project history awareness	1	2	
4-2.1.3.9.Understanding commitment and communication	1	1	
4-2.2.team selection	0	0	
4-2.2.1.Gut feeling	9	25	
4-2.2.2.lack of structured instruction	3	5	
4-2.2.3.Pre-selection workshops	2	3	
4-2.2.3.1.Capability	1	1	
4-2.2.3.2.Real-life situation	2	2	
4-2.2.4.Observation	1	2	
4-2.2.4.1.Communication	3	4	
4-2.2.4.2. behaviour	1	1	
4-2.2.5.Scoring system	2	5	
4-2.2.6.Psychometric evaluation	1	2	
4-2.2.7.Different soft skills with other procurement systems	0	0	
4-2.2.7a.No close relationship with the PM in D&C	1	1	
5. ECI Managing strategy	0	0	
5-1.Team management	0	0	
5-1.1.Acquiring diverse resources	2	2	
5-1.2.Consistency in behaviours modelling	1	1	
5-1.3.Willingness to coach	1	1	
5-1.4.Natural development	4	5	
5-1.5.Training	3	5	
5-1.5.1.Behaviour patterns	3	4	
5-1.5.2.Acting roles	1	1	
5-1.5.3.Ineffective	2	2	
5-1.6.Understanding the personality differences	1	1	
5-1.7.Understanding team dynamics	4	5	
5-1.8.Leadership and communication skills	1	1	
5-2.The best practice strategy	0	0	
5-2.1.Best practice strategy definition	0	0	
5-2.1.1.Not possible to define	5	10	
5-2.1.2.Implementation	1	1	
5-2.1.3.Understading of rights and contractual obligations	2	2	
5-2.1.4.Inspirational environment	1	1	
5-2.1.5.Understanding of impact of decisions	1	1	
5-2.2.Best practice strategy for Risk Management	0	0	
5-2.2.1.Early risk management understanding and assessment	4	11	
5-2.2.2.Balance of performance risks	1	4	
5-2.2.3.Ongoing risk assessment	1	1	

Nodes			
Name	Sources	References	
5-2.2.4.Setting a method for dealing with unknown unknowns	1	3	
5-2.2.4.1.Risk sharing regime	4	9	
5-2.2.4.2.Re-negotiation	1	1	
5-2.2.5.Good understanding of risks	7	9	
5-2.2.5.1.Involvement of cross-section of stakeholders	4	4	
5-2.2.5.2.Effective communication	4	5	
5-2.2.5.3.Understanding of contractual obligations	1	2	
5-2.2.5.4.Understanding of the regulations requirements	1	1	
5-2.2.6.Setting effective mitigation strategy	6	7	
5-2.2.7. Considering Value for money	1	1	
5-2.2.8.Risk documentation-lessons learned	1	1	
5-2.3.Best practice strategy for Relationship and Communication Management	0	0	
8.4.1.4.Permission to be proactive	3	4	
9.1.3.05.Escalation process	1	1	
9.1.3.06. Joint leadership team (JLT)	4	5	
9.1.3.07.Understading of roles of JLT	4	6	
9.1.3.6.1.Empowering the project's delivery team	1	2	
9.1.3.6.2.Regular meetings	2	2	
9.1.3.6.3.Visibility of Joint Leadership Team	1	1	
9.1.3.08.Stakeholders management	0	0	
9.1.3.09.Trust building	1	1	
9.1.3.8.1.Understanding of stakeholders' objectives	4	6	
9.1.3.11.communication relationship are entwined	2	3	
9.1.3.13.infomration sharing strategy	2	2	
9.1.3.13.1. Respecting confidentiality	2	2	
9.1.3.14.Building a collaborative culture	3	6	
9.1.3.04.Flexibility	1	1	
9.1.3.14.1.Opennes	2	2	
9.1.3.14.2.Honesty	2	2	
9.1.4.6.Best for project	2	2	
9.1.4.3.BS11000	1	1	
9.1.4.4.No surprises	1	1	
9.1.4.7.Alliance type of relationship	1	2	
5-3. Manging strategies assessment	0	0	
5-3.1.Perception	0	0	
5-3.1.1.Challenging task	4	4	
5-3.1.2.Need for governance structure	1	1	
5-3.2.Project key performance indicator (KPI)	8	16	
5-3.3.Risk Management	1	2	
5-3.3.1.Comparing value of risk	2	5	

Nodes			
Name	Sources	References	
5-3.3.2.Savings on variations	1	2	
5-3.3.3.Effectiveness of the processes in place	2	3	
5-3.4.Relationship and Communication Management	1	2	
5-3.4.1.Quality of communication	1	1	
5-3.4.2.1.Leadership	1	1	
5-3.4.2.Quality of relationship	2	2	
5-3.4.2.1.Accountability	1	2	
5-3.4.2.2.Empowerment	1	1	
5-3.4.2.3.Sense of connectedness	1	1	
5-3.4.2.4.Autonomy	1	2	
5-3.4.2.5.Self-motivation	1	1	
5-3.4.2.6.Sense of competence	1	1	
5-3.4.3.Feedback from stakeholders	6	6	
5-3.4.4.Peer reviews	1	1	
5-3.5.Project outcomes	2	2	
5-4.Improvement of managing strategies	0	0	
5-4.1.Repetitive ECI with one contractor	2	2	
5-4.2.Information management	3	3	
5-4.2.1.Targeted information	1	1	
5-4.2.2.Sufficient information	1	1	
5-4.3.No single approach	1	1	
5-4.4.best strategy on the both sides	1	1	
5-4.5.Application of Lessons learned	6	13	
5-4.6.Application of BS11000	1	1	
5-4.7.Informing the client	1	1	
5-4.8.Better uncertainty assessment	1	1	
5-5.Current practice	0	0	
5-5.1.Embedding clients team into contractors team	1	1	
5-5.2.Not effective	4	5	
5-5.2.1.Lack of quality leadership	1	1	
5-5.2.2.Changes in resources	1	1	
5-5.3.Satisfaction in the current practice	0	0	
5-5.3.1.Evolving over time	2	2	
5-5.3.2.Progmatic approach	2	3	
5-5.3.3.Culture of partnering	1	1	
5-5.4.On-site decisions	1	3	
5-5.5.formal practice	2	9	
5-5.5.1.Hierichal structure	1	2	
5-5.5.2.Written in the contract	1	1	
5-5.5.3.Project Leadership Team (PLT) and Project Management Team (PMT) set up	2	2	
5-5.5.3.1.Dispute resolution process by PLT	1	2	
5-5.5.3.2.Project governance by PLT	1	3	
5-5.5.3.3.Project management by PMT	1	1	
5-5.6.Informal practice	0	0	
5-5.6.1.Negotiation	4	4	
5-5.6.2.Communication management by the constrcutor only	1	2	
5-5.6.3.Relationship management by the client	1	2	