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University of Technology Sydney

The development of a conceptual framework of the competitive strategies used by consulting engineering companies in New South Wales

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A thesis submitted in fulfillment of the
requirements for the degree of
Doctor of Philosophy
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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Daren Maynard, declare that this thesis is submitted in fulfilment of the requirements for the award of PhD Built Environment, in the School of Built Environment, Faculty of Design, Architecture & Building at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Date: 09 Feb 2020

DEDICATION

I dedicate this PhD degree to my parents: Mr Wayne (deceased) and Mrs Earlyn Maynard. They have always encouraged me to study even if it took me far away from Trinidad and Tobago. Thank you for the love and support over the years as I pursued my studies and dreams of becoming Dr Maynard.

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STATEMENT OF THE THESIS

This thesis is a conventional thesis as defined by section 9.1.1 in the UTS Graduate Research Candidature Management, Thesis Preparation and Submission Procedures (2019 version).

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LIST OF ABBREVIATIONS

AEC	Architecture, Engineering and Construction
ANZSIC	Australian and New Zealand Standard Industrial Classification
B2B	Business-to-business
B2C	Business-to-customer
CEC	Consulting engineering companies
CIA	Comparative institutional analysis
CIT	Critical incident technique
D&C	Design and construct
FTE	Full-time equivalent
HIT	Historical institutional analysis
GDL	Goods-dominant logic
M&A	Mergers and acquisitions
NSW	New South Wales
OSI	Open source information
PSF	Professional services firms
SDL	Service-dominant logic

ABSTRACT

Consulting engineering companies (CECs) compete to be selected for various built environment projects. These CECs have various competitive strategies, which are governed by economic theories. The relationship between the CECs and their client firms is a business-to-business (B2B) one. The research investigates what economic theories are applicable to the competitive strategies used by CECs in New South Wales in their B2B relationships. The research explores how economic theories can explain the commercial behaviours of the CECs in the marketplace. The research questions are answered using a positivist research paradigm applying a mixed methodology. The mixed methodology consists of quantitative and qualitative data collection and analysis methods. The research developed a multidimensional conceptual framework, which explains the competitive strategies used by the CECs. The framework incorporates micro-economics, institutional economics, strategy, value and pricing theories.

Keywords: consulting engineering company, micro-economics, institutional economics, competitive strategies, value.

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1 INTRODUCTION

This research sets out to determine the validity of the economic theories that govern the competitive strategies of consulting engineering companies (CECs) in New South Wales (NSW). The questions arise: what are the economics theories that explain the commercial behaviours of CECs in the market? Are the prevailing micro-economic theories applicable to the CECs? Or do they require modifications to be explain these behaviours? Alternatively, does another economic strand do a better job of explaining them? For example, does institutional economics better explain their behaviours? Professional services firms have other firms as their clients. The way professional services firms interact with other client firms differs from the way professional services firms interact with individuals as clients, that is business-to-business (B2B) versus business-to-customer (B2C) interactions. These interactions influence the commercial behaviours of the CECs.

CECs are professional services firms, who use their technical knowledge to help their clients develop, build and maintain built environment artefacts. The professional services firms, like CECs, are differentiated not only by their size but by their intellectual resources employed by them. The intellectual resources or capital are the economic power behind the professional services firms. The built environment consists of physical structures (artefacts), which are constructed as additions to the natural environment. It is acknowledged that the CECs can also work on energy, mining and industrial projects. The CECs are an example of professional services firms that work principally on built environment projects (Consult Australia 2015a, 2015b, 2016). However, they also work in other economic sectors as determined by the statistical classification bodies (Australian Bureau of Statistics 2006; Greeno & Hall 2008; Infrastructure NSW 2018). The CECs are part of the built environment market. The Australian built environment market has been competitive because of sustained public and private sector investments over the last ten years (2008–2018) (Australian Bureau of Statistics 2018; Infrastructure Australia 2018; Infrastructure NSW 2017, 2018; Reserve Bank of Australia 2018).

The economic output of the architecture, engineering and construction (AEC) sectors is the built environment. One of the major actors in the built environment is the CEC. The CECs work with the architects, builders and client-owners to design built environment artefacts. The CECs are necessary because they provide engineering knowledge, which is required by law for built environment artefacts. The engineering sector has a wide spectrum of disciplines in order to cover the range of built environment projects. There

are different competitive strategies, which are used by the CECs to win the contracts for these projects. These competitive strategies are applied within certain economic conditions. The CECs in New South Wales provides the engineering expertise to their clients on the different built environment projects.

There have been continued investments into the built environment by successive governments at the State and Federal levels and private sector entities across Australia (Infrastructure Australia 2018; Infrastructure NSW 2018). These investments contribute to the demand for professional services firms likes CECs (Australian Bureau of Statistics 2018; Reserve Bank of Australia 2018). NSW has the largest investment in the built environment across Australia (Infrastructure NSW 2018) with an investment plan of A$73 billion of built environment projects earmarked between 2018–2022 (Infrastructure NSW 2017). The NSW State Infrastructure Strategy (2018–2038) advocates both for public-sector and private-sector investments in the built environment across the state. The strategy also advocates for geography-based investments in terms of Regional NSW and the Sydney Capital Area (a future metropolis of three cities) (Infrastructure NSW 2018). With a committed investment in each of NSW's key infrastructure sectors, the CECs can be assured of continued opportunities for commercial work in the next two decades. This creates a healthy environment for the CECs to be actively engaged in the economy.

With the active investments in infrastructure, New South Wales is a prime geographical area for any CECs to win work. If the CECs operates nationally or internationally, they will pick the state to establish operations. The CECs can be assured of the continuous work coming from the state-funded agencies. Additionally, with the physical infrastructures that are being built, private investors can build further structures that use the public-owned infrastructures. For example, privately constructed housing development projects that are built on next to public-sector funded railway stations and highways. There are synergies between the investment activities of the public and private sectors. The international CECs, who wants to stake a claim in Australia will use the state as their first entry. This entry can be done by establishing a new branch or buying their way into the market.

The CECs actively compete to win contracts to work these current and future built environment projects. The pricing of their commercial services is an output of the commercial strategies used by the CECs. Baker (2011) posits, that for professional services firms (like CECs), the micro-economic model of retail pricing does not apply. In order words is the customers in retail markets are not the same as customers in business markets. Furthermore, Farr (2001) argues that under the retail pricing approach CECs compete based on the lowest price possible. This results in the commoditisation of CECs.

He argued that CECs should follow an alternative called value pricing, which takes into consideration the value they provide to their clients. Nagle, Hogan & Zale (2011) and Ng (2007) incorporate value in their discussions around competitive strategies and pricing for professional services firms. Their theoretical positions are contrary to conventional micro-economic theories advocated by McTaggart, Findlay & Parkin (2013) and Perloff (2014). The micro-economics are established theories, which has been used extensively to describe modern day business practices (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; OpenStax College 2014; Skitmore, Runeson & Chang 2006).

Micro-economic theories do not demonstrate effectively what happens in the built environment market. Aoki (2007), Dequech (2009) and Williamson (2000) discuss economics from an institutional economics perspective. Their theoretical approaches underpin an alternative economic model to explain the competitive behaviours of the CECs in NSW. The use of institutional economics is supported by the inclusion of the service-dominant logic as positioned by Åkesson et al. (2016), Eggert et al. (2018) and Vargo, Maglio & Akaka (2008). The service-dominant logic provides an alternative perspective of competitive strategies, pricing and economic models compared to the standard goods-dominant logic found in the micro-economic models.

This research centres on the applied economics governing the decision-making by CECs. It utilises an active economic sector, which has a wide range of variables that makes it a complex problem to research. However, this research area has a potential to establish new theoretical insights from different strands of economics – micro-economics, institutional, and project. Business strategy is an intersection of the various components of a firm, but in the end, it guides how economic decisions are made across a firm.

The research focuses on CECs, who work on the built environment and physical infrastructure projects for business clients. These CECs face various institutional constraints, which affect their operations, service delivery and markets. The CECs compete based on the internal and external business factors, which contribute to their competitive strategies. The research answers what economic theories best explain why these competitive strategies are used by the CECs in New South Wales.

1.1 THEORETICAL KNOWLEDGE GAP

This research fills the *theoretical knowledge gap* in the understanding of the (1) market(s) of CECs, (2) competitive strategies used in their business-to-business service environment, and (3) application of economic theories to discuss their competitiveness. Currently, several theories have been proposed to explain the competitive strategies, and

subsequently the pricing of different types of goods and services in different economic markets (Arias-Aranda 2003; Clegg et al. 2011; Hinterhuber & Liozu 2012; Kim & Mauborgne 2005; Nagle, Hogan & Zale 2011; Porter 2008). The markets for products, intermediate goods and materials as well as the labour markets are well researched (Hinterhuber 2015; Perloff 2014). They are usually in the context of a business-to-customer relationship. However, the literature review has revealed that there is a gap in our knowledge about the determination of strategy and prices in the market of services from a business-to-business perspective.

With these knowledge gaps (Figure 1), it is necessary to understand the theoretical frameworks being used to support the research. The *theoretical framework* encompasses three strands: micro-economics, institutional economics and value creation. They are discussed briefly below.

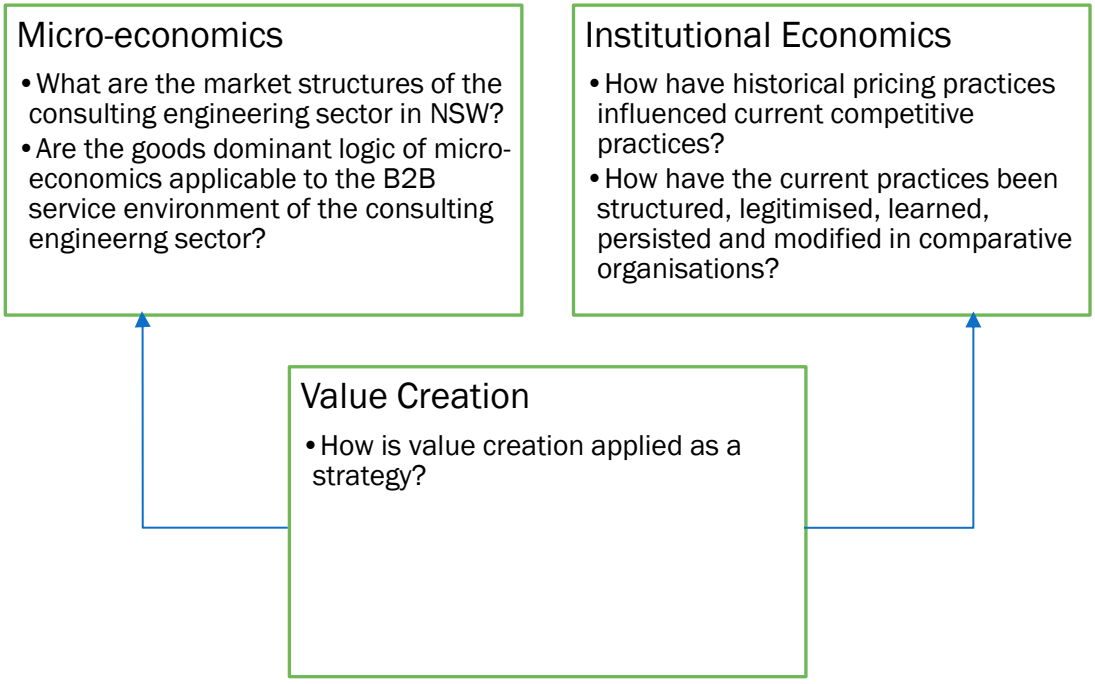

Figure 1: Theoretical knowledge gaps being filled by the research.

The consulting engineering industry in NSW is analysed and classified using market structures as outlined by *neoclassical micro-economics*. The first objective is to establish if the industry is subdivided into smaller sub-markets. The sub-markets are the different specialised engineering fields. Do the sub-markets have one of the four most common market structures, based on the number of sellers? Those four structures are monopoly, oligopoly, monopolistic competition and perfect competition.

Monopoly refers to a market structure where there is a single dominant seller in the market, who can determine the price of its goods and services without any competition.

Oligopoly refers to the market structure where there are few dominant competitors in the markets. They can manipulate the prices but their ability to do so is affected by their competitors' responses. They may offer identical or differentiated goods and services. In the monopolistic competition structure, there are many competitors in the market, and they do not have much ability to influence prices. They must differentiate themselves in order to achieve a market share. They may offer similar but not identical goods and services. In perfect competition, there are numerous competitors, who have little or no influence on the market price. They offer identical goods and services (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; Perloff 2014).[1]

The idea behind the different market structures is that they reflect different levels of market power; primarily the ability to determine their price of their products by the sellers. It ranges from a monopoly, where the seller can set any price, to perfect competition, where the seller can only accept the going price. For example, the discussion from McConnell, Brue & Flynn (2012) on monopolistic competition market structure refer to product differentiation using the physical characteristics of goods. They also extend their discussion to services but only in a business-to-customer setting. Is this product differentiation applicable to the consulting engineering services in the built environment market in the business-to-business context?

Under micro-economic theory, a firm in a monopolistic competition market structure may have some control over prices in limited cases since there are several substitutes for its products (inclusive of services). The question arises, are the specialisms in consulting engineering equivalent to product substitutes when using the micro-economic perspective of monopolistic competition? The firms in a theoretical oligopoly market have considerable influences on pricing but they are affected by their competitors, productivity, pricing and non-pricing decisions like advertising (McConnell, Brue & Flynn 2012). This creates an opportunity for the research to establish if and how non-price factors influence the strategies of CECs with an empirical basis. Do the CECs behave differently because of the market structure in terms of their competitive strategies?

Secondly, this research analyses the competitive strategic decisions from an *institutional economics* perspective. The various micro-economic models use individualism to analyse and theorise decisions made in the market as outlined in Clarke (1985), McConnell, Brue & Flynn (2012), and Perloff (2014). The companies being analysed in the empirical investigations are institutions themselves. Therefore, they warrant the use of institutional

[1] While this will not be discussed here, markets may also be classified based on the number of buyers and are subjected to similar types of analyses.

economic analyses. A institution means a collection of individuals who work together to achieve a common goal (Aoki 1996, 2007; Duina 2011; Gagliardi 2008). The CEC is an institution as it has a group of employees, who are working together to deliver consulting services to its clients. Historical institutional analysis is applied to interpret past actions by firms in the market, which influences current practices. While comparative institutional analysis techniques are used to interpret the institutionalised behaviours of firms in comparison to the rest of the firms in the market. The research looks at how institutional decisions have been made and used to enforce the consulting engineering market structure (Aoki 2007; Duina 2011; Gagliardi 2008; Greif 1998; Hodgson 1998; Kapp, Berger & Steppacher 2011; Williamson 2000, 2005).

Under the micro-economics model, a supplier's value is expressed via its price (McConnell, Brue & Flynn 2012; Ng 2007; Perloff 2014). Alternatively, Åkesson et al. (2016), Payne, Storbacka & Frow (2008) and Zhu & Zolkiewski (2016) advocated the service-dominant logic (SDL) perspective of value. The value created is based on the intellectual nature of professional service firms of CECs. Koskela-Huotari & Vargo (2016) combined the value creation process with the SDL. In other words, they invite an institutional economics approach to their analysis of value.

The definition of value is tied to disconfirmation, that is the perception of the client on the performance of the service provider (Patterson, Johnson & Spreng 1997). This is aligned to the idea of perceived quality (perceived net value), where the service providers consistently meet the expectations of the clients (expected net value) (Ng 2007). Ng (2007) analysis of pricing for services positions the expected net value (ENV) framework as a useful tool to understand pricing decisions for services. The firm that provides the highest ENV to the client increases the probability that the client will chose that firm's services over its competitors (Ng 2007). This is critical for credence services like consulting engineering, who provide intangible attributes-driven benefits to their clients.

These strands are used to govern the data collection and data analysis activities as shown in Figure 2 below. They are broken further into five structural strands. This multidimensional approach to economic analysis was demonstrated by Lancaster (1966) and applied in different ways by the researchers in different fields. The five dimensions are discussed in Chapters 6 (Data Collection) and 7 (Analysis) and remodelled in Chapter 8 (Conceptual Framework of the Competitive Strategies used by CECs in New South Wales).

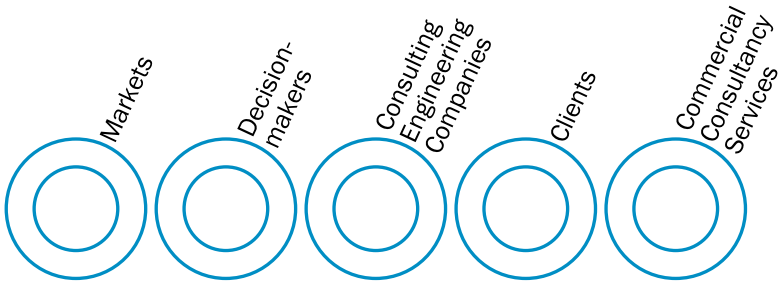

Figure 2: Analytical framework tied to the micro-economics, institutional economics and value literature.

1.2 RESEARCH QUESTIONS, AIM AND OBJECTIVES

The aim of this research is to develop a multi-dimensional conceptual framework to examine the competitive strategies of CECs. Competitive strategies are applied in the business-to-business part of the built environment market. In order to determine the applicable economic theories, which govern the competitive strategies of CECs, there are various research questions that need to be answered. They are:

1. Does the current micro-economic theory of pricing hold for CECs?
2. What, if any, modifications are needed to the current micro-economic theory of pricing to make it applicable to CECs?
3. Are there alternative economic theories, such as institutional economic theories, that better explain the behaviour other than micro-economics theories?
4. Are the competitive strategic practices being used in the CECs a modified form of a common framework?

The research is executed through the following objectives:

1. Establish the market(s) that the CECs work in – theoretically and empirically through literature review, interviews and analysing mergers and acquisitions data.
2. Examine the behaviour of the CECs in the market(s).
3. Establish, if necessary, how micro-economic and institutional economic models need to be modified to accommodate the specific nature of these firms, their services, and their clients.
4. Establish if they can create market power through differentiation to earn higher profit.
5. Establish the implications of the research findings for academia, the industry, and the clients in a conceptual framework of a competitive strategy framework for CECs.

6. Summarise the conclusions and suggest future research.

This PhD research does not consider anti-competition behaviour such as cartels, pricing fixing or collusion. Those topics are outside of the scope of the PhD. They are currently being investigated by the Australian Competition & Consumer Commission through their Commercial Construction Unit (Australian Competition & Consumer Commission 2018).

1.3 RESEARCH BOUNDARIES

In developing research boundaries, the structure of the consulting engineering market was considered from a theoretical perspective. As shown in Figure 3 below, the market can be divided using three approaches: (1) engineering disciplines, (2) economic sectors, and (3) geography. The economic sector is using classifications by Infrastructure NSW (2018) for the built environment focus, since the research is centred on the Greater Sydney Capital City Statistical Area.

Figure 3: Market classification (Australian Bureau of Statistics 2016; Engineers Australia 2016; Greeno & Hall 2008; Infrastructure NSW 2018).

If one uses the various engineering disciplines as the dividing principle, the consulting engineering can be based on the type of engineering the client requires. However, in consulting engineering, the different disciplines collaborate in order to produce a design for the built environment artefact (Greeno & Hall 2008). Depending on the size of the firm, the number of consulting engineering disciplines that is offered by the company may change. The type of engineering found in the firm depends on the intellectual resources.

Alternatively, the consulting engineering market can be divided based on its clientele, which can either be from the private sector or the public sector. The public sector market is divided into three tiers of governments: federal, state/territory, and local government (Australian Bureau of Statistics 2009; Digital Transformation Office 2016). Because of

the differences in their economic focus, public sector and private sector engineering markets have differences in their social impacts. The private sector-commissioned projects are for private benefits and are usually for profit. On the other hand, public sector-commissioned projects are built for the benefit of society and usually at the most economic cost possible (General Services Administration 2005; Infrastructure NSW 2018; Samson & Parker 1994).

While, the three tiers of government established the sub-division for the public-sector market in terms of its clientele, the tiers can also act as geographical markers for the different engineering markets. The research is restricted to the firms in New South Wales or otherwise known as the Greater Sydney Capital City Statistical Area (Australian Bureau of Statistics 2016) to provide a more nuanced understanding of the built environment market and its drivers. This provides a manageable geographical range to conduct the research before expanding to other Greater Capital City Statistical Areas across Australia or even to an international market. The applicability of various economic factors across the different markets will increase the number of variables being investigated. The value of doing research within the Greater Sydney Capital City Statistical Area is that it provides an economically active area within the built environment market (Infrastructure Australia 2018; Infrastructure NSW 2017, 2018). This PhD research project timeline was planned for three years between 2016–2019. Therefore, the scope of the PhD research is restricted to what can be reasonably achieved within the three-year timeframe.

1.4 RESEARCH DEFINITIONS

In this PhD research project, there are several terms that are used frequently and interchangeably. This sub-section explains the terms in detail.

Consulting engineering company (CEC), consulting engineering firm, engineering consulting firm, engineering firm – this refers to a business that provides engineering design and engineering consulting services as per the Australian Bureau of Statistics (2006) publication 1292.0 – Australian and New Zealand Standard Industrial Classification (ANZSIC).

Economic sectors are classified according to the Australian Bureau of Statistics (2006) publication 1292.0 – Australian and New Zealand Standard Industrial Classification (ANZSIC) and Infrastructure NSW (2018)'s State Infrastructure Strategy. The Australian Bureau of Statistics (2006) states 'industries are formed by grouping business units that are mainly engaged in undertaking similar economic activities.' ANZSIC defines how the unit of classification for the firm can change based on a set of guidelines. This is useful

especially as there have been consolidations in the consulting engineering market. Where there is vertical integration, the firm is classified based on their predominant activity (Australian Bureau of Statistics 2006). If there is no discernible way to measure the value between the constituent parts, the last part of the value chain is used to classify the firm (Australian Bureau of Statistics 2006).

The classification is broken from the top level to the smallest level (division, sub-division, group and class) for CECs using the ANZSIC:

> Division M Professional, Scientific and Technical Services.
>
> > Subdivision 69 Professional, Scientific and Technical Services (Except Computer System Design and Related Services).
> >
> > > Group 692 Architectural, Engineering and Technical Services.
> > >
> > > > Class 6923 Engineering Design and Engineering Consulting Services.

Alternatively, Infrastructure NSW (2018) uses ten divisions compared to nineteen divisions from the ANZSIC. However, these divisions are aligned to the built environment as it involves the physical artefacts that enable these economic activities. See Figure 3 on page 8.

Architecture, engineering and construction (AEC) is a classification used by academic writers to discuss the companies that participate in the built environment market (Ayinla & Adamu 2018; Kamara et al. 2002; Sepasgozar, Loosemore & Davis 2016; Singh & Holmström 2015). However, to better align with the ANZSIC and Infrastructure NSW's terminologies, the term *built environment market/industry* is used interchangeable.

For this PhD research, the term *market* is used closely with the term industry. The market is a concept that facilitates economic exchanges between suppliers and buyers. This concept may be a physical location, like a supermarket, or it can be a virtual location, like a stock exchange. Markets that deal with goods and services are referred to as product markets, while those that deal with labour and capital are described as factor markets (Perloff 2014; Rutherford 2002). The term *industry* is used when referring only to the supply side of the market.

The research output can be classified as a *conceptual framework*. The framework provides the visual-linguistic and visual-spatial representation of the research findings. They are used throughout the literature review, for example, on value (Ng 2007), economics of institutions (Williamson 2000), motivation and technology adoption (Singh & Holmström 2015), and so on. These diagrams are constructed using *pillars*, *dimensions*

or *building blocks*. The multi-dimensional approach of the conceptual framework are used by Betancourt & Gautschi (2001), Lancaster (1966) and the conceptual framework developed for this research (Chapter 8).

1.5 STRUCTURE OF THE THESIS

The thesis is divided into nine chapters. Chapter 1 is the Introduction, which outlines the general case for the research, discusses the research subjects – CECs and their sector – architecture, engineering and construction. The chapter also discusses the research questions, aims and objectives. Additionally, it gives a sense of the research gap being filled by this research.

Following the Introduction, the next three chapters discuss the literature associated with the research. Chapter 2 (Literature Review: Micro-economics) discusses the theoretical definitions of the market, customer choice, marginal utility, supply and demand functions and market structure. Chapter 3 (Literature Review: Institutional Economics) explores the theoretical definitions and strands of institutional economics, and of institutions and their five modifications. Chapter 4 (Literature Review: Strategy, Value and Pricing) analyses the literature on how strategy is used to determine how a company operates commercially, delivers value (marginal utility) and at what price point to the client.

Chapter 5 outlines the research pyramid in terms of Research Design: Paradigm, Methodology, Methods and Techniques. It provides the theoretical justifications of the research design in terms of these four components. The research design is executed in the following two chapters. Data Collection (Chapter 6) focuses on the primary data collection for the research along the five pillars of market, decision-makers, buyers, sellers and services. It executes the mixed methodology research design as discussed in the previous chapter. The data is collected from interviews and quantitative mergers and acquisitions (M&A) data. It is followed by Chapter 7 (Analysis), which uses the five pillars to analyse the interview and M&A data.

Chapter 8 is the Conceptual Framework of the Competitive Strategies used by CECs in New South Wales. The conceptual framework outlines three types of competitive strategies – commoditised, innovative (value innovation) and hybrid. These strategies are affected by the structural demographics of the type of markets (discipline, geography and sector) and the intellectual resources they have. The strategies are further modified by business environmental factors that affect the deployment of the strategies. They are commercial services operations, principal–agent relationships and technology. The economics theories, which govern the dimensions of the conceptual framework are

discussed. The micro-economics, institutional economics, strategy, value and pricing theories are used to build the conceptual framework.

Chapter 9 is the Conclusion, which answers the research questions. The limitations of the research are discussed in this chapter. Future research areas are also discussed in this chapter.

1.6 SUMMARY

This chapter provides the basis of the PhD research project. It provides the academic case for the research in terms of the research problem, aim, questions and objectives. The theoretical gap that this research aims to close is discussed. The structure of the thesis is provided. Next, the research theories are explored through the lens of the neoclassical economists in the literature review chapter.

2 LITERATURE REVIEW: MICRO-ECONOMICS

2.1 INTRODUCTION

Competitive strategies involve the pricing of services and goods. This chapter discusses the various theoretical strands from micro-economics as outlined in Figure 4 below. Market equilibrium is discussed in Sections 2.2 and 2.3. Economic agents are discussed in Section 2.4. Supply and demand functions are discussed in Section 2.5. Market structures and pricing are discussed in Section 2.6.

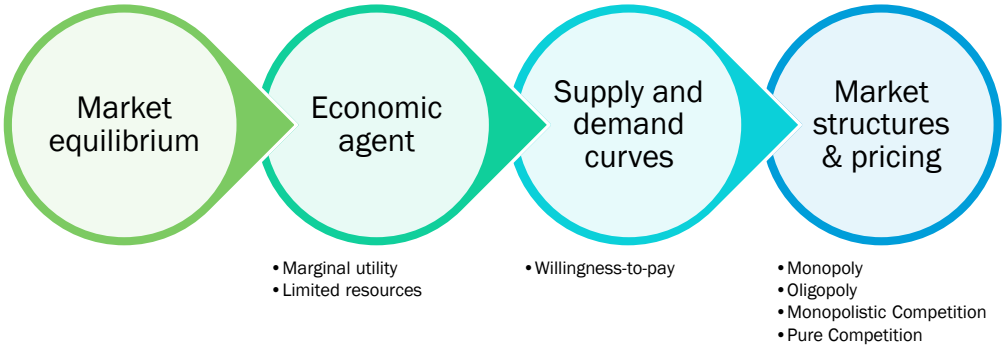

Figure 4: Micro-economic framework

2.2 DEFINITIONS – THE FOUNDATIONS OF ECONOMICS

Economics can be defined as 'the study of how humans make decisions in the face of scarcity' (OpenStax College 2014, p. 8). The scarcity arises because 'human[s'] wants for goods, services and resources exceed what is available' (OpenStax College 2014, p. 8). A traditional definition explains it as the 'social science of earning a living' (Hayford 1917, p. 59). It is the science of the allocation of scare resources with alternative uses.

Economics is a field of science and it is divided into various branches. The micro-economics branch is derived from it, and it 'focuses on the actions of individual agents within the economy, like households, workers, and businesses' (OpenStax College 2014, p. 12). Micro-economics can also be described by what type of economic power is possessed and how the economic power is exercised by individual agents in a market. Decisions have consequences for the markets and the economy. Furthermore, it is considered as price theory because the decisions by the buyers and sellers determine the prices of products and factors, which in turn impact on future decisions and behaviours (Perloff 2014). This last definition is one that will be used in this research as it ties in the

pricing based on decisions of buyers and sellers in the market, which influences actions to come.

The following section explains what is considered a market – an institution, an economic agent, and an abstract thought.

2.3 THE MARKET

If one takes the definition of economics given in Section 2.2 above, one can see there are decisions to be made based on the scarcity of resources in terms what to make, sell or buy. Economic agents have to make sacrifices to receive one thing over the other, even 'free' items are paid for by sacrifices of the economic agent (McConnell, Brue & Flynn 2012). Therefore, there exists an institution that encompasses all the decisions being made, which is referred to as the market. The market is an institution that facilitates the economic exchanges between the suppliers and buyers. This institution may be a physical location, like a supermarket, or it can be a virtual location, like a stock exchange. Markets that deal with goods and services are referred to as product markets, while those that deal with labour and capital are described as factor markets (Perloff 2014; Rutherford 2002). The connection between the two types of market is that the demand for products leads to a demand for the factors. The market can be described as an institution from different perspectives. Chapter 3 goes into greater details about what makes an institution an institution (Section 3.3). In this section, the discussion is pre-empted by using some of the terms that are further expounded later in this chapter and the following chapters.

The market permits goods and services to be sold in exchange for monetary and non-monetary rewards. An economic agent can be defined as a person who has to make a decision about what to buy, make or sell (Rutherford 2002). The market was established to facilitate these exchanges. Overtime, these exchanges developed traditions, rules and norms (abstract thoughts) to govern how they operate. These governance structures differed between the different industries and countries. This is seen today in the differences in the rules for the exchange of goods and services inside and between countries. The rules are established and enforced by governments, which influence the level of freedoms afforded to the market. These freedoms determine where on the spectrum a particular economy lies in terms of traditional-command-free market economy (OpenStax College 2014). However, the rules of the market change over time as economic institutions react to the rules, establish new rules or supersede the rules (Aoki 1996, 2007; Greif 1998; Schumpeter 1939). These rules are influenced by customer choice,

margin utility, supply and demand and market structure, which are discussed in the sections that follow.

2.4 CUSTOMER (CLIENT) CHOICE AND MARGINAL UTILITY

In making an economic decision, individuals and firms have to make a choice. They are faced with the scarcity of resources. Since resources are finite concepts, economic decisions are often based on maximising the use of these scare resources to get the maximum benefits from them. When considered in the micro-economic sense, the choices have to be made in what products (goods and services) and factor to make, sell or purchase. The ability of the decision-maker to deal with resource constraints is governed by another resource constraint, which is money. Therefore, the choice is affected by the budget constraint of the buyer, which is the amount of money available to buy the products or factors with their real income (Rutherford 2002). The buyer has to choose what to buy as they have unlimited wants but limited income (McConnell, Brue & Flynn 2012).

Furthermore, as economic agents deal with scarcity in terms of resources, this brings opportunity cost to the forefront. There is a cost associated with making this choice and it is referred to an opportunity cost (OpenStax College 2014; Rutherford 2002). This opportunity cost impacts on purchasing and pricing decisions, especially as one considers the consumer's surplus and seller's surplus, respectively (Ng 2007). This is further expanded later in the chapter during the discussion of value (expected net value framework and law of diminishing marginal utility). If the buyer makes a buying decision, they forgo the money to buy something else. The amount of money spent on the buying decision is the opportunity cost of not buying the alternatives.

Economic decisions are subjected to marginal analyses by the decision-maker, who attempts to maximise his/her marginal utility or weigh up the costs and benefits of the economic decision (McConnell, Brue & Flynn 2012; Perloff 2014). Marginal utility refers to the difference between the benefits/gains of acquiring the goods/services and the cost of acquisition (Ng 2007; OpenStax College 2014). Rutherford (2002, p. 368) defines it as 'the amount of satisfaction obtained from consumption of the last unit of a good or service.' Another way to look at marginal utility is as micro-economic decisions that are taken to maximise the happiness of the decision-maker (Perloff 2014). The decision-makers want to make a choice that they will not regret (aversion to loss) and that they are happy to live with.

Moving from customer (client) choice and marginal utility, the next section discusses supply and demand functions. The demand for scarce resources determines the costs to obtain the resources and the quantities demanded. By extension, the supply of scarce resources is influenced by the quantity demanded for them and the prices accepted for them

2.5 SUPPLY AND DEMAND FUNCTIONS

For the market to exist, there must be products and factors that are in demand and there must be both a willingness to pay and an ability to pay for them by the buyers (McConnell, Brue & Flynn 2012). The aggregated quantity of demand (of the products and factors) in the market is based on the market prices charged by the aggregated suppliers in the market. The relationship between the supply of products (goods and services) and the demand for them is mediated by the price the products are being sold at and the price the buyers find acceptable. This is the basis of the equilibrium of prices as proposed by Walras (Walker 2006).

In a graphical sense (Figure 5), there is a law of demand and a law of supply, which intersect to have an equilibrium point where all of the supply is matched exactly by the demand for it – the equilibrium price (P_e) or the market clearing price (McConnell, Brue & Flynn 2012; Rutherford 2002). The law of demand is manifested in an inverse relationship between the quantity demanded (x-axis) and the price willing to pay (y-axis), which may be derived from the demand function (Rutherford 2002). On the other hand, the law of supply has a positive relationship where the quantity of goods and services (x-axis) supplied increases with the price being charged (y-axis), which is derived from the supply function (Rutherford 2002).

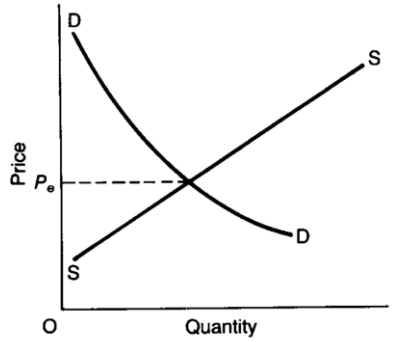

Figure 5: Supply and demand curve with the equilibrium price at the intersection of the curve (Rutherford 2002).

However, there will be situations where supply and demand are not in equilibrium. When the supply quantity exceeds the demand quantity, it can result in lower prices. The

aggregated prices in the market are below the equilibrium price point. It is considered more favourable to the buyers and less favourable to the suppliers. On the other hand, demand can exceed supply. When this occurs, it can result in higher prices. The aggregated prices in the market are above the equilibrium price point. It is less favourable to the buyers and more favourable to the suppliers. In other words, excess supply results in an under-equilibrium price and excess demand results in an over-equilibrium price (OpenStax College 2014). This is also known as a disequilibrium price (Rutherford 2002).

The supply–demand curve (Figure 5) shows the mathematical relationships of the demand and supply of a good in the market. It can be altered based on several factors. For example, the following determinants of demand impact on the shift of the demand curve either to the left (reduction) or to the right (increase): (1) changes in consumers' income, (2) changing consumers' tastes or preferences, (3) the prices of substitutes and complementary goods/services, (4) the number of buyers in the market, (5) the expectation of the consumers, or (6) the probability of future events (Baker 2011; McConnell, Brue & Flynn 2012; Nagle, Hogan & Zale 2011; Ng 2007; OpenStax College 2014; Phillips 2005). This shift results in the change of the willingness to buy from the demand side of the economic transaction – these exogenous factors influence the decision-makers to increase or decrease the quantity of products demanded.

Not only do shifts in the demand curve occur, shifts also occur in the supply curve. This can be caused by changes in: (1) the cost of inputs, (2) changing consumer tastes, (3) resource availability and prices, (4) government regulations and subsidies, (5) changes in technology, (6) the presence of competitors, (7) expectations of the producers, (8) the prices of substitutes and complementary goods/services, or (9) the probability of future events. These all impact on the shift of the supply curve either to the left (reduction) or to the right (increase) (McConnell, Brue & Flynn 2012; Nagle, Hogan & Zale 2011; Ng 2007; OpenStax College 2014; Phillips 2005). With the presence of these external factors, the supply side of the economic transaction can adjust how much of a product is supplied to the market. These shifts in the demand and supply functions can be represented by graphs as shown in Figure 6 (demand) and Figure 7 (supply) below.

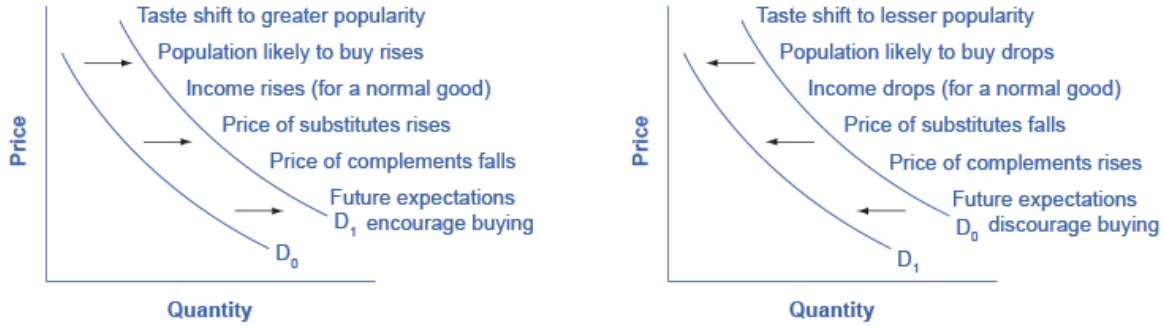

Figure 6: Factors that shift demand functions (OpenStax College 2014).

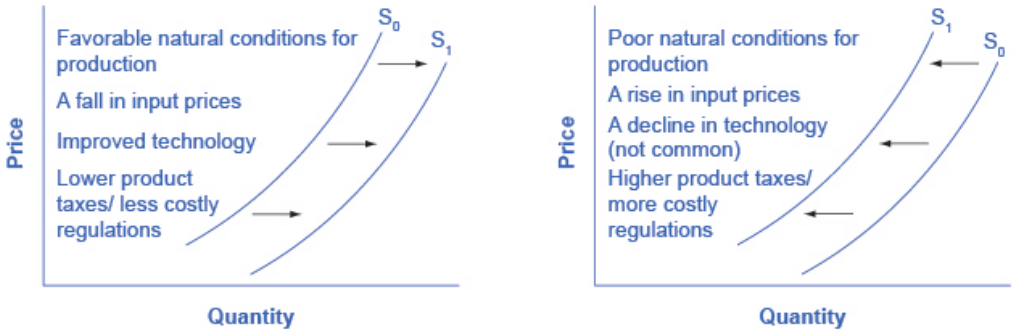

Figure 7: Factors that shift supply functions (OpenStax College 2014).

The next section discusses how the market is structured and governs the choices made by the buyers and sellers in the market.

2.6 MARKET STRUCTURE

The market is structured in relation to the presence of firms that compete for business from the consumers in the market. This results in different market structures, which influence: (1) the amount of power each firm has, (2) the barriers to entry for competitors, (3) how similar their commercial offerings are to each other, (4) the competitive advantages held by each firm in the market relative to the other firms, and (5) how many firms exist in the market (market concentration) (Clarke 1985; McConnell, Brue & Flynn 2012; OpenStax College 2014; Perloff 2014; Stuckey & White 1993). The structures are along a spectrum from perfect competition to the monopoly, as shown in Figure 8 below, which is related to their market power.

Figure 8: The spectrum of competition (OpenStax College 2014)

McConnell, Brue & Flynn (2012, p. 31) contend that 'competition among buyers and sellers diffuses economic power within the businesses and households that make up the economy.' When a firm prices their services, they often do it with the intension of recovering the cost of production, the cost of service delivery and maximising profits (Nagle, Hogan & Zale 2011; Ng 2007).

2.6.1 Perfect competition market

In the perfect competition market, various assumptions are made by economists from a pricing theory (society-focused) perspective (Ng 2007). It is commonplace to describe the perfect competition market structure as one where there are many sellers of the same (homogeneous) product with many buyers for their offerings. Both buyers and sellers have the same information to make rational decisions, and low barriers of entry and exit for competition (McConnell, Brue & Flynn 2012; Ng 2007; OpenStax College 2014; Rutherford 2002; Stuckey & White 1993). In this model of the market structure, buyers and sellers are considered as price takers (McConnell, Brue & Flynn 2012; Perloff 2014). There exists information asymmetry between the buyer and seller, which the seller exploits to maximise their revenue and seller profit, and the buyer exploits to maximise their own customer surplus. However, because of the presence of competitors, the market arrives at an equilibrium price (P_E), where every seller sells at the same price. If they attempt to sell above the price without any good/service differentiation, they lose sales to their competitors (Ng 2007; Perloff 2014). The market structure is described as incentive incompatible if the market is in equilibrium as there is no incentive to change the price being offered and accepted by the market (Rutherford 2002).

In describing the perfect competition market structure, the structure is an ideal form of the market. Competing firms are described as price takers if they have some of the following characteristics. The first characteristic is that the quantity of selling companies and buyers are large. The market for a specific product is served by many small companies, who are targeting the same customers, and their output cannot affect the

market price. The market has arrived at an equilibrium price. Any firm wishing to sell a product must sell it at this price and the buyer has to purchase at this price as well. Secondly, if the product is homogeneous and the market cannot tell the difference between one offering and another, then sellers have to sell at the same price as everyone else. Thirdly, price information is freely available to everyone in the market and any price increases mean customers will shift to another seller, who is selling at the equilibrium price. Fourthly, the transaction costs to conduct the buying and selling exchange are very low so that it is very easy to find another buyer or seller to complete the trade. And the fifth characteristic relates to the ease of entry and exit from the market for the selling companies. If they are looking for a short-run profit, they can enter the market to earn the profit and exit when it is no longer profitable for them or stay for the long-run in the market if they plan to make a long-term investment (Perloff 2014).

2.6.2 Monopoly market structure

The monopoly market structure exists where there is only one supplier of a product or service. The supplier has such a significant market share that it can dictate the price of the good/service because it has all the power in the economic relationship. Usually, a monopoly can exist because of historical precedence, government intervention (regulatory acceptance) or technological advancements (OpenStax College 2014; Perloff 2014; Rutherford 2002). There exist various legal and natural ways for a monopoly to develop. The natural monopoly arises when the company can dominate the market using factors besides legal intervention, for example, having a patented process. The legal monopoly arises because the company is permitted to have a market monopoly by the government.

In the first instance, the natural monopoly is found where economies of scale make it easier for the company to add/serve other customers, while the cost would be prohibitive for a competitor to establish a commercial service network. It can also arise when the company has a command of the essential natural resource for the specific industry. The legal monopoly can be established to deliver a public good/service, for example, a public utility, or can occur when a company has been granted exclusive competitive rights because of intellectual property protections. The government may opt to designate certain sectors as key commercial sectors and heavily regulate them to maintain a legal monopoly; otherwise it may de-regularise or dissolve various legal monopolies to promote more competition (McConnell, Brue & Flynn 2012; OpenStax College 2014; Perloff 2014). This is often a result of free trade agreements signed between various countries or between internal states in federal systems (Perloff 2014). However, the services sector is often exempted or the last to be de-regularised (Boudier & Lochard 2013).

The monopoly can either set the price or the output (quantity) to influence their profit maximisation potential. It cannot set both. The monopoly has power in the market because it can set its price above its marginal costs, but it can only do it so high enough before it begins to lose demand from its customers. With a monopoly, suppliers can charge a higher price than they can under perfect competition (McConnell, Brue & Flynn 2012; Perloff 2014; Rutherford 2002). The higher the elasticity of the demand, the less market power the monopoly has to raise its prices.

2.6.3 Monopsony

A monopsony can also exist, where there is only one buyer of product or the buyer buys such a supermajority of the supply that it commands/determines the price of the product on offer (McTaggart, Findlay & Parkin 2013; Perloff 2014; Rutherford 2002). In this case, the monopsony can pay a higher price (P_M) compared to the price (P_C) in a perfect competition market structure. This can be the aggregated public-sector clients' demand for engineering services for their built environment projects.

2.6.4 Monopolistic competition

Monopoly, monopsony and perfect competition are idealised models of the market. There are two other types which show how the market behaves when it does not consist of many suppliers and buyers (perfect competition) or the market does not consist of a single powerful supplier (monopoly) or buyer (monopsony). Between the extremes exist two generalised market structures: (1) monopolistic competition and (2) oligopoly (Figure 8).

In the monopolistic competition market structure, there are many companies that are selling different goods and services but still compete as they often target a similar client bases (McConnell, Brue & Flynn 2012; OpenStax College 2014). There is a small amount of power exerted by the firms as there are so many competitors but they differentiate themselves with heavy advertising (McConnell, Brue & Flynn 2012; OpenStax College 2014). Additionally, the market is characterised by the ease of entry and exit of competitors (McConnell, Brue & Flynn 2012; OpenStax College 2014). Because of the large number of competitors, the market share of the individual companies is smaller where there is little or no collusion and there is an independent price behaviour. The demand curve is highly but not entirely elastic (McConnell, Brue & Flynn 2012). The monopolistic competition market gives some control over the prices to the company. The firms in this market structure use advertising to increase the awareness of the product differentiation focusing heavily on making price less of a decision factor.

Monopolistic competition market structures can be discussed using the two measures – the Concentration ratio (C_R) and the Hirschman-Herfindahl index (H), respectively. They

are useful in describing the state of the market in terms of the market power of the suppliers (Clarke 1985; McConnell, Brue & Flynn 2012). The former measure (formula 1) is an insensitive ratio but the second one considers all points on the concentration curve. The concentration ratio (C_R) can be used to describe the percentage of the output produced by a specific number of the largest firm in the market, for example, the top three, top four, top five, top ten etc. (Clarke 1985; McConnell, Brue & Flynn 2012). In using a top four concentration ratio, where the concentration ratio is less than 40% ($C_R < 40$), the market can be described as being monopolistically competitive, while having a concentration ratio greater than 40% ($C_R > 40$) describes an oligopoly (McConnell, Brue & Flynn 2012)

Concentration ratio = $C_R = \sum_{i=1}^{r} \frac{x_i}{x} = \sum_{i=1}^{r} s_i$ Formula 1

r = the number of the largest firms in the market

x_i = output of the ith firm

x = the total output of firms in the industry (market)

s_i = the market share of the ith firm

The Hirschman-Herfindahl index (H) (formula 2) is 'the sum of the squared percentage market shares of all firms in the industry' (Clarke 1985, p. 14; McConnell, Brue & Flynn 2012, p. 219). Schwalbach (1987) explored the use of the Hirschman-Herfindahl index as an indicator of how effective the actions taken by the current industry members to prevent entry of new competitors. In a monopoly, the Hirschman-Herfindahl index value will be 10 000 ($H = 100^2$). For monopolistic competition markets, the index will be small when compared to oligopolistic markets with a higher index value. However, if the profitability of the different fragments is high and constant, it would act as beacon for other firms to entry into the segment.

Hirschman-Herfindahl index = $H = \sum_{i=1}^{n} \left(\frac{x_i}{x}\right)^2 = \sum_{i=1}^{n} (s_i)^2 = \frac{C_R^2+1}{n}$ Formula 2

C_R = concentration ratio of the r largest firm in the market/industry

Monopolistic competition mixes price, product and advertising to seek the maximum profit. The market equilibrium for this market structure follows two conditions: *marginal revenue equals marginal costs* and *price equals average cost* (Perloff 2014, p. 518). The market concentration also is determined by the fixed costs of the competing firms. The profits of the industry would encourage entrants to the market to gain new business and earn economic profits. However, as the fixed costs increase, there is a higher barrier to entry and a less firm entry into the market (Perloff 2014). In the monopolistic competition

market structure, the firm mixes price, product and advertising to seek the maximum profit for itself. The firm has to adjust these three factors to find the optimal levels to get the maximum total profit for the firm. (McConnell, Brue & Flynn 2012).

2.6.5 Oligopolistic market structure

Firms can be monopolistically competitive if they are in the same market segment with the same speciality. However, this can shift to an oligopolistic market structure, where the number of suppliers is small when compared to the number of clients. The oligopoly can be concentrated even further to a duopoly, where there are just two major (largest market-share) firms who are competing. The oligopolistic market may see some coordination by the competitors in order to maximise profits – this coordination is called the cartelisation (Clarke 1985; McConnell, Brue & Flynn 2012; Perloff 2014). Under the oligopolistic market structure, competitors have more power over the price than in the monopolistic competition market structure and are price makers like in a monopoly (McConnell, Brue & Flynn 2012). This increased market power is owed to the fact there are less firms in the market. The firms would have a larger market share and thus a higher Hirschman-Herfindahl index and a top four concentration ratio greater than 40%. The higher these two metrics are, the greater the supplier power of the oligopolistic firms. The market behaviour is characterised by strategic behaviour and interdependence, where they closely consider the actions of their rivals. Their rivals' behaviours impact the market considerably in terms of how the overall market demands responses to the suppliers' actions (McConnell, Brue & Flynn 2012).

There can be a homogenous or differentiated oligopoly, where there may be considerable non-price competition. The oligopoly can exist at various levels – localised oligopoly markets, inter-industry competition, or the presence of a dominant price setting firm (McConnell, Brue & Flynn 2012). The oligopoly can produce some instances of a guessing game behaviour in terms of pricing their products. Do the firms all raise (or drop) their prices, or do they make the price changes independently of each other? This unpredictability can lead to attempts to control the price by the competing firms. This can be done but leads to one of two outcomes: (1) a state-sanctioned oligopoly, or (2) anti-competition proceedings. In the former, the state can implement legislation or regulations that govern the prices charged to the clients in the form of market-based pricing, that is the market collaboratively agrees around the price range. On the other hand, the government may not take kindly to the approach of companies coming together to collude on prices where there is no regulation. It may see this approach as disruptive to the principles of free market economics and cartelisation of the market (Clarke 1985; McConnell, Brue & Flynn 2012; OpenStax College 2014; Perloff 2014; Rutherford 2002).

Because the oligopoly is susceptible to the influence of the pricing decisions of its competitors, they compete heavily on product (goods and services) differentiation. They use advertising to demonstrate their differences when compared against their competitors. Firstly, advertising reduces the time that customers search for product alternatives. Secondly, competitors can introduce new products to the market and increase their awareness using advertising. Through advertising activities, they can gain sales. Thirdly, with increased sales for newer products, it promotes technological progress in the market. Fourthly, the increased sales push the company to produce more output, thus leading to economies of scale and reducing the long-run average total costs (McConnell, Brue & Flynn 2012; Perloff 2014).

On the other hand, advertising comes with negative impacts as well. Sometimes, the firms overstate the benefits of their products in their advertising even though there are no discernible differences between the competitors. The customers can purchase a product that does not bestow any benefit different from the other alternatives in the market. Additionally, advertising can increase the brand-name power of a company in the marketplace. This brand-name power enables the firm to gain significant market share – sometimes at a monopoly level. This can establish a high barrier to entry to the industry for potential competitors. As a result, the market is less competitive. The customers do not benefit from potentially newer and better ideas because the advertising costs to mount a challenge is prohibitive to the new entrant. In the same breath, the advertising spend by one competitor can be matched by its oligopolistic competitors thus can cancel each other out. The competitors do not gain an advantage over each other in the market. These different scenarios contribute to economic inefficiencies (McConnell, Brue & Flynn 2012).

In summary, the table below shows the properties of the monopoly, oligopoly, monopolistic competition and pure competition. Together with Figure 8 above, the four most common models of the market structures are outlined.

Table 1: Properties of the monopoly, oligopoly, monopolistic competition and pure competition market structures (Perloff 2014, p. 483)

Properties	Monopoly	Oligopoly	Monopolistic Competition	Pure Competition
Ability to set price	Price setter	Price setter	Price setter	Price taker
Price level	Very high	High	High	Low
Market power (price: Marginal Cost)	p > MC	p > MC	p > MC	p = MC

Properties	Monopoly	Oligopoly	Monopolistic Competition	Pure Competition
Entry conditions	No entry	Limited entry	Free entry	Free entry
Number of firms	1	Few	Few or many	Many
Strategy dependent on individual rival firms' behaviour	No (has no close rivals)	Yes	Yes	No (cares about market price only)
Products	Single product	May be differentiated	Is differentiated	Undifferentiated
Example	Local water utility	Airlines (differentiated); local electricity utility (undifferentiated)	Automobile mechanics in a small neighbourhood	Seasonal vegetable farmers

2.7 SUMMARY

This chapter explored neoclassical economic thoughts on markets. It established the generally accepted theories on the market and its equilibrium between supply and demand. Furthermore, it discussed the four market structures accepted as micro-economics levels. Next, the thesis discusses the institutional economics thoughts about the markets.

3 LITERATURE REVIEW: INSTITUTIONAL ECONOMICS

3.1 INTRODUCTION

The purpose of this chapter is to review the literature on institutional economics within the context of the CECs. The review takes the form of discussing what institutional economics are, followed by an in-depth analysis of different aspects of this paradigm (Section 3.2). While other chapters will deal with markets and CECs, this chapter looks at what is considered an institution as this definition influences the field of institutional economics with its different schools of thought (Section 3.3).

3.2 DEFINING INSTITUTIONAL ECONOMICS – THE FOUNDATION

Institutional economics is considered an open source of thoughts and critiques of classical economic theories. This branch of economics embodies a multitude of concepts that combine political and sociological analyses of economic behaviour into one (Aoki 1996; Duina 2011; Greif 1998; Hodgson 1998; Kasper & Streit 1998; Williamson 2000). This multiplicity of influences makes defining the branch a difficult one as it is open to different interpretations, but all are equally applicable when needed to explain economic behaviours.

Institutional economics is built with three major pillars as its foundation. Firstly, institutional economics considers the scientific, technological, social and environmental changes that impact on economic behaviour (Duina 2011; Greif 1998; Hodgson 1998). This leads to the second pillar, which is it that it does not demarcate what is economic and what is not (Kapp, Berger & Steppacher 2011). The third pillar addresses the biases and preconceived actions of pure micro-economic theories (Aoki 1996; Kapp, Berger & Steppacher 2011; Kasper & Streit 1998). The institutional economic paradigm aligns itself to the integrative interpretation of the economy within the social framework of culture, technology and the environment (Greif 1998; Kapp, Berger & Steppacher 2011).

There exists an inter-dependence among (1) the private firms within market, (2) market conditions, (3) firm behaviour and (4) economic performance, which are the basis of micro-economics (Clarke 1985). As a result, micro-economics can bear a close resemblance to institutional economics but differences still exist to make them different branches. Clarke (1985) writes about the causal link between market structures, business conduct and market performance, which he contends are the pillars of micro-economics. On the other hand, researchers like Duina (2011), Hodgson (1998), Kapp,

Berger & Steppacher (2011), and Williamson (2000) write from the sociological economic point of view.

Just as classical economics saw a resurgence in the form of neoclassical economics, institutional economics was introduced before the First World War but gained traction after the war (Hodgson 1998, 2000; Kasper & Streit 1998). This was the old (original) institutional economics. It has ascended as a school of economic thought in the latter part of the twenty-first century, which lead to the term 'new institutional economics' (NIE) by researchers like Duina (2011), Kapp, Berger & Steppacher (2011), Kasper & Streit (1998) and Williamson (2000), respectively. Hodgson (1998), like Kapp, Berger & Steppacher (2011), argues for the theoretical rigour of new institutional economics to explain their ideas and economics. NIE considers the pluralism of the various theories of institutional economics from the political, economic and sociological behavioural perspectives. Williamson (2000) gives the best demarcation for this NIE analysis by breaking it into four levels of social analysis as shown in Figure 9 below.

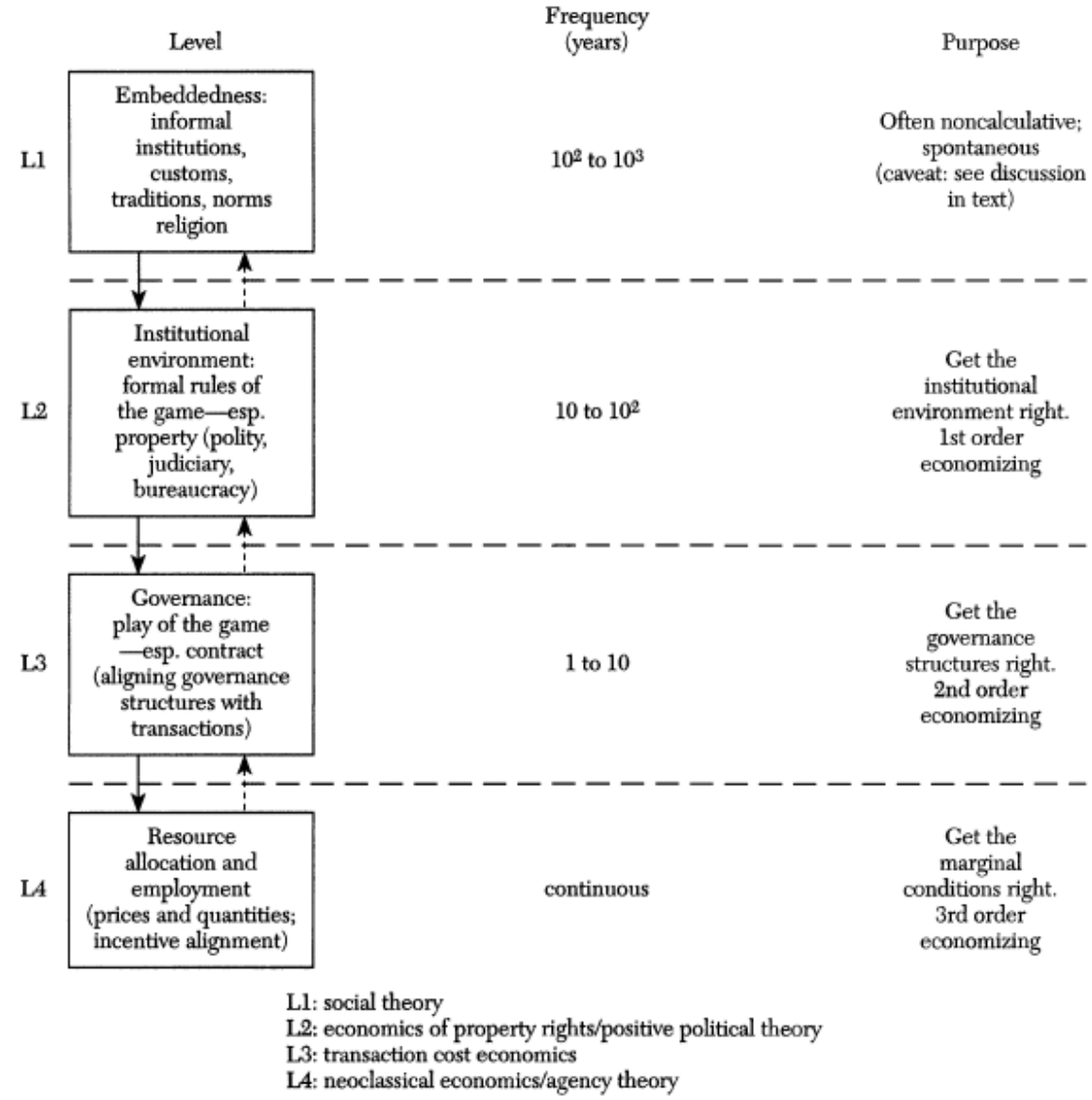

Figure 9: Economics of institutions (Williamson 2000)

3.2.1 Historical perspective (Historical Institutional Analysis (HIA))

The first new institutional economic school is that of the historical perspective (historical institutional analysis (HIA)), which takes into account institutional history to explain current and future economic behaviour of organisations (Gagliardi 2008; Greif 1998; Hall & Taylor 1996). Hall & Taylor (1996) speak from a political economy perspective but the principles are supported by Greif (1998), Hodgson (1998, 2000), and Williamson (2000) as political science and economics meet at the middle to create the political economy branch. The HIA proponents set forth four frames of thought. They include (1) the structuring of institutions, (2) the relationships between institutions and individuals, (3) the inequality of power distribution between institutions and individuals, and (4) the path taken in the development of institutions and the influence of previous actions (Hall & Taylor 1996).

Institutions and individuals can behave strategically based on the present and future actions of other economic agents in the market. Alternatively, they behave strategically based on their limited knowledge of the economic world (Hall & Taylor 1996). Hall & Taylor (1996) and Gagliardi (2008) postulate that the individual absorbs information and solves problems using pre-existing mental frames or systematic biases (also called heuristics). Williamson (2005) argued that economic transactions have costs associated with them and institutions were created to initiate, plan, execute, monitor, control and close these transactions. Hall & Taylor (1996) and Gagliardi (2008) imply that institutions evolve based on previously made decisions, which impact on future decisions. The different levels of institutional economics analysis proffered by Williamson (2000), as seen in Figure 9 above, shows the transitions between the different paths in an institution's development and influences of the past institutions.

3.2.2 Comparative Institutional Analysis (CIA)

Comparative institutional analysis focuses on institutions and their changes. Gagliardi (2008) describes this approach as being grounded in empirical evidence supported by historical information. It looks at the conformity of institutions and the rules of the economic games that govern economic actions. These rules are enforced by institutionalised learning (Aoki 1996; Gagliardi 2008; Greif 1998). It must be acknowledged that rules of the games are considered an institution and a game is a competitive economic activity (Aoki 1996; Gagliardi 2008).

Aoki (1996, p. 12) describes CIA as 'an emergent field which tries to understand why there is a variety of institutional arrangements across economies and what are the public policy implications of the diversity.' This is comparable to the rational choice institutionalism as discussed in Hall & Taylor (1996) using political science. Both institutional perspectives argue that institutions arise to benefit the actors in the game, whether it is an economic game or political game. Behaviours are reinforced because the actors learn them and are rewarded for them. At the same time the institutions are modified to promote the favourable economic/political behaviour. The transaction costs of achieving rewards are reduced with the evolution of the institutions. Once the institutions have evolved and the game achieves equilibrium, the various institutions that have developed to support this game equilibrium are said to be complementary institutions (Aoki 1996). As a result of this institutional complementarity, Aoki (1996) declares the similarity between HIA and CIA, and Greif (1998) combines them as Historical and Comparative Institutional Analysis (HCIA). CIA looks at how the institutions evolve to complement their comparative natures in equilibrium states. It is comparable to how HIA looks at the path dependence of current institutions from past institutions.

The combination of the historical and comparative institutional analysis techniques has a similarity of the original institutional economics (OIE). OIE advocates how decisions are made to satisfy society using an institutionalised process. OIE examines the processes of institutional adjustments caused by changes in the economic market. Stanfield (1999) suggests that OIE is concerned with how economic agents respond to the changes, which is dependent on their relative power and rank. Additionally, he positioned that changes impact on the competition between competitors and changes the market power (Stanfield 1999). OIE uses qualitative comparative analysis of historical and cultural actions as opposed to the quantitative statistical analysis of neoclassical micro-economics. This is applied in the HIA and CIA techniques, which have an anthropological approach.

On one hand, while CIA explains why institutions evolve in the economic game, the rational choice institutionalism speaks of the efficiency of the institutions. It is understood that these institutions arise based on exogenous characteristics and would be different under a different set of conditions (Aoki 1996; Greif 1998; Hall & Taylor 1996). In other words, when faced with different choices, individuals would create different institutions to address their economic/political games and would select the ones that maximise their benefits. While this seems similar to neoclassical economics, with its maximising perspective, CIA considers institutions as being a player (agent) in the economic game while neoclassical economics just considers only the individual as making the rational decisions. With its perspective on complementary institutions, CIA would be useful in understanding how different competitive strategies can coexist in the consulting engineering market.

3.2.3 Imperfect information theory

The third NIE school is imperfect information theory, which deals with institutions that are established when there is asymmetric information available for the parties involved in economic transactions (Bardhan 1989; Bardhan 2000; Gagliardi 2008). Under this paradigm, the market may not exist or may collapse because of the lack of information. What happens is the economic agents develop institutions that overcome the missing information and allow economic transactions to take place. This approach deals with interlocking economic transactions that are linked to each other because of information asymmetry. The imperfect information theorists have focused on credit, lending and risk economic behaviour and transactions, especially with linked relationships.

CECs and the engineering market have evolved over the past centuries to become regulated institutions. As a result, most of the institutional economic analyses would be

done using the historical and comparative institutional analyses, as discussed in the two previous sub-sections, instead of the imperfect information theoretical analysis.

This section has discussed briefly the schools of thought around institutional economics; it is now necessary to explain in greater detail the various components of these schools of thought. The first component to be discussed is what is considered as an institution.

3.3 INSTITUTIONS DEFINED WITHIN THE NEW INSTITUTIONAL ECONOMICS PARADIGM

As previously stated in the introductory paragraphs of this chapter, institutions have been defined in terms of economic, political and sociological perspectives. This tripartite umbrella of economic, political and sociological perspectives means there are dynamic definitions of the term institution. Although differences of opinion still exist in their definitions, institutions can be described within the boundaries of (1) the type of institutional model, (2) the influences of filtering institutions, (3) legitimacy, (4) stickiness, and (5) isomorphism (Duina 2011). This section proceeds to elucidate the concept of institutions as economic agents under the tripartite umbrella with its five components. Additionally, it discusses a CEC within the institutional economic viewpoint as it relates to its economic behaviours and relationships as a commercial institution and economic agent. This explains the rationale for the use of this theoretical perspective in analysing the business-to-business relationship of the CEC.

As a general principle, (new) institutional economists view institutions as a part of the economic behaviour of a market. Kasper & Streit (1998) posit that institutions are rules that govern economic behaviour, which decrease the information costs for and encourage trust between economic agents. Neoclassical economic theorists (Chicago School) ignore the concept of institutions in the economic sense. Instead, they subscribe to the view that an 'invisible hand' guides market behaviours (Aoki 1996; Kasper & Streit 1998). Neoclassical economists assert that individual economic decisions are made in self-interest, and when aggregated on a macro-economic level, they will naturally stabilise the economy without any help from the government (*laissez-faire*). As an alternative, institutional economics argues that economic behaviour can only exist if there are supporting features; for example, property rights, contract law and common currency, which are institutions themselves and are facilitated by government organisations (Duina 2011; Hodgson 1998, 2000; Kasper & Streit 1998; Nelson & Sampat 2001). Both neoclassical and new institutional economists agree that transactions that exist between economic actors have costs associated with them (transaction cost economics) (Aoki 1996; Bardhan 1989; Greif 1998; Hall & Taylor 1996). The new institutional economists believe these costs are caused by what is referred to as the stickiness between the actors

and these supporting features (internal and external institutions), which offer a way to increase the effectiveness of these transactions (Duina 2011; Gagliardi 2008; Williamson 2000).

3.3.1 Institutions as a collection of persons

The first definition of an institution centres on the idea that an institution is the collection of persons (economic agents), who are working together to achieve a common goal and participate in economic games (Aoki 1996, 2007; Duina 2011; Gagliardi 2008). The institutions can have a for-profit orientation with the aim of maximising profits for its shareholders, such as a CEC. The institutions can also exist as public-sector bodies with a regulatory/oversight function to make sure the economy functions properly, for example central banks or consumer protection bureaux. In addition, the institution may exist as a non-profit, non-government organisation, whose primary functions usually centre around some public/social goal, for example an engineering professionals' association. These institutions are concerned with resource allocation, employment, prices and quantities as well as conforming to organisational norms (Duina 2011; Williamson 2000).

3.3.2 Institutions as a belief system

Alternatively, some institutional economists consider organisations not to necessarily be institutions, but actors in economic games (Kasper & Streit 1998). Therefore, the second definition of institutions centres around the economic beliefs that are shared by persons. They influence what cultural behaviours, norms, laws, traditions, routines, assumptions and practices they follow as they live individually and collectively (Duina 2011; Gagliardi 2008; Hodgson 1998; Nelson & Sampat 2001). These behaviours, norms and practices can be both internal and external to the organisation and be both formal and informal in their enforcement. They are taught to the new entrants into the institution(s) as part of the institutional learning and become part of the institutional memory. Gagliardi (2008) refers this as the 'rules of the economic games'; which are aligned to comparative institutionalism (Aoki 1996, 2007; Greif 1998). On the other hand, Hall & Taylor (1996) use the sociological institutionalism paradigm to describe the cultural significance of institutions.

3.3.3 Institutions as an equilibrium between people and beliefs

The third definition of institutions centres on an equilibrium context where various players/institutions (first definition) and the shared economic rules/beliefs (second definition) are in a constant flux, which adapt and stabilise over time (Aoki 1996, 2007; Gagliardi 2008). Researchers who prescribe to this definition follow along the evolutionary game or repeated game approach in their analysis (Aoki 1996, 2007; Gagliardi 2008).

Kasper & Streit (1998) contend that institutions are sticky or resilient in the long term because they are community enforced sanctions for non-conformance to the agreed institutional practices. However, institutions change over time and this impacts on the economic behaviour of economic agents. Aoki (1996, 2007), Gagliardi (2008), and Kasper & Streit (1998) argue that the institutions follow an evolutionary process based on human interactions and experience, and explicit creation through a formal governance entity (authority).

The government creates institutions both to regulate and to participate in the economy, which influences how the economy functions. These institutions are considered as externalised institutions because of the need for coercive orders and formal sanctioning for non-compliance (Kasper & Streit 1998). For example, professional members of CECs are subjected to licensing requirements to practice as engineering professionals. The licensure (an institution itself) is administered and enforced by a government-sanctioned public body. If it so desired, this engineering licensing body can limit the number of engineering professionals, which impacts on resource allocation for CECs and competition in the field. As a result, it can be described as a political, an economic and a sociological decision (Hall & Taylor 1996). This is an evolutional step in controlling the market by acting as an entry barrier to competitors but also assuring the clients that professionals are certified, which can be explained under the complementary institutional arrangement (comparative institutional analysis) proposed by Aoki (1996, 2007) and Hall & Taylor (1996), or by the social order and public policy perspective proposed by Kasper & Streit (1998).

Another perspective for institutions is the sociological one, which looks at how people and organisations operate in an economic sense. The formal rules and practices can run counter to the informal ones. These informal behaviours happen because of the stickiness or 'embeddedness' of norms and customs, which lead to spontaneous actions and go against the efficiency and/or effectiveness goals of the formal rules (Duina 2011; Hall & Taylor 1996; Kasper & Streit 1998; Williamson 2000). Williamson (2000) describes them as the Level 1 institutions, which take between hundreds to thousands of years to change (see Figure 9 above). The idea of mimicry of organisational behaviour comes from the sociological perspective, where institutions adapt to or mimic models of leading examples of their types of institutions and behaving in socially accepted ways because of socialised roles (Duina 2011; Hall & Taylor 1996).

Institutions exist both inside (endogenously) and outside (exogenously) of organisations. This is a result of the fluid nature of the definition because of the 'contention and power

dynamics' of the individuals, organisations, and institutions in the marketplace (Duina 2011; Hall & Taylor 1996). Neoclassical economists have firmness in their definitions and take the view that institutions are a hindrance to economic activity. Whereas, the new institutional economists move with a fluidity in their definitions and take the view that institutions guide and facilitate economic activity (Aoki 1996, 2007; Duina 2011). Professional firms (like CECs) are institutions themselves both as a commercial entity and the traditions of the practice, which means new institutional economic views can be useful for analysing their dynamic economic nature.

3.3.4 Structural institutional models

Having discussed what institutions mean, we expand on the different aspects of that definition. Duina (2011) writes about the dominant models that these organisations take and how these models instruct on how the organisations interact internally amongst their teams and externally amongst other institutions. This is the first extension of the definition of an institution.

Because CECs exist as for-profit institutions, they would have different models for how they are structured. The model determines how they function in the marketplace. Devaney (2014) writes about the hybridism of organisations in using the various archetypes. Nelson (2008) writes about the profitability of institutions with the organisational structure being one of its factors amongst other factors. The following three models are considered as the commonest types: (1) functional hierarchical, (2) projectised, and (3) matrix organisational structures (Devaney 2014; Project Management Institute 2017). Devaney (2014) goes on to discuss additional models: (1) divisional based, which has three orientations: product-oriented, market-oriented and geographically oriented, (2) process and (3) circular organisational models, respectively.

The model for the CEC is split between hierarchical commercial and support services functions. The teams are aligned to occupational groups if they follow the functional hierarchical organisation structure (Kerzner 2009; Project Management Institute 2017). Alternatively, the CEC can be structured based on project types, like a collection of smaller versions of themselves working on specific projects. This follows the projectised organisational structure (Kerzner 2009; Project Management Institute 2017). The third option is the matrix organisational structure, where there is an overlay of functional hierarchical and projectised structures (Kerzner 2009; Project Management Institute 2017). In this model, the CECs have project teams working on projects under the leadership of a project manager, but the staff are drawn from functional groups.

Klapper, Laeven & Rajan (2006) write on the different types of leaders needed for transnational companies, which arise from matrix organisations and grow into global behemoths. The different institutional leadership styles arose because of these internal institutional structures. These structures both positively and negatively impact on internal collaboration and organisational effectiveness (Bartlett & Ghoshal 2003; Duina 2011; Project Management Institute 2017).

With these models, the questions arise – are they going to be accepted by everyone and why are they are accepted? The next sub-section looks at the legitimacy of the institutions.

3.3.5 Legitimacy of institutions

When the term 'legitimacy' is applied in an institutional economics context, it is considered alongside the term 'organisational conformity' (Duina 2011; Nelson & Sampat 2001). For the purpose of this study, the legitimacy of institutions concerns itself with how similar the CECs reflect each other's structures. As far as we understand currently, consulting engineering firms have different specialities, which means their organisational structures would vary. Because of these structural differences, they would respond differently to the market.

Organisational conformity gains influence because of the institutional memories of engineers-in-training. For example, after the engineers-in-training intern with existing firms, they move to other firms or set up one themselves. If they gain the necessary authority and influence, they can duplicate their reference firm's structure; or they can modify the structure to something new in their new firms. The legitimacy of the business is important in the B2B interaction, which is why pre-qualifications documents ask for organisational charts. Not only do they help with relationship building – to whom the clients speak with in the CEC – but also it is used as evidence that the business is structured liked the others in the market.

In Williamson (2000) analysis, legitimacy comes from the contracts that govern economic transactions. In absence of a formalised contract system, the institutions would still develop to execute the economic transaction. This was expounded under the imperfect information theoretic paradigm of institutional economics (Bardhan 1989; Bardhan 2000). Additionally, Commons (1936) writes on the institutional economic impact of the US Supreme Court on economic sovereignty. His discussion reinforces the requirements for a judicial system for the interpretation of contract law and to legitimise business practices. These actions establish further institutions, which factor in economic decisions made by companies. For CECs, they deal with various contracts as they relate to their project work, which influences how their projects are priced. This is subject of the Level 4

institution, that is, the incentive arrangements for intellectual work being produced by the CECs.

This is the second extension of the definition of an institution. The next sub-section looks at the third extension, which explains why legitimate institutional models stick around.

3.3.6 Stickiness of an institutional model

Institutions have a stickiness, which sees traditions, customs, formal and informal practices embedded into the way the organisations behave endogenously and exogenously (Duina 2011; Gagliardi 2008; Williamson 2000). This is the third extension of the definition of an institution.

Duina (2011) talks about the decoupling effect where members of an institution do not follow formal rules but use the informal ones. Hall & Taylor (1996) further explain that these informal rules are not entirely under the express choice of the individual. The individual decision-maker has to deal with an influx of information in their daily lives. This means decisions are affected by bounded rationality decision-making and these decisions would use the tried and tested informal methods leading to the decoupling effect (Duina 2011; Gagliardi 2008; Kasper & Streit 1998; Malerba 2002; Williamson 2000). This stickiness influences the current and new hires in the companies, which can affect how much they change. Even if the CEC is innovative, the company as an institution consists of people. It would take time for the company to change its internal processes, as shown in Figure 9: Economics of institutions (Williamson 2000).

With rational choice and unbounded rationality influencing the decisions made by individuals, formal and informal institutions usually tend to stick around. However, this stickiness can be tempered by filtering, which is explained in the next sub-section.

3.3.7 Filtering institutions

The fourth extension of the definition of an institution is the filtering institution, that is, how learning and knowledge occur in an institution (Duina 2011). This concept is aligned to the sociological institutional perspectives. The comparative institutional analysis is useful here because it helps to explain the evolutionary process of institutions as the company grows and learns (Aoki 2007; Gagliardi 2008; Hall & Taylor 1996). Nonaka, Toyama & Konno (2000)'s Socialisation, Externalisation, Combination and Internalisation (SECI) framework on institutional knowledge management and learning is a suitable example of how filtering institutions portray how knowledge is transferred inside of an organisation. It also establishes how colleagues interact with each other inside and outside of the institution (Duina 2011). The CECs through internships can indoctrinate

new engineers into their practices of the firms. These traditions of the institutions can be spread via stories and myths (Duina 2011).

Through these stories and myths, institutions can filter how they are perceived internally and externally, which leads to mimicry of these institutions by others. The next sub-section expands on the isomorphism of legitimate institutional structural models.

3.3.8 Isomorphism of institutions

The fifth extension of the definition of an institution is the isomorphism of institutions, which explains that institutional structural models and informal institutional conventions are similar for different companies. Duina (2011) writes about three types of isomorphisms – coercive, mimetic and normative – which was supported by the writings of Dequech (2009). Alternatively, there are three other ways to look at isomorphism beside Duina (2011) three archetypes. Firstly, there is the adaptation of 'idiosyncrasies' of a particular organisation by other organisations as part of their routines of doing a particular process or activity (Nelson & Sampat 2001). The second alternative describes it as using the evolutional game approach, which is the accepted institutional behaviour that has arisen from years of practice (Aoki 1996; Gagliardi 2008; Greif 1998). The third alternative describes it as a Nash equilibrium, where institutions are rewarded for conformance rather than deviation from the accepted norm (Hall & Taylor 1996).

Combining the four alternatives, one can describe isomorphism of institutions under the three harmonised pillars. The first harmonised isomorphic approach (coercive isomorphism) is governed by a formal rule for how an institution should be constituted, which is reinforced by a regulator with penalties for non-conformance (Dequech 2009; Duina 2011; Hall & Taylor 1996). The second harmonised isomorphic approach (mimetic isomorphism) can be seen as an idealism whereby an institution mimics a successful or idealised version of themselves (Dequech 2009; Duina 2011). And the third incarnation of harmonised isomorphism (normative isomorphism) is the middle of the road between coercive and mimetic in that the norms have been developed over time from a collective acceptance (convention) and not necessarily because it was dictated to the organisations by formal rules (Dequech 2009; Duina 2011; Gagliardi 2008; Hall & Taylor 1996).

For example, when one considers the structures and operations of the various CECs, their actions and processes are like each other. Different CECs can have a similar organisational structure but have different operational structures and behaviours based on the people hired for the firm. On the other hand, they are operating using similar practices, which can be reinforced by guidelines learned while training in universities, internships or workshops, or they are standardised by guidance from their engineering

associations. Social conventions are normalised and individuals are socialised to behave in a particular way in particular institutions (Dequech 2009; Duina 2011; Gagliardi 2008; Hall & Taylor 1996).

With these five extensions of the definition of an institution discussed in the five sub-sections above, the next sub-section combines them to reconcile them into the definition of an institution.

3.3.9 Connecting the extensions of an institution (and CEC)

As discussed earlier, institutions can be defined using economic, political and sociological perspectives, which can be further expanded by five extensions (structural models, legitimacy, stickiness, filtering institutions and isomorphism). Isomorphism is linked to legitimacy as a CEC is on par with its fellow companies because it meets the necessary market-approved structures. This influences the competitive nature of the CEC and, by extension, of the industry. The stickiness influences how responsive CECs are to change their competitive strategies and pricing models, which are an institutional concept in the engineering market. The pricing models are part of the filtering institution component. CECs have learnt and internalised various pricing models (Farr 2001; Sturts & Griffis 2005). It would take further change and learning in order to use other pricing models. This will require industry support, which provides legitimacy and isomorphism to push alternative pricing methods as viable options to pricing in the engineering market. It would be changing many institutions because it would involve a market shift against ingrained practices.

3.4 SUMMARY

This chapter discussed the new institutional economics paradigms. These thoughts are useful in understanding why economic agents behave the way they do. The different institutional perspectives provide a robust environment to explain economic behaviour. The next chapter discusses strategy, value and price within the context of the professional services firm.

4 LITERATURE REVIEW: STRATEGY, VALUE AND PRICING

This chapter explores the theories related to strategy, value and pricing as they relate to the research topic being investigated. The competitive strategies of professional services firms (PSF) like CECs determine their business operations, how they price their services, and how they compete with others. The companies use strategies to indicate what their value is to their clients. They execute these strategies to translate that value into financial earnings. Goods-dominant and service-dominant logic on value are discussed. As the service economy continues to grow, the conceptual frameworks that assess how services are consumed and valued by clients are discussed. Additionally, the pricing approaches by the companies are determined by their competitive strategies. There are various theories that explain the strategies, value and pricing in a commercial business-to-business setting.

4.1 STRATEGY

Strategy can be defined from different perspectives. Strategy involves doing a different set of different things to deliver value to clients (Boxall & Steeneveld 1999; Clegg et al. 2011; Dobni & Sand 2018; Porter 1996). Strategy provides a superior way of doing something when compared to other organisations; it can provide a competitive advantage (Castaldi & Giarratana 2018; Lewis & Brown 2012; Nickerson & Zenger 2004). However, competitors can copy the way that a successful organisation does their business. This leads to benchmarking, which means that competitors eventually look the same. Benchmarking is where the best practices or superior performances are shared and adopted by other competitors. These best practices lead to operational effectiveness. In effect, it becomes mutually destructive as the competitors mimic each other and are not necessarily different from each other. Porter (1996) contends that organisations confuse strategy with operational effectiveness. Companies who are focusing on the operational effectiveness lead to commoditisation in the industry (Porter 1996).

Furthermore, Porter (1996) posits that when companies determine their competitive strategies, there are a number of factors to considered. The companies have to determine what type of client they serve. The clients have different economic conditions and have different price sensitivities (Baker 2011; Nagle, Hogan & Zale 2011; Porter 1996). Firms can position themselves in three areas: variety-based, needs-based, and access-based (Semadeni 2006). Variety-based positioning focuses the company's strategy on delivering services based on the sub-set of the industry's services. Needs-based positioning focuses the company's strategy on delivering services based on the segmentation of the industry's

clients. Access-based positioning focuses the company's strategy on delivering services based on the geographical location or scale of the client. Companies can do a mixture of positioning. The positioning as discussed by Semadeni (2006) aligns to the Treacy & Wiersema (1992) strategy framework of operational excellence, customer intimacy and product leadership. The strategy would be how the company stakes their unique position in the market and delivers their services at value to their clients.

An alternative is the Miles and Snow framework, which was proposed in 1978 as cited in Desarbo et al (2005), Dvir, Segev & Shenhar (1993), Lin, Tsai & Wu (2014), Slater & Narver (1993), and Zahra & Pearce (1990). The Miles and Snow framework uses a classification for the different business strategy: Prospector-Ananlyser-Defender-Reactor (PADR). Their framework has been used in other strategy research as Desarbo et al 2005; Dvir, Segev & Shenhar 1993; Lin, Tsai & Wu 2014; Slater & Narver 1993; Zahra & Pearce 1990). However, it does not adequately deal with the capabilities and environmental attributes (Desarbo et al 2005). The strategy of the firm is usually affected by various internal and external factors (contingency factors). A strategy framework has to adapt to the contingency factors.

The seminal paper by Porter (1979), and updated in Porter (2008), argues that there are five forces that influences a company's strategy: the bargaining power of customers (clients/buyers), the bargaining power of suppliers (producers/sellers), threat of new entrants, threat of substitutes, and industry rivalry. Porter (2008) pushes the idea that the structure of the industry influences the competitive forces and profitability of companies in the medium and long runs. Additionally, he posits that other factors influence competitive forces, which impact on strategy and profits. They were complementary products and services, government, industry growth rate, and technology and innovation factors.

The sustainability of a competitive strategy comes from the fit of the strategy to the organisation's activities (Porter 1996). The organisation is seen a whole – and the strategy is applied across the organisation. The activities that support the strategy are part of a system (Johnson, Christensen & Kagermann 2008; Lewis & Brown 2012; Treacy & Wiersema 1992; Werr & Stjernberg 2003). Individual activities are success factors. It aligns with the holistic approach, where there is a systematic advantage over the singular feature advantage (success factors).

Changing strategic positions affects the overall company strategy and the necessary activities required to execute it (Mitsuhashi & Greve 2004; Porter 1996; Semadeni 2006). With changes in strategic positions, the new systems would need time to work and the

people in the organisation would need time to get comfortable with it. The systems are the competitive advantages for the companies. The companies try to copy each other in order to have the best adaptation for the markets. This can lead to hyper-competition fuelled by the idea of absorption of best practices via M&A of competitors. Consolidations become a form of gaining competitive advantages.

The traditional view of competition is that it is a zero-sum game and has been written about from the perspectives of military stratagems (Clegg et al. 2011; Kim & Mauborgne 2005). It involves winning and losing in the bid to acquire clients and achieve profits. It is referred to as red ocean competition strategy by Kim & Mauborgne (2005). However, contemporary strategy writers have proposed an alternative viewpoint, where no competitors exist, and the business creates new areas to deliver value to their clients. This is referred to as blue ocean strategy. Kim & Mauborgne (2005) posit a reconstructionist viewpoint where the firms determine the structure and limits of the market based on their actions – the blue ocean strategy. The red ocean assumes that the market is fixed in its boundaries and the firms have to compete through low costs or differentiation. With a blue ocean strategy, the firm has a systematic approach where the firm's utility to its customers, the prices charged and cost to serve are aligned, holistically (Kim & Mauborgne 2005; Porter 1996).

Kim & Mauborgne (2005), Salunke, Weerawardena & McColl-Kennedy (2018) and Dobni & Sand (2018) discuss how the services-dominant firms are using different strategies to the goods-dominant firms. The traditional competitive strategies of cost leaderships and differentiation leaderships are giving way to service-related innovation, value creation and knowledge transformation (Kim & Mauborgne 2005; Salunke, Weerawardena & McColl-Kennedy 2018). Salunke, Weerawardena & McColl-Kennedy (2018) further discuss how project-oriented firms used knowledge and innovation to have sustained competitive advantages over their competitors. CECs are project-based and knowledge-intensive organisations.

International diversification requires a change to the strategy. It can be considered as a means of acquiring competitive advantage when competing with other companies (Hitt et al. 2006). The diversification of the company creates an opportunity for new markets. The consolidation can be used to remove major competitors in various markets. Additionally, the diversification expands the cultural spread of the company. As the company expands, the question arises about its ability to maintain the strategic direction of the firm. There are social norms, which impact in the service delivery in multinational professional services firms (Bligh 2006; Chen et al. 2018; Spence et al. 2015). In addition, Thakur,

Hale & Al Saleh (2018) discussed how organisational culture is tied into the strategies of organisations. Organisational culture is related to the organisational structure of the firms, whether it is local or multinational.

4.2 STRATEGIC DECISION-MAKING APPROACHES

Watson, Rodgers & Dudek (1998) discuss the three strategic decision-making approaches found in management consulting – representative heuristic, confirmation bias, and fundamental attribution error. These three decisions-making approaches can be useful in CECs. The CECs depend on their intellectual capacity to develop designs and advice for their clients. Consulting is their job. Their business strategy about how to approach competitive bids can possibly follow one of the three decision-making modes. The representative heuristic means that the decision was made based on past experiences and memorised actions, for example, pricing decisions are made based on a previous reference point (Hinterhuber 2015; Hinterhuber & Liozu 2015; Iyer et al. 2015; Moosmayer, Schuppar & Siems 2012). Confirmation bias means decisions are influenced by situations that support a particular hypothesis (Watson, Rodgers & Dudek 1998). The fundamental attribution error means the behaviours of someone are viewed as a result of the internal characteristics of the person and not of the environment (Watson, Rodgers & Dudek 1998).

There are the organisational structures that facilitate strategic decision-making. Strategic decision-making is an evolutionary process where the company's strategy evolves alongside its organisational structure (Augier & Sarasvathy 2004; Pickering 2015; Thakur, Hale & Al Saleh 2018). New opportunities are created, and organisational evolution involves those persons involved in strategic activities. Alternatively, Klüppel, Pierce & Snyder (2018) argue that traumatic shocks impact on the organisations and their strategy. The Global Financial Crisis of 2007–2008 affected various economic sectors in Australia including the AEC sector. Klüppel, Pierce & Snyder (2018) indicate that historical traumatic shocks permeate and continue to influence how organisations strategise long after the shock has ended.

Strategic decisions made by the leaders of the CECs are made as individual decisions. The decisions are aggregated into organisational decisions (Augier & Sarasvathy 2004). These are connected as the individual decisions are made from the legitimate power of the leaders. The decision-making bodies, which can be collegiate endeavours, are institutional practices in the CECs. Based on the strategic decisions of the leaders, organisational artefacts stick around in the organisation (stickiness is another pillar of institutional economics).

The next section discusses value as it relates to services, value-in-exchange, and value-in-use mode.

4.3 VALUE BASED ON EXPECTATIONS AND PERCEPTION

Professional services organisations like CECs are knowledge intensive organisations (Castaldi & Giarratana 2018; Pickering 2015). They are often distinguished by their employees having special qualifications and expertise to solve their clients' problems. CECs create knowledge, which can become valuable to the client (Nickerson & Zenger 2004; Suddaby & Greenwood 2001). Solutions can become quite complex if one considers engineering solutions for the built environment. The intellectual nature of the service provided means the quality is subjectively perceived by the client. This is critical for credence services like consulting engineering, who provide a services based on the credibility of the consultants (Lapierre 1997; Pickering 2015).

Ng (2007, p. 25) defined the perceived net value (PNV) as 'the buyer's perception of the net gains of a good or service based on all relevant benefits and outlays *upon consumption*.' On the other hand, expected net value (ENV) was defined by Ng (2007, p. 25) as 'the buyer's expectation of the net gains of a product or service based on all relevant benefits and sacrifices *upon purchase*.' The ENV can be considered as value gained with the exchange of money. By extension, the perceived quality is defined as 'how well the service level delivered matches buyer expectations. Delivering quality service means conforming to buyer expectations on a consistent basis' (Ng 2007, p. 25). Satisfaction is considered as 'a post-choice evaluation of a good or service based on the total consumption experience over time' (Ng 2007, p. 25). In other words, it can be considered as value-gained in the use of the services. With this framework, there is a clearer option to move away from a micro-economics interpretation of value (price, marginal cost and marginal revenue).

Buying decisions for services involve the core and augmented benefits of the services. The firm that provides the highest ENV to the client increases the probability that the client will choose that firm's services over its competitors (Ng 2007). Figure 10 and Figure 11 show the ENV framework in use.

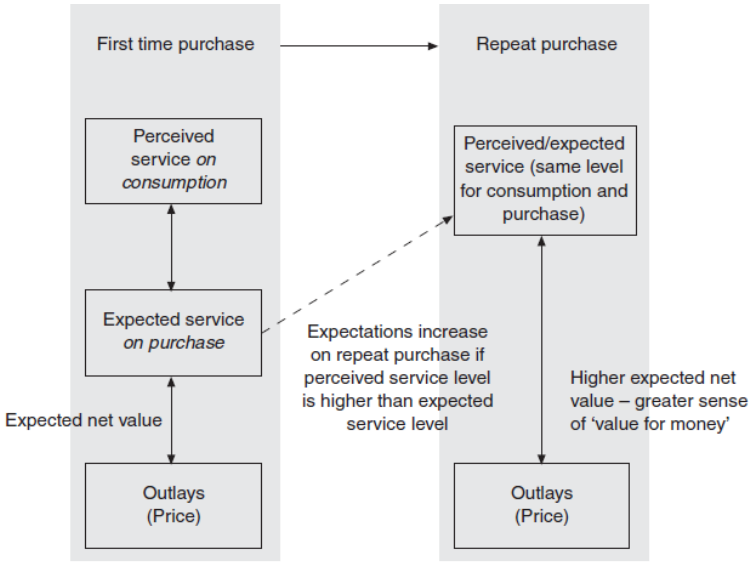

Figure 10: Changing expectations after consumption (Ng 2007).

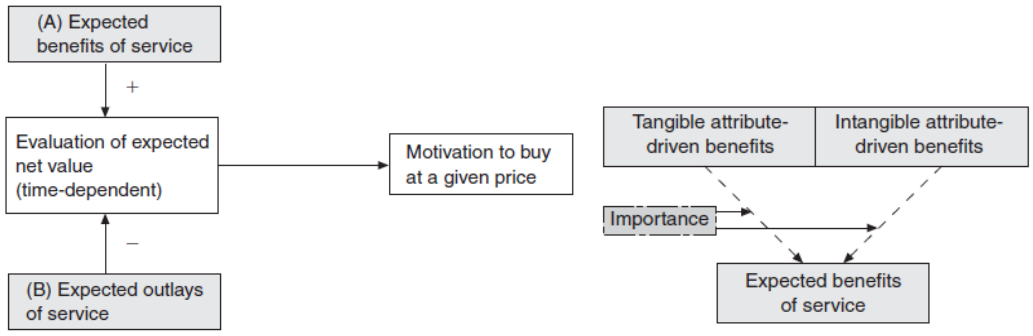

Figure 11: Evaluation of net value (left) and expected benefits (right) (Ng 2007).

Value is defined by the perception of the client on the performance of the service provider in doing an activity (Patterson, Johnson & Spreng 1997). This can be aligned to the idea of perceived quality – the service providers consistently meet the expectations of the clients (Ng 2007). Ng (2007) analysis of pricing for services positions the net expected value framework as a useful tool to understand competitive strategy decisions for services. Pickering (2015) posits that there is information asymmetry in the principal–agent relationship between the client and professional services firms like CECs. An engineering consultant has specific knowledge and skills that the client cannot assess the quality of until a job has been done. The purpose of hiring a consultant is for their intellectual insights.

Service quality is an abstract concept and prone to subjective measures of quality (Samson & Parker 1994). The standard of service quality for consulting engineering services is the responsibility of the CECs (Samson & Parker 1994; Tang, Lu & Chan 2003). Tang, Lu & Chan (2003) analysed the quality of service criteria, which are: (1)

professionalism, (2) competitiveness, (3) timeliness, (4) quality of design, (5) degree of innovation, (6) completeness of order consideration, (7) availability of support to client, and (8) supervision at implementation stage. The quality standards can be used to justify the hiring and retention of a CEC by a client.

Patterson, Johnson & Spreng (1997) advocate that customers perceive value in terms of disconfirmation. They contend that the satisfied customer paradigm is aligned to the concept of the difference between an individual's perspective expectation and post-purchase performance of the product/service, which is referred to as disconfirmation (Patterson, Johnson & Spreng 1997). Plewa, Sweeney & Michayluk (2015, p. 570) discuss this difference by focusing on 'the richness of customer perceived value by determining its benefit and cost dimensions in a complex service setting.' Woodruff (1997) argues for service providers to treat customer value as the next source of competitive strategic advantage. Salunke, Weerawardena & McColl-Kennedy (2018), Kim & Mauborgne (2005), and Porter (1996) posit that competitive strategies have to give value to the customers. These findings are supported by Woodruff (1997). He argues that a service provider (consultancy firm) who has a customer-focus orientation should see this value as a trade-off of what the client receives and gives up to get the service (Woodruff 1997).

4.4 VALUE CREATION AND SERVICES-DOMINANT LOGIC

Lapierre (1997) work on value outlines a model where value can be defined as a function of time. Value is discussed extensively in mass-product marketing. However, if one looks at service literature, value is discussed in terms of service quality with its four critical elements: overall quality, needs, expectations and price. The buyer's perception of value and quality can be derived by technical, functional and economic quality. This need for services is a result of a firm's desire to obtain an efficient value creation process, that is, cost-efficiency and market efficiency.

Cost efficiency involves using internal company resources more efficiently to create higher value, while market efficiency involves injecting high value into the customer's value creating process (Åkesson et al. 2016; Lapierre 1997). Market efficiency means the service providers' input impacts significantly on the performance of the clients' own products/services in the marketplace. The injection of high value intellectual work is where the consulting company can add their value to its client's processes. The organisation perceives the value of the services provided if they get what they asked for; this is applicable to credence services (Plewa, Sweeney & Michayluk 2015).

Suddaby & Greenwood (2001) discussion on knowledge commodification and colonisation align Salunke, Weerawardena & McColl-Kennedy (2018) discussion of knowledge integration capability in innovation-based competitive strategy. Knowledge commodification deals with the abstraction and reduction of knowledge into a transparent and generic format, which can be used and sold by the professional services company. This is the credence service that the CECs are selling – their engineering knowledge in a commoditised form that can be consumed by the client. It becomes problematic when the professional services company become so large that scaling this knowledge into a commercially viable service becomes a challenge. This is where knowledge colonisation comes in. The large CECs (some of which are multinationals) have to manage the spread of engineering knowledge amongst their staff and the deliver the same quality of service to their clients.

Lapierre (1997) developed a value creation process map as shown in Figure 12 below. A client buys professional services with the view of improving the performance of its organisation. The two levels mean that the organisation has to take into consideration value created during and after the services are performed. The relationship with the customer is important.

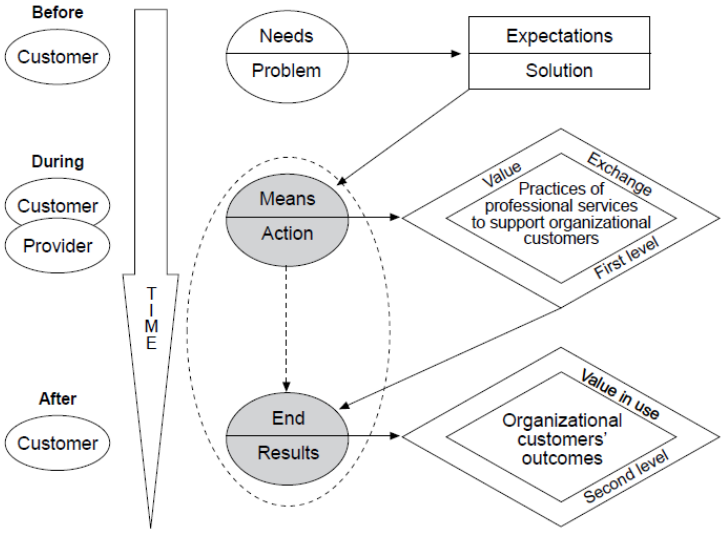

Figure 12: The value creation process (Lapierre 1997).

The value definition framework combines the service-dominant logic (Åkesson et al. 2016) and expected net value framework (Ng 2007). Under the micro-economic schools of thought, value is often discussed in terms of prices or value-in-exchange (Lapierre 1997; Ng 2007; Töytäri & Rajala 2015; Vargo & Lusch 2008). Ng (2007) advocates the expected net value approach. Alternatively, Åkesson et al. (2016), Payne, Storbacka & Frow (2008) and Zhu & Zolkiewski (2016) advocate for a service-dominant logic. Lapierre

(1997) pushed for the value creation process with Koskela-Huotari & Vargo (2016), combining the value creation process with the service-dominant logic. The service-dominant logic focuses economic theories on how intangible deliverables are provided to the customers by the service companies.

Vargo, Maglio & Akaka (2008) extend the discussion of services based on value. They argue that the services involve the 'application of competencies by one entity for the benefits of another' (Vargo, Maglio & Akaka 2008, p. 145). The value that is created is arranged into services systems. In other words, organisations that are known as professional services companies are services systems. Vargo, Maglio & Akaka (2008) and Vargo & Lusch (2008) make the distinction between 'value-in-exchange' and 'value-in-use' dynamics. They are equivalent to the 'goods-dominant (GD) logic' and 'service-dominant (SD) logic' (Vargo & Lusch 2008; Vargo, Maglio & Akaka 2008). Lapierre (1997) considers these two logics are part of the same value creation model as shown in Figure 12 above.

The goods-dominant logic and value-in-exchange are equivalent to the physical-goods-centred research of value and neoclassical micro-economics, respectively. Bowman & Ambrosini (2000), Neap & Celik (1999) and Zeithaml (1988) discuss value from the customer's perspective but use value-in-exchange perspectives. This logic focuses on how goods (or value) can be exchanged for money. Lapierre (1997) contends that this value-in-exchange is the first step of the value transformation. With value-in-use or service-dominant logic, the knowledge continues to be transformed as the client (customer) continues to add value to the received knowledge (Vargo & Lusch 2008; Vargo, Maglio & Akaka 2008). The question arises how the CEC captures the value-in-use as a competitive strategy. This strategy can be used to deliver a specific pricing strategy in terms of the prices that capture the client's willingness to pay and meet the client's perception of value.

CECs often collaborate with their clients to create solutions for their clients' problems (de Brentani & Ragot 1996; Filiatrault & Lapierre 1997; Koch 2004; Kreitl, Urschitz & Oberndorfer 2002). This can be seen as the client co-creating value and is described as the service-dominant logic in the marketing field (Åkesson et al. 2016; Payne, Storbacka & Frow 2008; Zhu & Zolkiewski 2016). Co-creating value can also be achieved through collaborations between other CECs when they cooperate to deliver service innovation for the clients. This service-dominant (SD) logic is seen as creating a dialogue between the consultancy and the client. The idea evolves from the understanding that the consultants

would be involved in a knowledge transfer to the client's staff (Eisingerich, Rubera & Seifert 2009; Payne, Storbacka & Frow 2008; Zhu & Zolkiewski 2016).

4.5 VALUE AS A STRATEGY

Marcos-Cuevas et al. (2016) argue that value co-creation and capabilities blossom between sellers and buyers with a sustained collaboration effort. Their research focuses on business-to-business relationships, which are characterised by the long-term nature of such relations. They extend the service-dominant logic, pushing that value co-creation has three pillars of practices: linking, materialising and institutionalising. These three practices are exercised by companies in value co-creation relationships.

These clients would talk to past clients about their experiences with the potential consultants, which creates a network/ecosystem of a sort where clients and service providers are connected (Åkesson et al. 2016; Ellram 1995; Prahalad & Ramaswamy 2004; Zhu & Zolkiewski 2016). In the business-to-business space, the service providers and clients often have individualised negotiations to suit each relationship. The client helps to design the project with the service provider. This ends up becoming a joint creation of value by the client and the service provider. The service provided under this collaborative space suits the process of the client. They work together to solve the problem. The client creates the experiences as well as the service provider. This acts as the impetus for future co-creation experiences.

The service-dominant logic is pushed as a strategic initiative for the customer-oriented firm. Åkesson et al. (2016) posit how frontline service professionals, who are educated and highly trained, often know the best way to develop and execute customer-centric service innovations. Åkesson et al. (2016) contend that the service consultant also learns from interaction with clients, whereby the consultant implements innovations into future clients' projects based on discoveries made while working on the current client's project. This is knowledge-based development, which contributes to the network effect and service innovations in business-to-business consultancy relationships (Eisingerich, Rubera & Seifert 2009; Ekman, Raggio & Thompson 2016; Zhu & Zolkiewski 2016).

Value creation can be discussed from the resource-based theory, which suggests that the use of a company's operant resources deliver the competitive advantages for the company (Bowman & Ambrosini 2000; Castaldi & Giarratana 2018; Vargo, Maglio & Akaka 2008). This competitive advantage is in terms of a product or service that a consumer perceives as being superior (Bowman & Ambrosini 2000; Salunke, Weerawardena & McColl-Kennedy 2018; Zeithaml 1988). This can be extended to the

quality of the service provided in terms of improving the efficiency of the client. However, Bowman & Ambrosini (2000) view labour as being unproductive and destroying value. This perspective clashes with the labour-intensive nature of the services industry and is symptomatic of value-in-exchange/goods-dominant logic writers, who take a neoclassical economist view of competitive strategy. This why Ekman, Raggio & Thompson (2016), Vargo & Lusch (2008) and Vargo, Maglio & Akaka (2008) argue for the transitioning from the goods-dominant logic to the services dominant logic.

The services ecosystems perspective (or network) effect can be discussed from an institutional theoretical perspective (institutional economy). Ekman, Raggio & Thompson (2016), Koskela-Huotari & Vargo (2016), Marcos-Cuevas et al. (2016), and Martelo-Landroguez & Martin-Ruiz (2016) pursue the idea of the systems/institutional context of value creation from the service-dominant logic. As a result, service providers use their resourcefulness and innovation to bring a systematic approach to developing the solutions to the clients' needs. This systematic approach imbibes value co-creation and market expansion. Institutions can be described in terms of structural models, legitimacy, stickiness, filtering institutions, and isomorphism (Duina 2011; Koskela-Huotari & Vargo 2016; Williamson 2000), which is expanded in the previous chapter on institutional economics. Collaboration between the different professionals in the consulting firms and other institutional partners to execute the service-dominant logic for the clients contributes to the resourcefulness of the service providers to deliver value (Koskela-Huotari & Vargo 2016).

The CECs can grow to different sizes. This growth comes from organic growth, mergers and acquisitions, and joint ventures (Kreitl, Urschitz & Oberndorfer 2002). The mergers and acquisitions can change the strategic focus of firms and the behaviours in the market. The size can be described in terms of the number of employees, market share (concentration ratio and Hirschman-Herfindahl index) and profits (Kreitl, Urschitz & Oberndorfer 2002; McConnell, Brue & Flynn 2012). The main costs of the CECs are the human resources costs for professional staff (Kreitl, Urschitz & Oberndorfer 2002). The firm can attract business based on the reputation of their staff (Castaldi & Giarratana 2018; Kreitl, Urschitz & Oberndorfer 2002). This is possible since clients like to work with engineers who have managed their past relationships with a customer focus and not just on a technical basis (Hecker 1997; Kreitl, Urschitz & Oberndorfer 2002). Communications between the client and the consulting firms are important for the success of the relationship (Marcos-Cuevas et al. 2016; Samson & Parker 1994). The client(s) for the CECs are usually the owners of built environment projects, therefore, the CECs work through direct interaction and/or indirect interaction with the owners (Koch 2004).

Competitive strategy involves offering value through a good or service at a competitive price (Hinterhuber 2017) supported by services marketing in the strain of Vargo & Lusch (2008)'s service-dominant logic. Business-to-business relationships hinge on the value offered by the business supplier (provider) to the business buyer (beneficiary) (Ekman, Raggio & Thompson 2016). For the corporate buyer, its purchasing decisions are often justified by a quantified value (Hinterhuber 2017).

In researching the impact of competitive strategies, it is crucial to understand the value definition frameworks. A services company's ability to contribute to their clients' market efficiency (Åkesson et al. 2016; Lapierre 1997) means the seller's services impact positively on the buyer's profitability. The value quantification capabilities of the seller translate into developing both quantitative and qualitative statements for the value of their services to the customer. Hinterhuber (2017) contends that converting a company's competitive advantage into a quantified monetary value is more than the total cost of ownership as expressed by business academics (Bhutta & Huq 2002; Ellram 1995). Generally, the total cost of ownership is applied more for the product-in-service scenarios (Zeithaml, Bitner & Gremler 2009) or value-in-exchange scenarios (Vargo, Maglio & Akaka 2008) instead of the pure value-in-use services only scenarios of the CECs.

The value definition framework of a service-dominant logic provides a theoretical framework to understand the competitive strategies of consulting engineers. The service-dominant logic advocates for co-creation practices, quantification, and value-in-use. Figure 13 below shows the value theoretical frameworks in alignment with the economic value of the consulting engineering sub-sector of AEC.

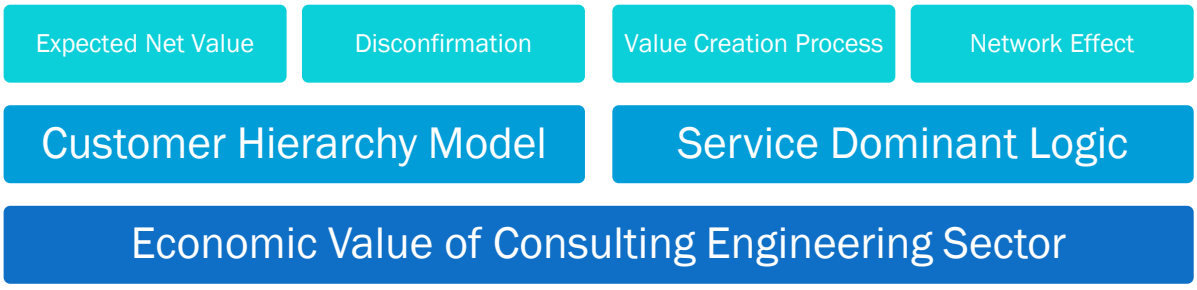

Figure 13: Value theoretical frameworks

4.6 STRATEGIC PRICING

The term 'strategic pricing' is generally understood to mean the high-level organisational approach that guides how a company segments its clients across its products and services offerings and the variance in pricing it offers to clients to maximise profits and optimise revenue (Lancioni 2005b; Morris & Calantone 1990; Sharma & Iyer 2011).

Companies who exercise strategic pricing can be considered as understanding that pricing is not an *ad hoc* approach but an integral part of an overall organisational strategy. When pricing strategies are executed properly, they can lead to profitable results for an organisation and signal the value of their products and services in the market (Hinterhuber & Liozu 2012; Indounas 2006; Lancioni, Schau & Smith 2005). The pricing strategy used to price the commercial offerings impacts on the revenue gained by the companies and by extension on its overall profits.

Strategic pricing brings to the forefront that companies should engage in differentiation of their pricing based on their clients, the market and the offered products and services, respectively. The use of strategic pricing becomes an integral part in the customised pricing environment, which can be considered as a project environment (Baker 2011). In the project environment, the work to be performed (inclusive of products and services) are unique with a specific output, start date and end date (Project Management Institute 2017). CECs operate in project environments, where the clients have specific requests that are unique. Pricing is considered a Level 4 institution in the Williamson (2000)'s Economics of Institution model. At this level, generally neoclassical economics/agency theories are used to explain institutional phenomena but the dynamism of this level means it is continuously changing (Williamson 2000).

4.7 MARKET SEGMENTATION

When taken from the comparative institutional school, market segmentation means dividing the economic game into different players. These different players have divergent and often competitive goals and play with information asymmetry (North 1990). The seller (CEC) can behave differently with the buyer (client).

In other words, based on market behaviour, the pricing strategy of a CEC is shaped by the segmentation of its markets. These buying behaviour segments were classified in four ways by Christopher & Gattorna (2005) using a supply chain viewpoint as the following: (1) collaborative, (2) demanding (quick responses), (3) efficiency (consistency) and (4) innovative solutions. These are comparable to Nagle, Hogan & Zale (2011) classifications of buying behaviours: (1) relationship buyer, (2) convenience buyer, (3) price buyer and (4) value buyer. However, on reviewing the description of the innovation solution buying relationship (Christopher & Gattorna 2005) and of the value buyer behaviour (Nagle, Hogan & Zale 2011), these descriptors are not equivalent and do not fit into a 1:1 direct comparison. Nevertheless, these descriptions impact on the pricing strategies of CECs, which are discussed in the following paragraphs.

In discussing and developing pricing strategies, classification of clients is part of the process (Lancioni 2005b) and two research teams have given two alternatives classifications: one is focused on the supply chain network relationship side (Christopher & Gattorna 2005) and the other is focused on the client relationship side (Nagle, Hogan & Zale 2011). These classifications are an attempt to name the complementary institutions, which have been established by the market to create informal and formal practices across economic transactions between economic players. These institutions work to reduce the transaction costs (North 1990; Williamson 2000, 2005). These client classification/taxonomy frameworks attempt to sort various commercial entities into four archetypes in terms of B2B buying–selling relationships.

These archetypes work for the CECs because they have listed various characteristics, which make it easy to classify the relationship. However, they must not be used in a dogmatic fashion, as an inherent disadvantage of any taxonomy frameworks is the presence of outliers, who do not fit smoothly into the classification families. Nagle, Hogan & Zale (2011) framework focused mainly on product-based B2B companies, but Baker (2011) showed how these frameworks can be applied to services companies. CECs in their project environment(s) offer both products and services, which require a client classification framework that can be applicable to both offering types. These two classification frameworks can be modified and help the CECs determine their pricing strategies for the prospective and current clients.

Baker (2011) explores Nagle, Hogan & Zale (2011) classification framework from a price sensitivity outlook of the buying firm and the value of the buying firm to the selling firm. Nagle, Hogan & Zale (2011) outline their framework from the perspective of the importance of differentiation and cost of searching for the buying firm. Since this PhD research is focused on the selling firm (consulting engineering firm), the analysis of Nagle, Hogan & Zale (2011) classification framework is from that perspective. In comparison, Christopher & Gattorna (2005) classification framework is discussed from the selling firm's supply chain network perspective in the following paragraphs.

The first alignment of these two frameworks is the collaborative buying relationship (Christopher & Gattorna), which is equivalent to the relationship buyer (Nagle, Hogan & Zale), and deals with a continuous replenishment supply chain environment. In this relationship, the buyer has a strong (symbiotic) interaction with the seller, where they work together to get the products and services delivered to the buyer. For example, a CEC would be the designated engineering consultancy firm used by the client whenever they are

doing any projects that require consulting engineering. This (institutional economics) relationship would be governed by a retainer-type pricing strategy.

The second alignment centres around the demanding/quick response buying relationship (Christopher & Gattorna), which is equivalent to the convenience buyer (Nagle, Hogan & Zale), and deals with an agile supply chain environment. In this situation, the buyer needs a one-off purchase and is not price sensitive, as the buyer firm knows it is paying for convenience and quick delivery. In this scenario, the buyer has a relationship with the seller and knows it can deliver the products or services on time. For example, a CEC that is contracted to design for an emergency project with a short timeline and a quick response. Under a developed pricing strategy, the CEC would charge an emergency or rush design price.

The efficiency/consistency buying relationship (Christopher & Gattorna), which is equivalent to the price buyer (Nagle, Hogan & Zale), deals with a lean supply chain environment and is the third and final alignment. The price buyers shop around for prices or will negotiate prices for specified products and services in order to control costs. This type of buyer–seller relationship can be rigid/adversarial, where the sellers can be bidding against each other to get the sale. The pricing decision involves properly pricing for their offerings and being competitive enough to be considered by the buyer (Phillips 2005). For example, a CEC would be bidding as part of a public sealed tender bid for design consultancy services. In this scenario, the bid response must meet the public agency's specifications. Furthermore, the pricing strategy would be of a customised pricing approach, where line items components are priced higher compared to bundled pricing of the entire bid.

The value buyer classification (Nagle, Hogan & Zale) is the fourth archetype but is not equivalent to the innovative relationship classification (Christopher & Gattorna). They are not aligned but are considered as separate institutional arrangements. The former classification describes a relationship located between the characteristics of the price buyers and relationship buyers, respectively. This buyer purchases in a high volume, which represents a significant proportion of sales for the selling company; however, the buyer still has high price sensitivity. If a value buyer is offered a better valued product from an alternative seller, they would switch. This classification does not neatly work with a CEC, which is mainly service-oriented but can make customised product offerings. The classification is best suited for product-oriented firms.

The latter classification of innovative relationship works better for the CEC, as it signifies a fully flexible supply chain environment. This description works with the solution pricing

description outlined by Sharma & Iyer (2011) and Iyer et al. (2015). The CEC has both a high technical and high commercial integration, whereby the client gets a high value for the service offering. The CEC (seller) works with their client (buyer) to deliver the required services or products in a creative and innovative way. Since the request is not a standard request, the buyer is not necessarily price sensitive. This fits into the value creation narrative (Åkesson et al. 2016; Salunke, Weerawardena & McColl-Kennedy 2018; Vargo, Maglio & Akaka 2008). For example, a CEC may be hired to create a solution to a problem, which exists only for the client, and where traditional approaches cannot work. The pricing strategy would be a premium price reflecting the intellectual capital required to solve the problem. This would be governed by a project specific contract (and price) (Stuckey & White 1993).

4.8 PRICING METHODS

The current pricing models and literature have looked at business-to-customer pricing (Phillips 2005) but business-to-business pricing methods have been explored from the industrial marketing perspective (Christopher & Gattorna 2005; Hinterhuber 2004; Hultén, Viström & Mejtoft 2009; Lancioni 2005b; Xue, Wang & Ettl 2016). Business-to-customer pricing focuses on the pricing of products and services being sold by a business to individual buyers, who are purchasing for themselves or someone else in a personal capacity. On the other hand, business-to-business pricing looks at the pricing of products and services being sold by a business to another business, which is purchasing for themselves or someone else in a business capacity. However, many of the researchers investigate the product side (Chenavaz 2012; Cross & Dixit 2005; Lancioni 2005b; Sharma & Iyer 2011) or process side (Chenavaz 2012) and do not address the service side of pricing. However, others have discussed the service side as part of their research (Hinterhuber 2015; Hinterhuber & Liozu 2012; Liozu & Hinterhuber 2013). For CECs, their work includes both products (tangible items like drawings and reports) and services (intangible items like advice); therefore, the pricing methods must include both components.

4.8.1 Cost-recovery pricing

The cost-recovery methods are the oldest and most common used pricing techniques, where the company recovers its costs and gains a profit by using an arbitrarily-set price point, mark-up on costs, or preset profit margin (Hinterhuber & Liozu 2012; Indounas 2006; Phillips 2005). It can also be called the absorption cost method (Kinsella 2002) or cost-plus method (Nagle, Hogan & Zale 2011). It is considered to be an objective way of pricing and is favoured by finance teams because it is standardised across the customer

and product/service mix, but it does not support price differentiation (Indounas 2006; Kinsella 2002; Phillips 2005). In addition, it does not work effectively with labour costing in terms of an accurate cost estimation as the overheads can be arbitrarily or incorrectly assigned to products and services (Dixon & Freebairn 2009). However, price differentiation is important for revenue optimisation and cost-plus promotes price distortions impacting on profitability. Some have argued that an activity-based costing approach makes for a better way to calculate project profitability (Kinsella 2002). Additionally, the clients' feedback, competition behaviour and market value are ignored in cost-recovery methods (Dolgui & Proth 2010; Indounas 2006; Phillips 2005).

Cost-recovery methods have their drawbacks as a pricing method (Baker 2011; Hinterhuber 2004, 2015; Indounas 2006; Sturts & Griffis 2005). Cost-recovery pricing methods have a simplistic approach, with the use of mark-up added to the costs of production/services. However, these costs can be incorrectly calculated; especially when it comes to the calculation of overheads and reciprocal allocations to services departments that support the production environment (Kaplan 1973; Lowenthal & Malek 2005) and the fixed costs (Indounas 2006). Even when using activity-based costing as proposed by Kinsella (2002), the reciprocal allocation problems remain, which was explored by Kaplan (1973) and revisited by Lowenthal & Malek (2005).

Cost-recovery methods are a roundabout way to set a price as they force the seller's costs onto the client. By focusing on recovering costs, the seller can under-price the product or service because they ignore how much the customer is willing to pay based on the perceived value of the product or services. Under-pricing means the business has left money on the table, which means less revenue is earned for the sales and there is less potential for profits (Baker 2011; Hinterhuber & Liozu 2012). Despite the unfavourable status of cost-recovery methods, they remain in use because of (1) the simplicity and ease of adaption, (2) traditional use by selling firms (conformity bias), (3) demand from clients, and (4) they are taught in engineering and management programs.

Another reason for the continued use of cost recovery in CECs is the tradition of cost-plus pricing through conformity bias by the decision-makers (Hinterhuber & Liozu 2012; Liozu & Hinterhuber 2013). Sturts & Griffis (2005) explore this conformity bias as part of their action research with young engineers. Farr (2001) also explores this bias with his research into the commoditisation of consulting engineering services. The traditional cost-plus pricing is based on labour-hours spent by the engineers on the design. With the improvements to design technologies, engineers are spending less time doing the design work. If the price is based on the amount of time spent on the design, then the company

would receive less revenue because of the time reduction. This puts a CEC at a disadvantage in maintaining profits if the design hours are dropping and labour costs for the engineers are increasing because of pay increases (as a result of experience and expertise). Additionally, the roundabout way of cost-recovery is reinforced where the design costs are calculated based on the percentage of the construction costs, which are derived from a cost-recovery perspective – materials and labour (Burton 2015; Kerzner 2009; Macaluso & Walker 2011; Sturts & Griffis 2005).

Cost-recovery pricing methods mean the market focuses on price as the only competitive decider versus the willingness of the client to pay based on the value of the product and service to the client (Iyer et al. 2015; Smith et al. 1999). Smith et al. (1999) explore this concept but focus mainly on the product side. Iyer et al. (2015) talk about rational and normative pricing decision models, which are just calculus-based cost-recovery methods favoured by finance and accounting departments. These are not conducive for value-based discretionary or customised pricing decisions. Value-based pricing decisions are applicable to CECs, who aim to offer value to their clients with engineered solutions. In using cost-recovery methods, discount pricing and allowances, rebates, discriminatory pricing and promotional pricing are used to entice clients, which can become disadvantageous in the long run (Baker 2011).

Despite the popularity of cost-recovery pricing methodology, researchers have shown a preference or made a recommendation for the market-influenced and customer-value pricing approaches, where the marketing person or sales person makes/influences the pricing decision versus the finance person (Baker 2011; Hinterhuber 2004; Nagle, Hogan & Zale 2011; Phillips 2005). Market-influenced and customer-value pricing are two alternative pricing methods explored from the industrial marketer/pricing and revenue optimisation perspectives (Baker 2011; Frei 2008; Hinterhuber 2004; Iyer et al. 2015; Phillips 2005). These methods are used to overcome the inherent weaknesses of the cost-recovery approaches, which promote 'unwarranted risk avoidance, inappropriateness of chosen pricing objectives, perception of the lack of decision-making control, inflexibility in decision-making, and lack of knowledge of more sophisticated methods' (Iyer et al. 2015).

4.8.2 Market-based pricing

Market-based pricing takes on the competitive side of pricing – where the costs are determined by the company but the margins are set by industry (Lancioni 2005a; Phillips 2005). However, it can be difficult to price at times if the competition's pricing approaches are not always clear. Market-based pricing has an inherent weakness since it does not

give the client an idea of what the relevant value is of each competitor's product or service in relation to each other. Additionally, market-pricing can lead to pricing wars, where competitors attempt to offer the lowest prices, which can lead to price depression and unprofitable operations (Hinterhuber & Liozu 2012). For CECs, their projects are not commodities that can use market pricing. However, pricing guidelines produced by professional bodies often used market prices based on services provided and location of the services, which can commoditise the consulting engineering services (Burton 2015; Farr 2001; Macaluso & Walker 2011).

It can be argued that market-based pricing methods can help to stabilise prices in the markets. Various jurisdictions have sought to do just that by establishing pricing guidelines, which determine how market prices for consulting engineering services (Consulting Engineers of British Columbia & Association of Professional Engineers and Geoscientists of British Columbia 2009; Engineering Council of South Africa 2013; Institution of Engineers Sri Lanka 2012). In reviewing their pricing guidelines, these engineering associations attempt to provide market-based pricing by setting the general price range. While they are considered generally accepted pricing, the pricing methodologies they promote are cost-recovery methods with the added component of market-determined ranges. The guidelines produced by Consulting Engineers of British Columbia & Association of Professional Engineers and Geoscientists of British Columbia (2009) and Engineering Council of South Africa (2013) also mention briefly value pricing as an alternative pricing method but stick mainly to cost recovery. The Institution of Engineers Sri Lanka (2012) writes exclusively using the cost-recovery methods, while dictating that the market accepts ranges for the prices for engineering services. Therefore, CECs, even when using market-pricing methods, are guided into using cost-recovery methods by their official registration bodies.

4.8.3 Customer (client) value pricing

This sub-section explores the theoretical perspectives of value pricing and how it is applicable to CECs. Customer-value pricing helps to justify price premiums once the customer values the product or service (Iyer et al. 2015). The applicability of the findings in Lancioni (2005a) in relation to the services side of the CEC's portfolio of projects can be questioned. He discussed strategic pricing from an industrial market perspective although the findings would be applicable to the product side of the portfolio of projects. In a second article, he does speak about services, only briefly though, while discussing the product side extensively (Lancioni 2005b). He argues that cost control is now more in the hands of the supply chain network because of outsourcing, an argument that was supported by Christopher & Gattorna (2005). In this scenario, a CEC must look at how its

suites of services contribute to customer value. Pricing cannot just be about recouping costs; therefore, the pricing model must account for a supply chain value to the client.

Baker (2011) challenges the way a service company prices their services. His argument is supported by Nagle, Hogan & Zale (2011), Hinterhuber & Liozu (2012), Lancioni (2005a), Lancioni (2005b), Lancioni, Schau & Smith (2005), and Smith et al. (1999), respectively. Baker (2011) argument is useful for this PhD research because it covers the unanswered parts left by the other authors (Chenavaz 2012; Lancioni 2005a, 2005b; Smith et al. 1999), who focus only on value pricing methods for product-based businesses. Baker (2011) argued that services can be priced competitively based on the perceived value of the services to the clients. He argued against the use of cost recovery techniques used by services firms. CECs have traditionally used cost-recovery techniques; however, this did not show a true reflection of the value created for the client (Baker 2011; Dell'Isola 1997; Farr 2001; Sturts & Griffis 2005). Professional fieldwork by this PhD researcher also endorsed the descriptions on how engineers felt about the traditional cost-recovery methods, using the hourly rated approaches, which were also documented by Baker (2011), Farr (2001) and Sturts & Griffis (2005), respectively.

Value pricing relies on the client's perception of value in order to capture a greater pricing than would normally be obtained under market-based or cost-recovery methods. It ties into the willingness to pay and purchasing behaviour of clients (Hinterhuber 2004, 2015; Hinterhuber & Liozu 2012). However, the client value pricing approach does not work well if the company does not know what the value of its products or services are to clients, because then it would not know how to charge its clients (Hinterhuber 2008). For the selling firm who uses value pricing, the price is equal to the costs plus the value captured; while the client's profit is the difference between the value created and the price paid (Baker 2011). For the client to be considered happy paying a price for a product or service, it must receive a value profit, that is, in using a product or service, the client receives a value greater that the price paid for it.

It is worth noting that value pricing has an impact on the self-esteem of the employees of the CECs. The ability to value by the CEC depends on the psychological frame of mind of the seller. Baker (2011) promotes this idea that in order to do value pricing, the professional selling the service must first believe that he/she is worth the price being charged to the client. This is reinforced by the findings from Sturts & Griffis (2005), where the respondents felt that their services had been commoditised, which is explored by Farr (2001) as well. The commoditisation of engineering services comes from hourly billing

approaches, which are a form of cost-recovery, which leads to write offs/downs because not all the hours logged can be billed to client.

Various researchers have written about value pricing for products, tying it to client (B2B) or customer (B2C) profit; therefore, this can be applied to the services side as well. It must be acknowledged that the intellectual capacity of the CEC is its competitive advantage, which can be competitively priced using the value pricing model.

4.9 SUMMARY

This chapter explored the literature about strategy, value and pricing. The theoretical analysis focuses on the services economy perspective and professional services organisations. The next chapter discusses the theoretical research design.

5 RESEARCH DESIGN: PARADIGM, METHODOLOGY, METHODS AND TECHNIQUES

5.1 INTRODUCTION

This chapter discusses the research paradigm, methodology, methods and techniques being applied to the research design. The chapter analyses the different options for the research design and decides on the best-suited one for the research problem. The research design uses the Jonker & Pennink (2010) framework of four research action levels as shown in Figure 14 below. Paradigm refers to a researcher's view of reality/frame of reference. Methodology describes how the research principle is tailored to the research paradigm. Methods are the research steps that are executed in a certain order, and techniques are the instruments or tools for generating, collecting, storing and analysing the data (Jonker & Pennink 2010, pp. 23-25).

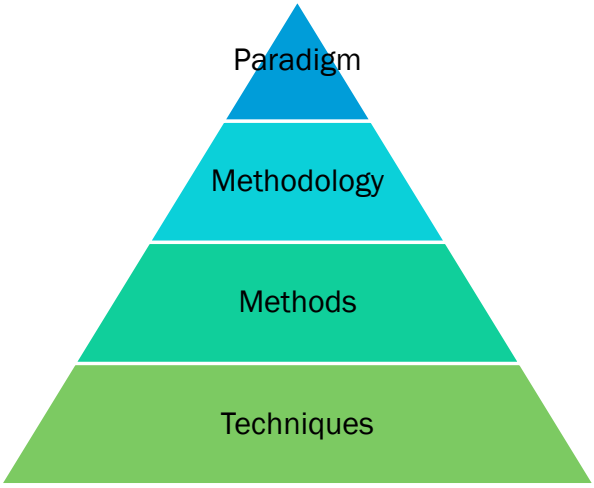

Figure 14: Jonker & Pennink (2010) framework of four research action levels.

The methodological paradigm influences the choices and actions of the researcher. The paradigms can be approached from different alternatives – positivist and constructivist (Jonker & Pennink 2010; Runeson & de Valence 2015). Mackenzie & Knipe (2006) analyse four paradigms: (1) post-positivist/positivist, (2) interpretivist/constructivist, (3) transformative and (4) pragmatist. The positivist approach uses previous knowledge in the form of theories, which are tested as being true or false by research. The constructivist approach involves a belief that reality is a social construct. This reality is based on the perception of the persons who see it. Knowledge is extracted from the social constructs of the persons in this reality. The third and fourth paradigms are discussed in more details in Creswell (2013) and Mertens (2014). The transformative and pragmatist paradigms

are used more for ethnographic/anthropological research, which is different from the applied economics theme of this research.

Runeson & Skitmore (2008) and Runeson & de Valence (2015) argue for the use of a positivist approach in building/construction economics research. It means applying theoretical models and testing in what conditions the models work and do not work (Runeson & de Valence 2015). The positivist approach reduces the probability of the subjectivity of the researcher. It permits the research to be built or centred on generally accepted theories. It tests the validity of assumptions and auxiliary statements. Alternatively, Jonker & Pennink (2010) argue for both positivist and constructivist approaches. The constructivist paradigm adopts solutions based on the research problem. Based on situational analysis, the constructivist approach applies where realities have changed. However, this subjective view introduces biases into the analysis of the research. Therefore, the positivist research paradigm is selected, and this influences the other layers in the research pyramid.

Jonker & Pennink (2010) steer the concept of methodology as an action-oriented concept, that is, the research is guided in a systematic way based on a closed or open research question. They argue that methodology does not prescribe what should or should not be done in a specific situation. Additionally, they contend that the methods are the stringent order of steps that are followed to get the research data before any analysis is conducted. Using the research design process, the methodology and theoretical frameworks are specifically selected for the problem being investigated. The selection of the methodology guides the range of methods that are used for the research. It lends itself to the credibility of the collected results and their analysis (Dawson 2002; Jonker & Pennink 2010; Rugg & Petre 2007). Furthermore, Jonker & Pennink (2010) posit that the techniques are the tools used to generate, register, classify, and analyse the research data. The data can be existing or newly created and of linguistic, numerical and visual natures. The research design is discussed next.

5.2 RESEARCH DESIGN

In designing the research, three types of studies were considered: exploratory, descriptive and theoretical. Research studies exist along a spectrum of how far the knowledge of the research area has advanced (Sekaran & Bougie 2011). The exploratory study is the first type, where researchers are looking at the problem for the first time or there are limited studies conducted on the topic area. The second type is the descriptive study, where researchers attempt to describe characteristics of a research topic from different perspectives. This type of study is applied when the problem must be studied before

theoretical and managerial implications can be determined. It provides an opportunity to systematically study the research topic and use it as a launch pad for future research. The third type is the theoretical, which looks at the relevance of the theoretical frameworks when applied under certain conditions. It may involve hypothesis testing to determine whether the theoretical framework holds when controlling for some variables and manipulating variable(s). The fourth type is where researchers apply accepted theories to newer applications to investigate if they hold or not.

Based on the literature review (Chapters 2, 3 and 4), an exploratory study was not needed since there is generally accepted knowledge about strategies, pricing, consulting engineering and business-to-business relationships. However, there are some knowledge gaps in terms of the competitive strategies being used by CECs, which are more suited for a descriptive and/or theoretical study. This study can describe the theoretical phenomena associated with engineering markets and decision-making in firms as it relates to their competitive strategies.

Since this study focuses on theoretical frameworks used to explain the economic behaviour of CECs, it is a theoretical study. The study considers comparative theories that are applicable to the competitive strategies used by CECs. It evaluates whether comparative theories from micro-economics and institutional economics are applicable to the commercial behaviours of the CECs. The research aims to develop a conceptual framework to explain the competitive strategies of CECs used in NSW. The conceptual framework gives solid theoretical bases to the commercial activities of the firms.

The research design is connected to the different components of this thesis. The research questions and objectives in Section 1.2 show a requirement for both quantitative and qualitative methods. These research methods and techniques are influenced by the analytical framework (Section 1.1), micro-economics market definitions (Chapter 2), institutional economics analysis techniques (Chapter 3), and strategy, pricing and value theories (Chapter 4). Based on the research design, the data was collected (Chapter 6) and analysed (Chapter 7) using the methods and techniques described in this chapter. The research output, the conceptual framework, is developed and displayed in Chapter 8 using the knowledge representation technique from Section 5.5.4 and aligned to the theories in Chapters 2, 3 and 4.

5.3 RESEARCH METHODOLOGY

The research methodology is the 'system of methods and principles' that guides any research (Dawson 2002; Jonker & Pennink 2010; Rugg & Petre 2007; Sekaran & Bougie

2011). It influences how any research data is collected and analysed. It incorporates the various research design processes to create a unifying ideology for researchers. In any research, there are three major methodologies: quantitative, qualitative and mixed/hybrid (Cameron, Sankaran & Scales 2015; Creswell 2013; Dawson 2002; Rugg & Petre 2007; Sekaran & Bougie 2011). The first two methodologies are the most popular and have been expounded on by various writers on research methodology and methods, while the third is gaining ascendance and popularity with researchers (Cameron, Sankaran & Scales 2015; Creswell 2013; O'Cathain, Murphy & Nicholl 2008). The three methodologies are briefly explained followed by the justification of the selection of one methodology over the other two.

5.3.1 Quantitative methodology

Quantitative methodologies are used by researchers where the research problem is enumerated and the answer to the research problem depends on a numerical answer (Dawson 2002; Rugg & Petre 2007). Jonker & Pennink (2010, p. 65) describe it as:

> contribut[ing] to the development of the theory, where conceptual models can be operationalised and be subsequently measured by the means of variables and questions.

This methodology is applied in hypothesis testing research, where there is a closed question. The closed question is a research problem that is well defined and explained in a conceptual framework. Statistical analyses are often applied to the data collected to provide answers to the closed question. It can also be applied to case studies where the data collected and decisions to be made are based on numerical analyses. Quantitative methodology requires that the researcher can quantify the research answer. It is also used in exploratory and descriptive studies if research answers are enumerated. Exploratory study uses quantitative methods to develop the initial research answers to a problem that is enumerable.

5.3.2 Qualitative methodology

Qualitative methodology deals with research problems that can be answered in terms of feelings, ideas, statements and behaviours (Dawson 2002; Rugg & Petre 2007). Alternatively, this methodology 'attempts to understand the organisational reality and occurring phenomena from the perspectives of those involved' (Jonker & Pennink 2010, p. 77). The research question is open and can change with the research. The research problem(s) and its (their) answers are not easily enumerated but can be described in qualitative terms. These are used primarily in exploratory and descriptive studies. These types of studies lend themselves to the qualitative approach because the researchers use

the methodology to explore fuzzy questions that are not necessarily numerical in nature. The research is conducted 'within a specific context and not in a specific reality' (Jonker & Pennink 2010, p. 80). It helps to open the doors to finding further answers to a problem, which are complicated by human interactions. By extension, the wide reach of the methodology leads to a broad spectrum of possible data sources – observations, informal conservations and in-depth interviews.

5.3.3 Mixed methodology

The third methodology is mixed methodology, which combines both quantitative and qualitative principles (Cameron, Sankaran & Scales 2015; Creswell 2013). Researchers have found that combining the two research principles brings the advantages of the two into the research design (Cameron, Sankaran & Scales 2015; Creswell 2013). The data collected from the research can be in different formats (qualitative and quantitative), which permits researchers to analyse them using the different techniques. The conceptual modelling that is the hallmark of qualitative research can be solidified by the validity of numerical analysis, the hallmark of quantitative analysis. As a result, the research can bring a broader perspective to the problem being investigated (Cameron, Sankaran & Scales 2015; Creswell 2013).

Mixed methodology is different from multi-methods in research design (Cameron, Sankaran & Scales 2015; Creswell 2013; Dawson 2002; Greene 2007). Mixed methodology requires the data collection and analysis to incorporate both qualitative and quantitative approaches, while multi-methods mean that more than one research method is being used but the methods can be from either the quantitative or qualitative methodological camp (Cameron, Sankaran & Scales 2015; Creswell 2013; Dainty 2008; Greene 2007).

This research has a project economics theme where both quantitative and qualitative methodologies can be applied. Project economics takes into consideration the economic factors of projects used in decision-making (Marnell 2016). Research questions (RQ) 1 and 2 (Section 1.2) are quantitative as they deal with micro-economics, while RQs 3 and 4 (Section 1.2) are both qualitative and quantitative as they deal with institutional economics and prices. The research objectives (RO) 1–6 (Section 1.2) are both quantitative and qualitative in nature. With research questions and objectives demonstrating qualitative and quantitative natures, the use of both methodologies was considered appropriate for this research.

5.4 DATA COLLECTION METHODS AND TECHNIQUES

Data collection was necessary to find answers to the research problem being studied. The discussion following is related to this PhD research. There are primary and secondary data collection methods (Dawson 2002; Rugg & Petre 2007; Sekaran & Bougie 2011). Primary data is the data curated by this PhD researcher (author) based on his direct involvement with the data sources for the first time during his research study. Secondary data refers to data that were collected and possibly analysed by someone else before this PhD researcher interacts with it.

Primary data collection methods can include interviewing, questionnaires, participant and non-participant observations, focus groups, Delphi studies, field studies, and experimentations. Secondary data collection methods usually mean literature reviews but can also include collecting raw data from previous studies and past records. In general, research data can be collected using mixed methods and multiple sources (Dainty 2008; Greene 2007; Rugg & Petre 2007; Sekaran & Bougie 2011). These mixed methods are aligned to the mixed research methodology selected for this PhD research. Using mixed methods gives a combined approach for answering this PhD research problem. Additionally, they are useful for modelling potential solutions to the research problem.

5.4.1 Quantitative data collection

The primary quantitative data collection methods considered for this research were surveys (questionnaires) and quantitative market data (financial performance, mergers and acquisitions). The owners of the financial performance data from individual firms were not likely to release them for this PhD research. The sensitivity of that kind of data means the time spent requesting it would negatively impact the PhD research schedule. Therefore, M&A data in the built environment markets are considered instead of the individual financial performance data from different companies. The quantitative survey is used in construction economics research like Ahmad & Minkarah (1988) and Chan & Kumaraswamy (1996) as well as in pricing research like Ingenbleek et al. (2003) and Liozu & Hinterhuber (2013).

The survey questions were developed to answer the research question 1 (RQ1) and research question 4 (RQ4) (Section 1.2). The quantitative survey was a preliminary device to get a range of the possible perceptions of competitive strategies among the CECs in NSW. Additionally, the survey provided the opportunity to understand how the market was structured around the different engineering specialities. The survey used a combination of electronic and in person distribution techniques to increase the probability of reaching the participants. The quantitative M&A data confirmed the market structure, which was

identified from the literature reviews. The M&A data was sourced from electronic M&A databases.

While designing the survey, the method for distribution was considered. Liozu & Hinterhuber (2013) use professional associations to assist in distribution of their survey. Their research investigated pricing practices employed by pricing professionals in organisations. This PhD researcher considered the same approach in designing the distribution plan. Consult Australia, Engineers Australia and Property Council of Australia were approached to help with the survey distribution. This PhD researcher recognises that persons respond to a survey if it comes from a reputable source. Surveys have an air of authority if they are seen as coming from a professional association (Petrovčič, Petrič & Lozar Manfreda 2016).

5.4.2 Qualitative data collection

In reviewing the different qualitative data collection methods, two primary methods stood out as principal approaches – interviews and Delphi panel study. The interviews were conducted using the critical incident technique (CIT) and laddering technique, while the Delphi panel study uses moderated questionnaires as its delivery technique. The Delphi study is considered both a quantitative and a qualitative method because it uses both interviews and statistics to measure the consensus.

The Delphi panel study has been the subject of various process and technical-comparative studies that look at the effectiveness of the method to understand judgement decisions. Rowe, Wright & Bolger (1991, p. 236) described it as the 'an attempt to obtain the most reliable consensus of a group by a series of intensive questionnaires interspersed with controlled opinion feedback.' The idea of the Delphi study is to harness the positive benefits of group judgements.

There are four components of the Delphi panel study that make it a good method for data collection. Firstly, the Delphi assures anonymity for the Delphi panel members, allowing them to be more open and honest in their opinions. Secondly, the iterations allow the expert to change their opinions over time as they get feedback on their opinions. Thirdly, the controlled feedback mediated by the researcher ensures everyone who participates in the study gets to provide their opinion and explain their positions. Fourthly, the Delphi panels tend to a consensus position (Hsu & Sandford 2007; Rowe & Wright 1999; Rowe, Wright & Bolger 1991). However, keeping the Delphi panel motivated for all four rounds is very difficult and not sustainable based on the target participants.

Another qualitative data collection method considered was non-participant observation. Non-participant observations are difficult to organise in the various firms in order to

observe the competitive strategy and pricing practices. The downside of this method is that participants would behave differently if they know they are being observed by a relative stranger (Dawson 2002).

Alternatively, a focus group of managers with strategy and pricing authority from different firms could have been assembled to discuss the questions around competitive strategies and pricing. However, this approach had the potential to run afoul of the Australian *Competition and Consumer Act (Cth) 2010* with the appearance of collusion. With the focus group, the participants were not from the same organisations. The topics of competitive strategies and pricing approaches are considered sensitive information for the participants. They were not able share in a group setting with their competitors present. This method was not considered further.

Another primary data collection method is the interview. Interviews are used to collect more in-depth data of the themes identified from the survey and literature. This research requires a closer look at how the decisions are made as discussed in Section 1.1 (theoretical framework). The interviews help to answer the four research questions as discussed in Section 1.2. Using interviews, this PhD researcher aims to understand what makes a good competitive decision from the compiled knowledge areas of the interviewees.

The research interview is designed based on guidance from Butterfield et al. (2005), Flanagan (1954) and Rugg & Petre (2007), respectively. During the interviews, the company executive explained how competitive decisions were made in the past using significant examples that defined the company's current practice(s). The interview is used to identify the institutionalisation of competitive strategy practices and confirm market structure characteristics. The Critical Incident Technique (CIT) helps to identify the past experiences that are used for future learning by other professionals charged with strategy and pricing in the company. This organisational learning is an institution identified under the comparative institutional analysis strand of institutional economics (Aoki 2007; Gagliardi 2008; Greif 1998) as discussed in Chapter 3.

The laddering interview style was applied in tandem with the CIT. Reynolds & Gutman (1988) described it as a technique based on unpacking ideas and thoughts using directed questions. The laddering technique allows the researcher to understand the values being employed in decision-making for a concept. This interviewing technique was used when the interviewee does not want to be recorded using the digital recorder. The notes taken during the interview were written using the laddering technique explained by Reynolds & Gutman (1988) and Rugg & Petre (2007).

The questions were reviewed by the supervisory panel and the independent Human Resources Ethics Committee. The questions were framed to reduce the change of participant and researcher (interviewer) biases. The questions selected were designed to avoid social desirability and habituation biases (Lindhjem & Navrud 2011; Salazar 1990; Shah 2019)

5.5 DATA ANALYSIS METHODS AND TECHNIQUES

Data analysis methods are used to interpret the results of the data collection activities. Just like their data collection counterparts, there are qualitative and quantitative analysis methods. The analytical methods selected are based on the type of data collected.

5.5.1 Quantitative data analysis

The quantitative analytical methods feature mainly quantitative data representation: descriptive statistics with visual graphical modelling (Almukkahal et al. 2013; Huck 2012). This was applied to the M&A data collected from the Thomas Reuters and Morrissey Goodale databases. The numerical M&A data was sorted based on year, geography, transaction type, disciplines involved and value chain integration. The visual graphical modelling for the M&A data used the programs Microsoft Excel 2016 and Tableau 2019.1. Visual graphical modelling was also used with the quantitative content analysis. NVivo 11 was used to generate the visual maps of codes for further analysis (Edwards 2001; Rugg & Petre 2007; Stubbs 2001).

5.5.2 Qualitative data analysis – Discourse analysis

Discourse analysis looks at what was being said, how it was said, and who was talked about (Couper-Kuhlen 2001; Edwards 2001; Rugg & Petre 2007; Stubbs 2001). Discourse analysis is derived from the field of linguistics. Stubbs (2001) posits that intonations provide additional information that cannot be easily conveyed in written text. This PhD researcher listened to the interviews and created a causal network diagram connecting the various ideas expressed during the interviews. The causal relationships were recorded in post-interview memos and stored in transcription software as recommended by Saldaña (2016).

The digitally recorded interviews were analysed for changes in the voices. The transcription software showed the waveform graphs of the audio while being transcribed. The discourse analyst (researcher) notes where there are spikes and dips in the speech waveforms. However, this could be due to the different timbres of the interviewers and interviewees. Furthermore, the recording device was a decommissioned BLU Android phone and not a multi-directional recording device.

In using discourse analysis, this PhD researcher explored the various layers of the interview. The advantage of this technique is that this PhD researcher did not have to transcribe all the interviews. Since content analysis was another technique being considered, the interviews had to be fully transcribed (Edwards 2001; Stubbs 2001). A disadvantage of discourse analysis was that this PhD researcher would have had to listen repeatedly to the digital recordings to identify the various themes. Furthermore, discourse analysis requires further knowledge of linguistics.

Nevertheless, Stubbs (2001) explains how lexical cohesion lends itself to the coding techniques as explained by Rugg & Petre (2007) and Saldaña (2016). The transcription software program was built as a computer-assisted and corpus analysis tool. The transcription of the interview recordings makes it easier for coding and analysis (Edwards 2001; Stubbs 2001). As the different stages of coding happen, the interpretation of the transcript becomes clearer (Edwards 2001; Rugg & Petre 2007; Stubbs 2001). This is explained in the next section on content analysis.

5.5.3 Qualitative data analysis – Content analysis

Content analysis was selected to interpret the literature (secondary data), and the interview transcripts. The content analysis method interprets the meaning, symbolism and intended communications of curated content from primary and secondary research (Hardy & Bryman 2009; Krippendorff 2004). The categories to be enumerated are based on the literature and research questions.

The qualitative content analysis is positioned by Rugg & Petre (2007) as a steady way to interpret the written word. Rugg & Petre (2007) narrower interpretation focuses on written text in their view of content analysis and fits into Edwards (2001) interpretation of transcription for discourse analysis. Krippendorff (2004) applies a wider interpretation of using any form of visual and situated media as content. Krippendorff (2004) posits that content is not just written text but also numbers, images, signs and other visual constructs that are interpreted to give meaning to an idea or thought. This expansion provides a firmer framework for the review of the research content generated by the data collection. This expansionist view of content provided a wider scope for the use of the content analysis method by this PhD researcher.

Edwards (2001), Krippendorff (2004) and Rugg & Petre (2007) describe content analysis as a multi-pass approach. Rugg & Petre (2007) three-part process consists of verbatim, gist and superordinate category analyses. With verbatim analysis, this PhD researcher reviewed the written materials for repeated words or phrases. These words and phrases were counted and tabulated from the interview transcripts. In verbatim analysis, the

counts are represented using visual models. Using the typography put forward by Richards (2014) and further expanded by Rourke et al. (2001), the verbatim analysis is considered to be a form of quantitative content analysis.

With verbatim analysis, the activity happens after the data collection and before further in-depth analysis is conducted. Since the various content constructs or units of analysis (words, phrases) are counted and tabulated into predetermined categories, summary data are calculated. Once these constructs are counted and tabulated, they are now considered as codes. These codes are collapsed further by future analyses, that is, gist and superordinate categories. The superordinate codes are the five pillars of the theoretical framework as outlined in Figure 2 on page 7.

Following the verbatim analysis, the gist analysis was conducted. In gist analysis, the tabulated words and phrases are categorised under synonymous categories. Once that has been completed, the synonymous categories are aggregated under their parent categories in superordinate category analysis. The meso- (gist) and macro- (superordinate) levels of coding provided more interpretation of the data as a work-in-progress (Hardy & Bryman 2009; Krippendorff 2004; Saldaña 2016). This multi-pass approach provided an avenue for data reduction and data retention with the aim to understand what the data mean and what they say about the research area (Richards 2014). Although the content analysis is described as a three-part process, the various stages are repeated to capture the reflections of this PhD researcher on the data.

5.5.4 Mixed data analysis – Knowledge representation

Rugg & Petre (2007) describe knowledge representation as the structured methods to expressing various ideas, thoughts and concepts. Knowledge representation tools assisted this PhD researcher to map the data into accessible formats and help to encapsulate the various thoughts of the research. These tools included Microsoft Excel 2016, Microsoft Visio 2016, NVivo11 and Tableau 2019.1.

There were three stages of knowledge representation during this research: catalogue of categories, idea maps and conceptual models. These activities are akin to Saldaña (2016) After First Cycle and Second Cycle Coding methods. Richards (2014) describes the use of a catalogue of categories to help with creating coding hierarchies. The catalogue of categories is useful for content and discourse analyses. It produces a hierarchy to represent the coded content (content analysis) and coded oral data (discourse analysis). Furthermore, it can be used to show the frequency of codes in the data in numerical, textual and visual manners as a form of code landscape (see Chapters 6–8 for examples).

Following data reduction, data retention and interpretation were applied to the coded data. Using the superordinate categories from the content analysis, the idea maps were developed with associated nodes. The idea maps were the brainstorming components of the data analysis. They involved pattern recognition, which is used to establish the connections between the ideas identified from the analysis. From the idea maps, further interpretation and synthesis was done to create the conceptual models (Chapters 6–8) to explain the ideas (Rugg & Petre 2007; Saldaña 2016; Stubbs 2001). This transition is shown in the simplified version of the knowledge representation model below.

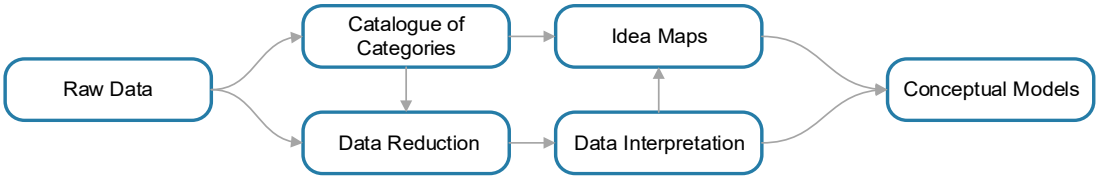

Figure 15: Knowledge representation (Rugg & Petre 2007; Saldaña 2016).

5.6 PILOT AND MAIN STUDIES

The pilot study was used to evaluate the techniques selected for the survey and interviews. It provided feedback to the researcher on the effectiveness of the two methods for collecting data for the research project (Arain et al. 2010; Wray, Archibong & Walton 2017). Figure 16 below shows the execution map for the pilot study.

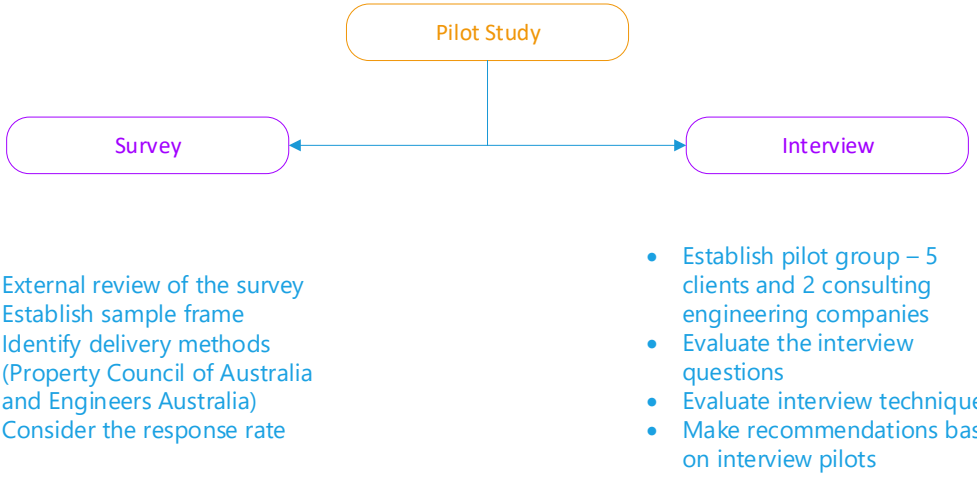

Figure 16: Pilot study execution map.

The evaluation criterion for the survey was whether the questions made sense to external reviewers. The evaluation criteria for the interview were divided into three parts: pre-interview, interview and post-interview. The first part (pre-interview) reviewed how to communicate with the participants and what was required to get them to participate. This

reduced the probability of sponsor bias (participant), question-order bias (interviewer), and leading questions and wording bias (interviewer). (Salazar 1990; Shah 2019). The second part (interview) reviewed whether the interviewees understood the questions and provided coherent answers to the questions during the interviews. This was critical to reducing the probability of acquiescence bias (participant) and confirmation bias (interviewer). The final part (post-interview) looked at whether the recording device could capture the interviews and if transcripts of the interviews could be done using the transcribing software.

Once the research techniques were evaluated from the pilot study, the main study (Figure 17) was executed. The main study consisted of interviewees from architectural, consulting engineering and project management companies. The three professional types were selected, as they were ones actively involved in the CECs' activities in the built environment sector. In the pilot study, property developers and infrastructure investors were interviewed. The face-to-face semi-structured interviews provided more opportunities to ask the participants about the decision-making process around the companies' competitive strategies (consulting engineering) and selection criteria (clients – architects, infrastructure investor, property developers and project managers). The study period for the M&A activities is between 2007–2017. This was selected because 2007 was the start of the Global Financial Crisis (GFC). M&A in the built environment markets and GFC are two recurring themes in the pilot and main studies' interviews.

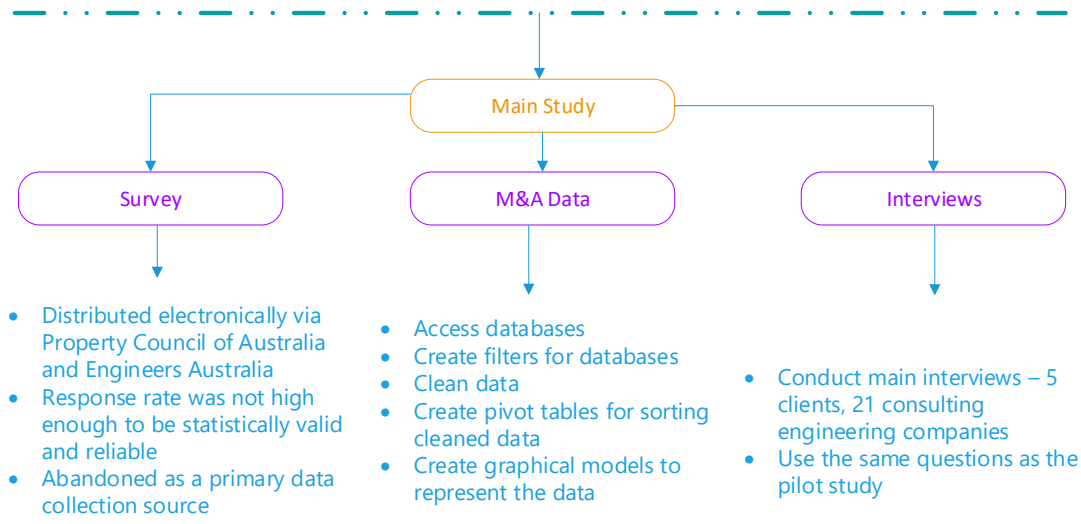

Figure 17: Main study execution map.

5.7 SUMMARY

This chapter discussed the research design within Jonker & Pennink (2010) framework of four research action levels. The paradigm is positivism as this PhD research tests the applicability of various economic theories to explain the behaviours of CECs in the market. A mixed methodology is applied incorporating the use of both qualitative and quantitative methods and techniques. The selected data collection methods are literature review and mergers & acquisitions data for secondary data, and the primary data are surveys and interviews. The selected data analysis methods are descriptive statistics, visual modelling, content analysis and knowledge representation. Next, the data collection chapter of the thesis follows. It discusses the practical results of the research design plan discussed in this chapter.

6 DATA COLLECTION

This chapter discusses the data collection methods and the collected data associated with the research, as shown in Figure 18 below. The research investigates the competitive strategies being used by CECs in NSW. While the previous chapter discussed the theoretical research design, this chapter shows how the research plan is executed. The data collected is aligned to the five theoretical pillars as discussed in Section 1.1. The sensitivity of the collected data is also considered when deciding which methods to use and from which organisations to request the data. The chapter discusses the qualitative and quantitative data collection methods, and what data is collected from the pilot study versus the main study.

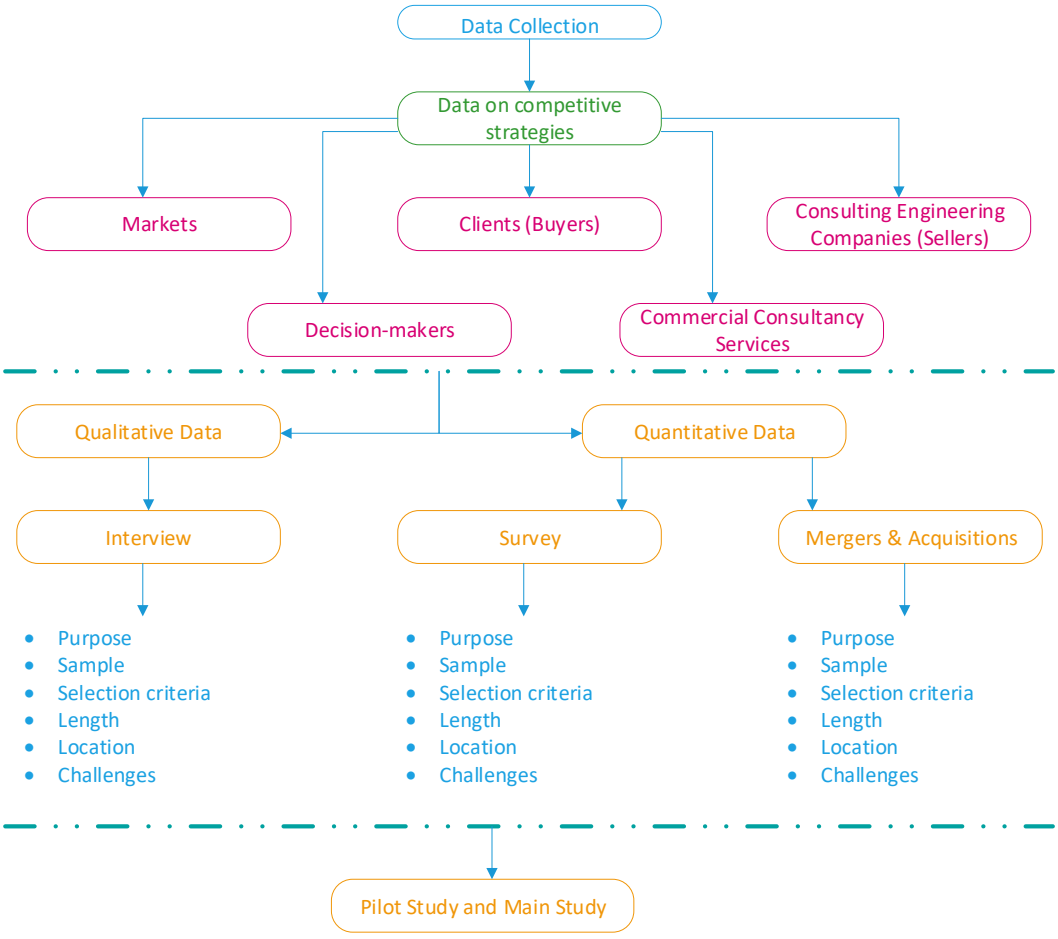

Figure 18: Data collection flowchart.

6.1 PILOT SURVEY REVIEW

In the previous chapter, surveys were identified as one of the data collection methods for this PhD research. A survey was designed to gather information about competitive

strategies of the CECs. The questions asked information about the CECs, their commercial services offerings, and their internal decision-making models.

The survey consisted of fourteen questions. The full survey is outlined in Table 10 in Appendix section 10.1. The questions were aligned to the theoretical framework of CECs (sellers), client (buyers), commercial consultancy services, decision-makers and markets. A volunteer group of six academics and three policy advisors from three different industry associations external to this PhD researcher (author) reviewed the pilot survey between June and August 2017. The academics were from different research areas but were active researchers in business, education, construction and economics. The pilot survey was evaluated for whether it would make sense to the respondents and reduce the probability of participant bias (Arain et al. 2010; Fink 2003; Lindhjem & Navrud 2011; Salazar 1990; Shah 2019; Tourangeau, Conrad & Couper 2013). Changes were recommended regarding the wording of the questions. These changes were made for sentence fluency. Question 7, which dealt with the definition of pricing categories, was the one with most feedback. Once the changes were incorporated into the survey, it was released for the main study (as discussed in Section 6.3).

Petrovčič, Petrič & Lozar Manfreda (2016) discuss how the perception of the authority can improve the response rate for electronic surveys. Liozu & Hinterhuber (2013) use professional and industry lobbying associations to get organisational support for the survey distribution during one of their research projects. The use of industry bodies to distribute the survey was motivated to provide a level of authority and organisational endorsement of the survey and the research itself.

Three industry associations were approached to provide organisational support for the survey during the review period. They were the three peak bodies representing property development and engineering professionals, that is, the Property Council of Australia (PCA), Engineers Australia (EA), and Consult Australia (CA), respectively. The PCA and CA are industry associations for corporate organisations, that is, their memberships are based at an organisational level and not at an individual level. PCA represents property development companies across the country. Architectural, engineering, and construction companies are also part of their membership. Membership in EA is based on an individual level. It represents engineers in Australia. It provides the registration and certification of engineers across Australia. CA represents the consulting engineering firms across Australia but also has property development firms as members. All three advocate and recommend policy at all levels of government.

The sample for the survey came from the population of the CECs operating in NSW. The sampling frame was the CECs who were members of the NSW branches of the Property Council of Australia and Consult Australia, respectively. Additionally, their individual engineers would be members of the NSW branch of Engineers Australia. The approved survey is distributed, electronically. Survey participants took about ten-to-fifteen minutes to fill it out.

6.2 PILOT STUDY INTERVIEWS

Interviewing was selected as the principal way to collect primary data about the competitive strategies used by the CECs to win work. The pilot participants were interviewed in a semi-structured format. The interviews provided answers about the market, decision-makers, sellers, buyers, and commercial consultancy services. Table 11 and Table 12 in Appendix section 10.2 give the full questions. Appendix section 10.3 gives a sample transcript. Figure 19 below shows the sources of participants for the pilot interviews. This allowed this PhD researcher to test the questioning, note-taking, recording and transcription of the interviews. The pilot interviews were conducted from July 2017 to August 2017.

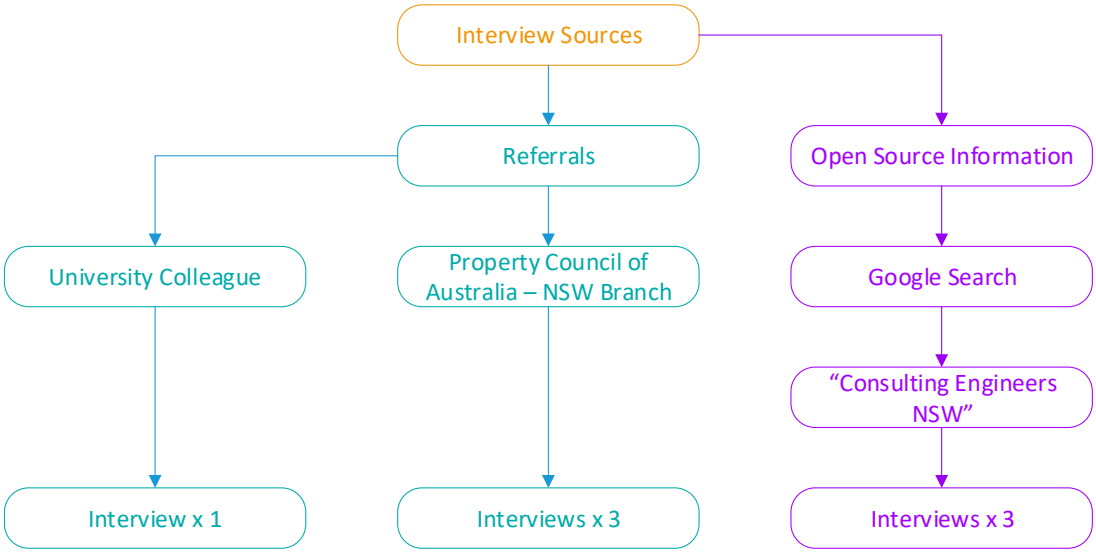

Figure 19: Pilot Interviewee sources.

The participants were identified first from the organisation type and then by their role in the organisation. The companies were divided into client-type and CEC. There were three client-types: infrastructure investor (II), property developer (PD), and project manager (PM). They were a mixture of firms who had a variety of the number of full-time equivalent (FTE) employees, the number of commercial areas (disciplines), and the number of

physical office locations or geographical operational regions. The sample frame of companies was sourced using open source information (OSI) and referrals.

The companies were identified using Google Search results. Google was selected as the principal search engine based on its market dominance of online search engines (StatCounter 2019). Using the "Consulting Engineers NSW" search parameter and variations of it, CECs in NSW with a web presence were identified. The CECs were sorted based on their registered locations in Australia and internationally where applicable. The firms that had offices in NSW were selected if they had both websites and provided email addresses for their management teams. The management teams were emailed and contacted by phone.

Referrals were used where possible to recruit interview participants. The Property Council of Australia – New South Wales branch sent out an email requesting interested parties to participate in the interviews. The respondents were all client-type companies. A university colleague made a personal introduction to another potential participant, who worked for a property developer.

The potential participants were identified by the following titles: Managing Director, Principal Architect, Director, State Leader, and Sector Leader (Department Manager). For the CEC, the interviewees were employed in one or more of the following roles: (1) accounting and finance, (2) consulting engineering, (3) contract and procurement management, (4) project management, and (5) sales and marketing in the company. From the client-type company, the interviewees were employed in one or more of the following roles: (1) property/infrastructure development, (2) contract & procurement management, and/or (3) project management. The potential participants had decision-making authority around the identified areas in their respective firms.

It is noted that there are CECs who do not have a website, and there are firms who have a website but do not provide email contacts. This resulted in a selection bias in the sampling frame as they had a lower probability of being contacted by this PhD researcher (Almukkahal et al. 2013; Huck 2012). Nevertheless, the widest possible search parameters were used to sample the various CECs.

The pilot study interviews were with senior-level staff members in the NSW offices from the different companies, as shown in Table 2 below. The interviewees were from three property development companies (PD1, PD2, PD3), one project management company (PM1), one infrastructure owner (II1) and two CECs (CEC1, CEC2). Five of the firms are global companies with operations in Australia, and have their Australian head offices in Sydney, NSW. Two of the firms operate solely in Australia – where one operates only in

NSW and the other operates across the country. The CECs are multidiscipline engineering practices.

Table 2: Pilot study interviews – the characteristics.

ID	Name	Title	FTE	Offices	
				Australia	International
CEC1	Engineering Consultant 1	Sector Leader	500+	6	3
CEC2	Engineering Consultant 2	State Leader/Sector Leader	500+	6	5
II1	Infrastructure Investor 1	Sector Leader	500+	1	0
PD1	Property Developer 1	Sector Leader	500+	6	6
PD2	Property Developer 2	Sector Leader	500+	4	0
PD3	Property Developer 3	Sector Leader	500+	5	5
PM1	Project Manager 1	Managing Director	500+	1	5

The interviews were in a semi-structured format. Once the participants agreed to be a part of the research, they were sent the predetermined questions, consent form and participant information sheet before the interview. This allowed the participants to prepare some answers beforehand and feel comfortable in the interview. This also reduce any potential bias in the leading question and wording bias (Salazar 1990; Shah 2019). Several interviewees commented favourably on having the questions before in order to prepare fuller answers for the interviews. The structure of the interview instruments was evaluated based on listening to the digital recordings of the pilot interviews. Improvements and adjustments were made to the pace of the questions being asked and the approach to the probing of the interviewees. It is noted that the use of longer pauses prompted the interviewees to add more information, which was useful to the research. This reduced the chance that the participants were feeling rushed. Additionally, if they were asked if they have any additional thoughts at the end of the interview, they provided extra insights into the research topic.

Six of the pilot study interviews were recorded digitally while one interview was not recorded digitally. The interview notes from the unrecorded interview were written using the laddering technique during the interview then further edited in the post-interview review. The interviews were on average forty minutes long and conducted at the participants' offices. The interview recordings and notes were uploaded to a secure cloud solution and transcribed using NVivo 11 qualitative software. The interviews were analysed into various themes as shown in Figure 18 on page 74. The questions asked in the pilot interviews were not changed materially. They were used for the main study interviews (see Section 6.4). The analysis of the interview transcripts for the pilot study interviews can be used jointly with the main study interviews. This was approved by the University's Human Research Ethics Committee in June 2017.

6.3 MAIN STUDY SURVEY

After the pilot study was completed in August 2017, it was given to the PCA and EA for distribution to their mailing lists in September 2017. They did not grant access to their mailing lists so this PhD researcher could not do any pre-screening of the potential survey participants. PCA sent the survey to their associate members, who are CECs in New South Wales. The survey was sent to 310 CECs asking them to participate in the research survey in September 2017. EA sent the survey as part of their monthly newsletter to their New South Wales membership of 26,174 persons and posted the link on its website in September 2017.

The main study survey was run concurrently with the main study interviews. During the main study interviews, it was noted that unless the respondent was a high-ranking decision-maker in the CEC, the data related to market, sellers, commercial services and decision-making were confidential. Additionally, the social desirability bias of doing the face-to-face interview influenced the respondent to be more attentive and responsive (Lindhjem & Navrud 2011). The survey was designed to have anonymous responses. Without the assistance from the trade organisations, the status of the respondents could not be ascertained. Therefore, the participants could not be contacted for clarification unless they provided their email addresses in the free response section.

Statistically valid responses were not guaranteed during the main study. As a result, this method was abandoned (Dey 1997; Dillman et al. 2009; Fink 2003; Tourangeau, Conrad & Couper 2013). The lack of statistically valid responses occurred despite the efforts of using the professional associations to distribute the surveys. The section briefly explains how the survey was developed, released and the decision made to abandon it. This ensures that the integrity and validity of the PhD research process.

It was decided to not use the survey as a principal data collection method. This was because this PhD researcher (author) could not guarantee either the competence of the respondents nor that the low response rate did not result in a biased outcome. Dey (1997) and Dillman et al. (2009) discussed how to handle low response surveys. To compensate for this, an increased number of interviews were organised for a more reliable research result. The interviews were increased from twenty-six to thirty-three. The interviews were organised along the lines of seniority of the interview participants.

6.4 MAIN STUDY INTERVIEWS

Over a six-month period (August 2017–January 2018), the main study interviews were organised, conducted, transcribed and analysed. The participants were the same type as the pilot interviews. One additional client-type was added based on feedback from the pilot interviews. It was the architects (AA). The sample frame of companies was sourced using open source information (OSI), referrals, and personal introductions. Figure 20 shows the sources of participants for the main interviews.

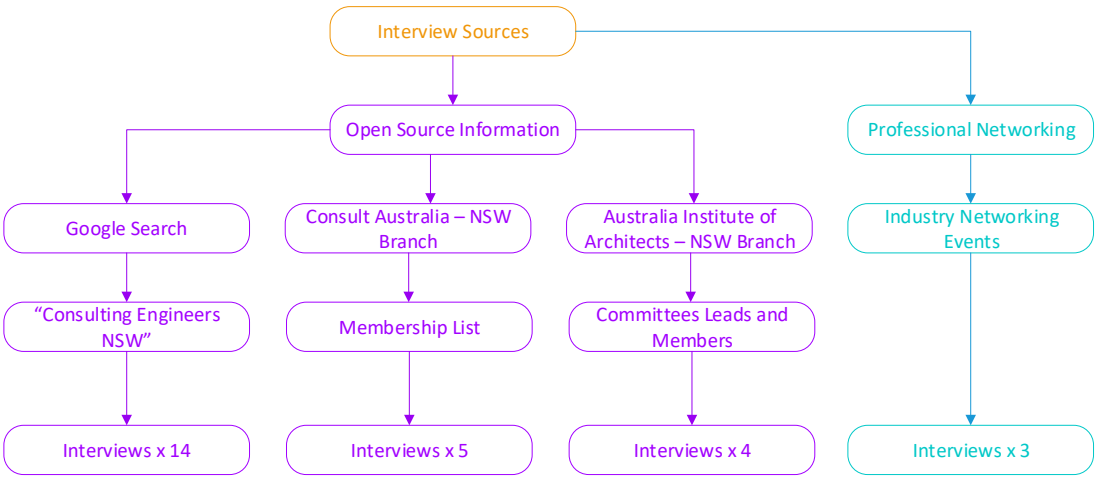

Figure 20: Main Interview sources.

The companies were identified through from a Google search (discussed in Section 6.2), the Consult Australia's website and the Australian Institute of Architects' (AIA) website. Consult Australia has a list of member organisations on their website, which was also reviewed. The CECs were sorted based on their registered locations in Australia and internationally where applicable. The firms who had offices in NSW were selected if they had both websites and provided email addresses for their management teams. The management teams were emailed and contacted by phone. The architectural companies were identified via the webpages of the NSW branch of AIA. The architectural companies were contacted like the CECs based on the availability of a company's website and the email addresses of their management teams.

This PhD researcher attended three professional networking events organised by the Project Management Institute (PMI) – Sydney Chapter, Sydney BIM (SYDBIM), and NSW International Students Awards (NSWISA). At these events, contacts were made with engineering professionals. This PhD researcher made those contacts at three separate events. In the follow-up from the events, interviews were organised with participants who met the selection criteria. The contact from the PMI event was made in August 2016 and the interview request made in September 2017. The contact from SYDBIM was made in December 2016 and the interview request was made in August 2017. The contact from the NSWISA was made in December 2017 and the interview request was made in January 2018.

The potential participants were identified by the following titles: Managing Director, Principal Architect, Director, State Leader, and Sector Leader (Department Manager). From the architectural company, the interviewees were employed in one or more of the following roles: (1) architecture and planning, (2) contract and procurement management, and/or (3) project management. The potential participants had to have decision-making authority around the identified areas in their respective firms.

It was noted that there were CECs that did not have a website, and there were firms that had a website but did not provide email contacts. This resulted in a selection bias in the sampling frame as they had a lower probability of being contacted by the researcher (Almukkahal et al. 2013; Huck 2012). In order to reduce the impact of the bias, the different sizes of companies being interviewed were monitored, which permitted for three cycles of searching and recruitment of potential interview participants. Companies that do not have a website are generally smaller firms and they were recruited by referrals and through professional networks.

The main study interviews started from August 2017 and finished in January 2018. The main study interviews consisted of twenty-one CECs, four architectural firms and one project management firm. The main study focused on the CECs, which ranged from global firms to single-person operations. Some of the CECs operate only in the Australian eastern states or only in NSW. Other companies operate across Australia but not overseas. Some operate overseas but use one or two countries as their staging ground to do work across in neighbouring countries. Nevertheless, they all have one thing in common – they operate in NSW. The interviewees in the CECs ranged from corporate level executives to department managers and team leaders. The corporate level executives were responsible for the competitive strategies in the target region of NSW, often as state (sector) leaders.

In many cases, they were the country leaders for Australia or international (sector) leaders for the Australasia/Asia-Pacific regions.

Following the pilot study, the architects were added to the main study as a client company. The architects were included in the main study as they also hire engineering consultants via the main client-owner (principal). The architectural companies were smaller in size compared to the CECs. They are based in New South Wales working across various sectors with public sector and private sector clients. The architects interviewed were the Principal Architects, who are the founding/managing directors of their respective architectural companies. The project management company was added as it operates as a project manager on the development approval and construction phases. The managing director of the project management company was interviewed. They manage the hiring process of CECs for the clients.

Based on the interview recruitment activities from the different sources, thirty-three confidential interviews were conducted from ninety-five contacted firms. When the main study interviews (Table 3 below) were added to the pilot interviews (Table 2 on page 78), there were interviews from twenty-three CECs, four architectural firms, three property developers, two project management firms and one infrastructure investor. Four interviewees requested not to be recorded digitally. The interview notes were written using the laddering technique during the interview then further edited in the post-interview review. The remaining twenty-nine interviews were recorded digitally. The interviews were on average forty minutes long and conducted at the participants' offices. Two of the interviews were conducted at the interviewer's office. The interview recordings and notes were uploaded to a secure cloud solution and transcribed using NVivo 11 qualitative software. The interviews were analysed into various themes as shown in Figure 18 on page 74.

Table 3: Main study interviewees – the characteristics.

ID	Name	Code Title	FTE	Office	
				Australia	International
AA1	Architect 1	Principal Architect	1–49	1	0
AA2	Architect 2	Principal Architect	1–49	1	0
AA3	Architect 3	Principal Architect	1–49	1	0
AA4	Architect 4	Sector Leader	50–99	2	0

ID	Name	Code Title	FTE	Office	
				Australia	International
CEC3	Engineering Consultant 3	Sector Leader	500+	8	6
CEC4	Engineering Consultant 4	Sector Leader	100–199	3	0
CEC5	Engineering Consultant 5	Sector Leader	100–199	3	0
CEC6	Engineering Consultant 6	Sector Leader	50–99	2	0
CEC7	Engineering Consultant 7	State Leader	200–499	5	0
CEC8	Engineering Consultant 8	Managing Director	1–49	1	0
CEC9	Engineering Consultant 9	Managing Director	1–49	1	0
CEC10	Engineering Consultant 10	Sector Leader	500+	5	6
CEC11	Engineering Consultant 11	Director	200–499	3	1
CEC12	Engineering Consultant 12	State Leader	100–199	3	0
CEC13	Engineering Consultant 13	Managing Director	1–49	1	0
CEC14	Engineering Consultant 14	Managing Director	1–49	3	0
CEC15	Engineering Consultant 15	Managing Director	100–199	3	1
CEC16	Engineering Consultant 16	Managing Director/Sector Leader	500+	4	6
CEC17	Engineering Consultant 17	Sector Leader	500+	4	2
CEC18	Engineering Consultant 18	Managing Director	200–499	5	4
CEC19	Engineering Consultant 19	Managing Director	1-49	1	1

ID	Name	Code Title	FTE	Office	
				Australia	International
CEC20	Engineering Consultant 20	State Leader	1–49	3	0
CEC21	Engineering Consultant 21	Sector Leader	1–49	1	5
CEC22	Engineering Consultant 22	Managing Director	1–49	1	0
CEC23	Engineering Consultant 23	Managing Director	1–49	1	2
PM2	Project Manager 2	Managing Director	1–49	1	0

As discussed in Section 6.2, there were several recommendations to the interviewing techniques, which were applied to the main study interviews. The flexibility of the interview scheduling protocol and using the online membership list from Consult Australia to get more participants worked effectively, especially in getting the last seven interviews. The online list did not provide any email address, but this PhD researcher visited the websites of each of the members to find contact information.

If the sample size is more than thirty, the sample can be considered to be normally distributed (Almukkahal et al. 2013). However, as this was a mixed methodology research project, the interviews were stopped at thirty-three as the last few interviews were not adding new information. In qualitative interviews, it is recommended that the interviews continue until the interviews no longer add any more new data (Baker, Edwards & Doidge 2012). The different engineering managers from the range of CECs expressed various thoughts about the competitive strategies but there were enough similarities to recognise the themes and their alignment to the five pillars. This was also noticed with the different client companies.

The next section discussed the M&A data collection efforts. This is developed as an additional component based on the data collected during the interviews.

6.5 MERGER AND ACQUISITION (M&A) DATA

6.5.1 Data classification and cleaning

During the interviews, it became clear that the built environment market had faced numerous consolidations in the past few years. M&As are important because they change the market for the CECs. This is because, in theory, the competition amongst the CECs alters as the firms change sizes or discipline expertise move around the different firms. M&As add dynamics to the behaviour of the firms and the clients. There has been a lot of activities globally in the built environment market in terms of vertical and horizontal integration. Horizontal integration means a firm expands its size by merging or acquiring another firm in its discipline class, for example, CEC A merges or acquires CEC B. Vertical integration means a firm expands its size by merging or acquiring another firm in a different discipline class, for example, CEC A merges or acquires architecture company C.

The M&A data was pulled for the Australian built environment market only. This data was based on M&A activities reported in the Thomson Reuters M&A (2007–2017) and Morrissey Goodale (2007–2017) databases, respectively. Thomson Reuters M&A was part of Thomson Reuters Deal Intelligence at the time of data extraction in January 2018. It is now referred to as Refinitiv. Morrissey Goodale is a management consultancy firm, which maintains a specialised database on built environment M&A activities around the globe. Using the M&A data, consolidation activities were examined within the Australian context as shown in the data map (Figure 21) below. The companies were researched for NSW offices to be included in the tables and visual data maps.

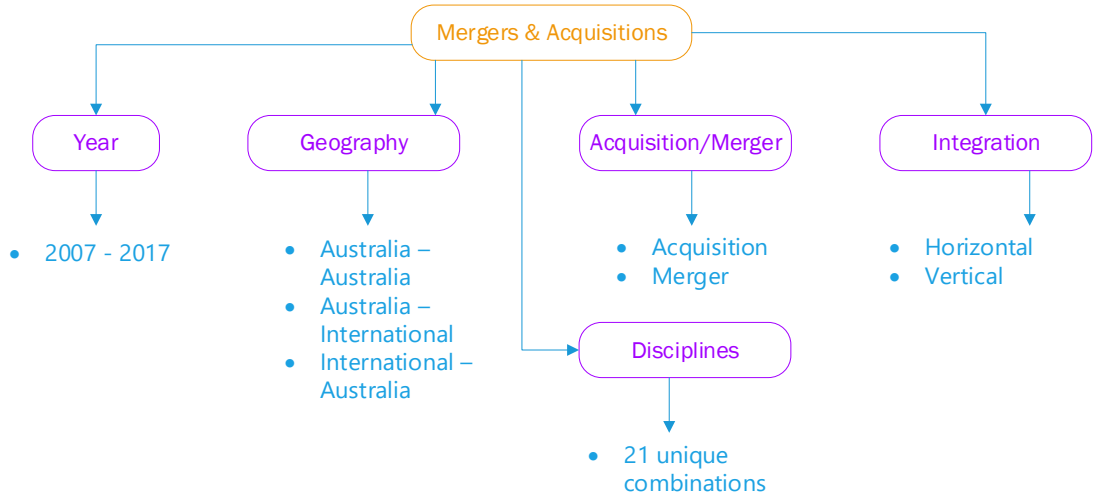

Figure 21: Merger and acquisitions data map.

Using the M&A databases from Thomas Reuters and Morrissey Goodale, M&As in the AEC sector were classified for Australia. They were recorded and enumerated, as shown in Figure 22 below and Appendix section 10.5. The resulting table of raw data and pivot

tables have five components: year, geographical status, disciplines, acquisition or mergers, and horizonal or vertical integrations.

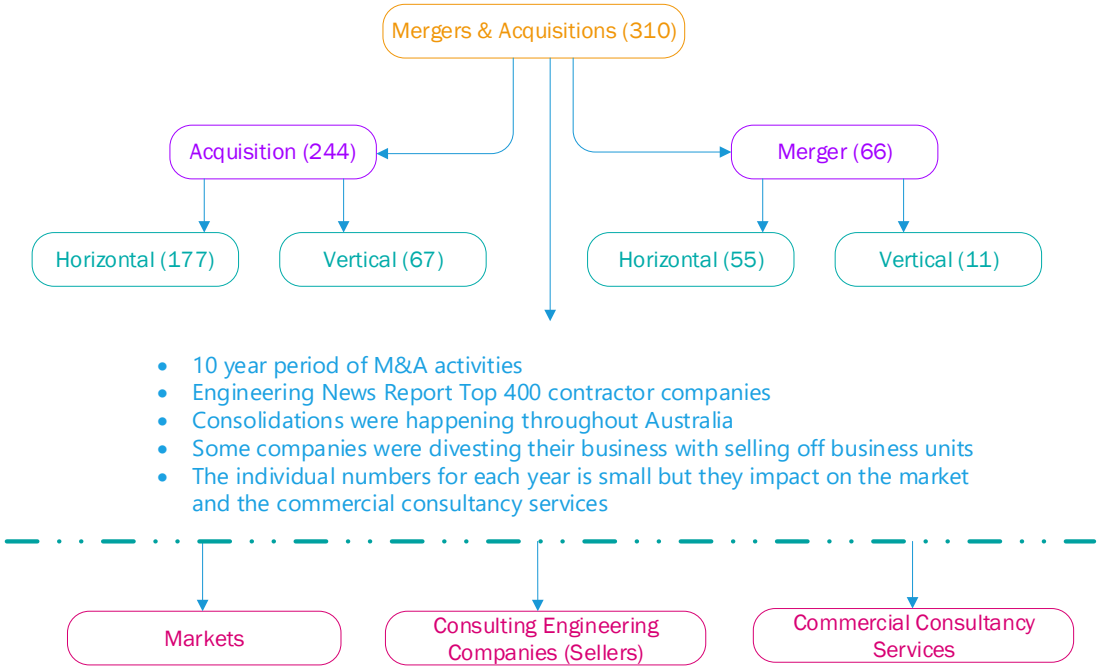

Figure 22: Merger and acquisitions analysis map.

- The year is between 2007 and 2017: This means the transaction was completed between 2007–2017 inclusive.
- The geographical status: The first firm was the one who initiated the merger or acquisition transaction. The second firm was the one who accepted the offer. The geographical status was related to where the firm was registered during the transaction.
    - Australia-based firm (1st) – Australia-based firm (2nd)
    - International-based firm (1st) – Australia-based firm (2nd)
    - Australia-based firm (1st) – International-based firm (2nd).
- The acquisition/merger (ACQ/MER) refers to whether the transaction was recorded as an acquisition or a merger.
- The different disciplines were classified based on the common disciplinary groupings found in the firms:
    - architecture, land-use planning, interior design (A)
    - construction, construction management, construction project management (C)
    - engineering, maintenance, surveying (E)
    - investor funds (I)
    - laboratory, inspection (L)

- project management (PM)
- professional services, consultancy (PS).

- The horizontal/vertical refers to horizontal integration (merger and acquisition of the same discipline) and vertical integration (merger and acquisition of the different disciplines).

6.5.2 Visual data models

The consolidations over the ten-year period of analysis have affected the economic landscape for CECs. The M&A of the companies across the built environment value chain provided opportunities for the clients to hire multidiscipline, multi-sectoral companies to handle their mega built environment projects. Vertical integration creates the capacity in companies to handle those major built environment projects. The public sector and private sector clients were investing heavily in the built environment sectors (Ellis 2017a, 2017b; Infrastructure Australia 2018; Infrastructure NSW 2017, 2018). These clients required companies with the expertise to handle the magnitude of the projects. The horizontal M&A also provided more capacity in the specific sector.

Horizontal integration accounted for approximately 75% of all the consolidations across the ten-year period. An alternative way of viewing this horizontal integration involved examining the integration of the firms before consolidating. Approximately 17% of all the consolidations were horizontal integration of already vertically integrated built environment companies. They were adding more discipline knowledge to discipline areas in which they already operated. Approximately 58% of all the consolidations were horizontal integrations of single discipline firms, for example, A–A, E–E or C–C. The vertical integrations were approximately 25% of all the consolidations. This involved the various firms adding new disciplines to their current commercial services. With horizontal and vertical integrations, the firms added new markets. The new disciplines (knowledge areas) had their own markets. They were increasing their market share by consolidations. Table 4 and Table 5 below show the raw numbers.

Table 4: Horizontal and vertical integration (2007–2017).

Type of consolidation	***Count***	***Percentage***
Horizontal	233	75%
Vertical	77	25%
Total	***310***	***100%***

Table 5: Horizontal and vertical integrations (2007–2017) – alternative.

Type of consolidation	*Count*	*Percentage*
Horizontal (Horizontal integrated firms)	181	58%
Horizontal (Vertical integrated firms)	52	17%
Vertical	77	25%
Total	***310***	***100%***

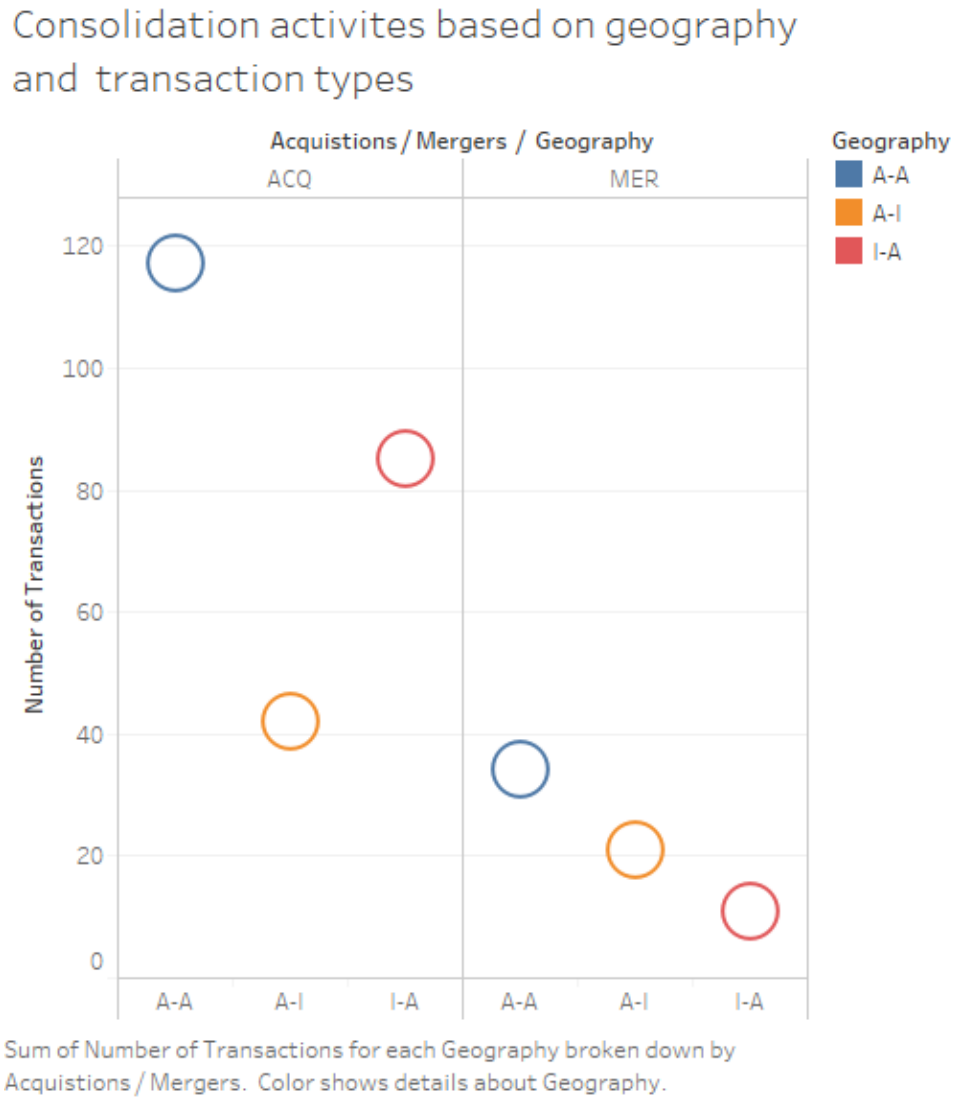

Figure 23: Mergers and acquisitions data model 1.

The first graphical model (Figure 23) shows how the consolidations were split between the acquisitions and mergers. It was further split into the geographical locations. This model shows how the M&As were distributed over the geographical regions. These were 117 ACQ transactions compared to thirty-four MER transactions for Australian-to-Australian consolidation activities (blue circle). On the other hand, there were forty-two ACQ compared to twenty-one MER for Australian-initiated consolidations of international

firms (orange circle). For the international-based firms, they had eighty-five ACQ versus eleven MER transactions (red circle).

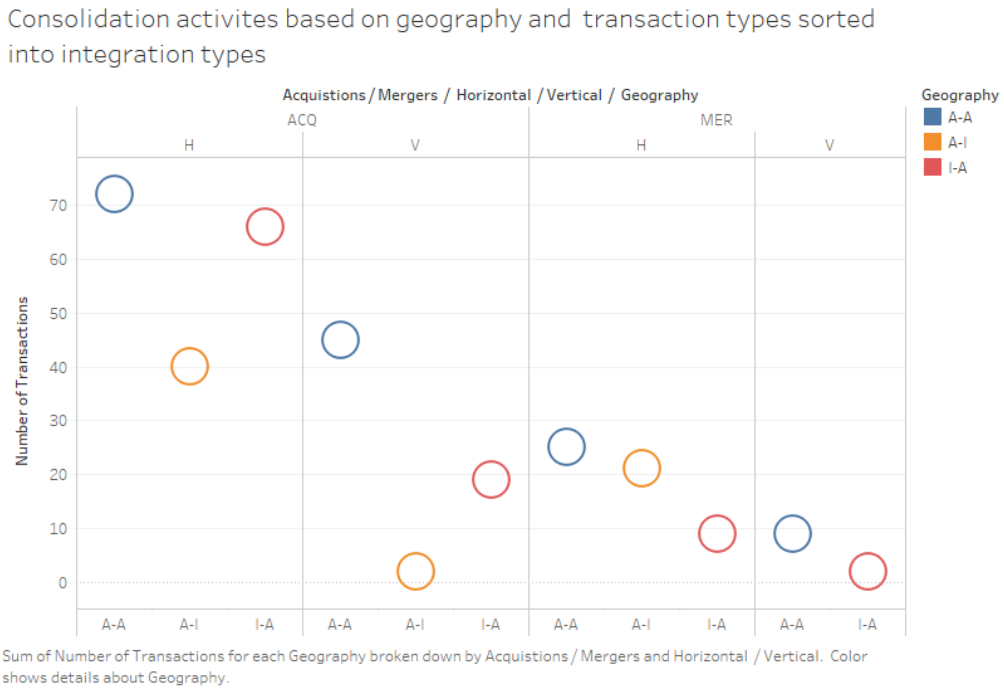

Figure 24: Mergers and acquisitions data model 2.

The second model (Figure 24) expands the analysis from first model by breaking it down to horizontal or vertical integration. For the Australian-to-Australian consolidations (blue), there were seventy-two horizontal integrated and forty-five vertical integrated acquisition transactions. For the mergers, there were twenty-five horizontal integrated and nine vertical integrated transactions. For the Australian-initiated consolidations of international firms (orange), there were forty horizontal integrated and two vertical integrated acquisition transactions. While for the mergers, there were twenty-one horizontal integrated and zero vertical integrated transactions. For the international-based firms (red circle), there were forty-five horizontal integrated and nineteen vertical integrated acquisition transactions. For the mergers, there were nine horizontal integrated and two vertical integrated transactions.

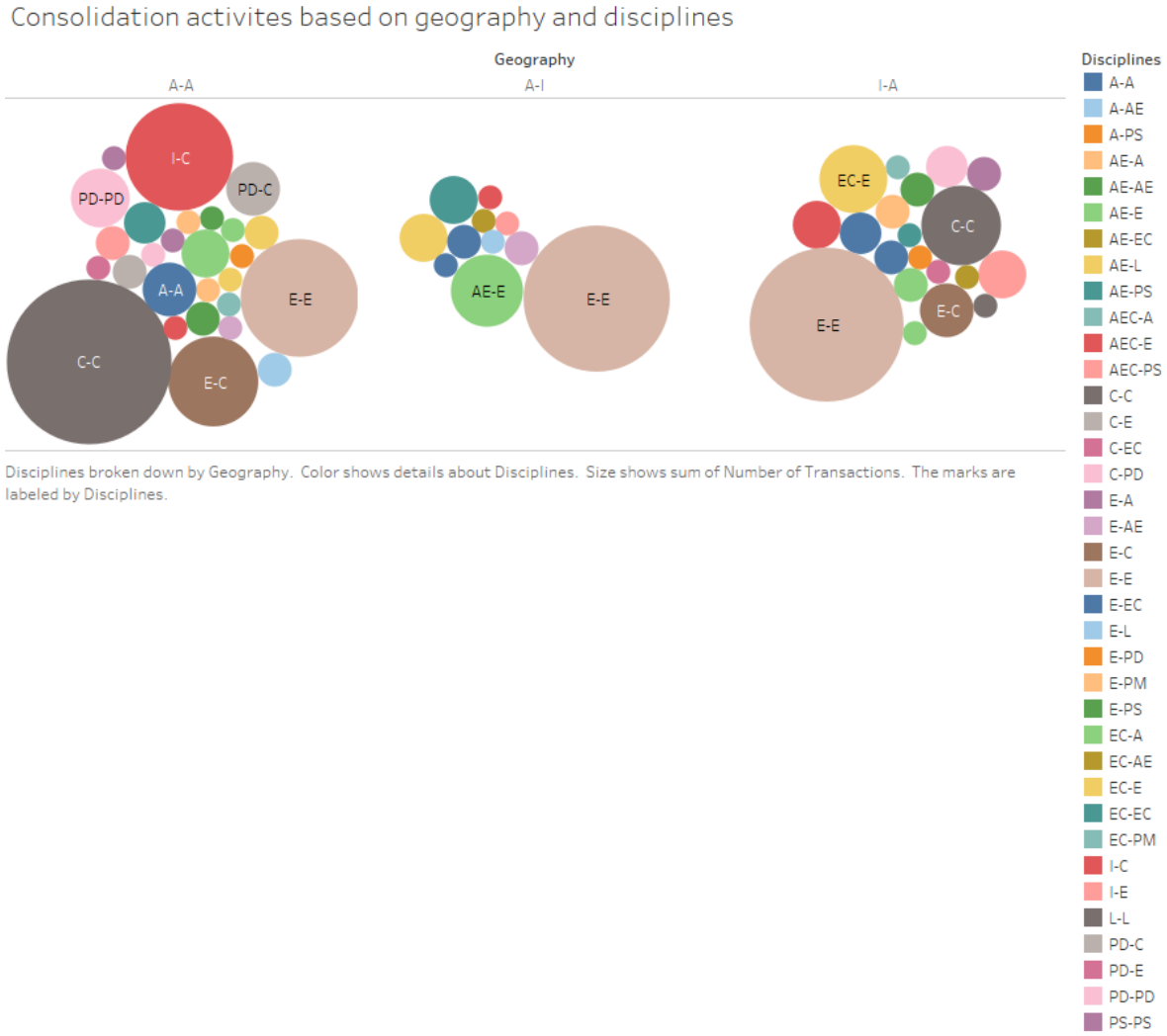

Figure 25: Mergers and acquisitions data model 3

The third model (Figure 25) outlines the consolidations activities based on geography. The three columns represent the Australia–Australia, Australia–International and International–Australia consolidations. Under each column, the size of the cluster is based on the absolute numbers of consolidations over the ten-year period. A cluster is sized in proportion to the other clusters. Each of the circles in each cluster is proportional to their absolute number. Their size changes in relation to their cluster. Each of the circles represents the discipline of the firm. They give an idea of what type of built environment firms are doing mergers and acquisitions.

The combinations of letters indicate what type of disciplines were involved in the consolidations. The letters before the hyphen represent the initiating firm, while the letters after the hyphen represent the acquired or merged firm, who accepted the offer. This is explained in Section 6.5.1.

The fourth model (Figure 26) expands the view of the third model. Each of the location is split into horizontal and vertical integration. The horizontal integrations occur across the different discipline clusters. As for the vertical integration, the firms are getting bigger but expanding into different areas of the built environment value chain.

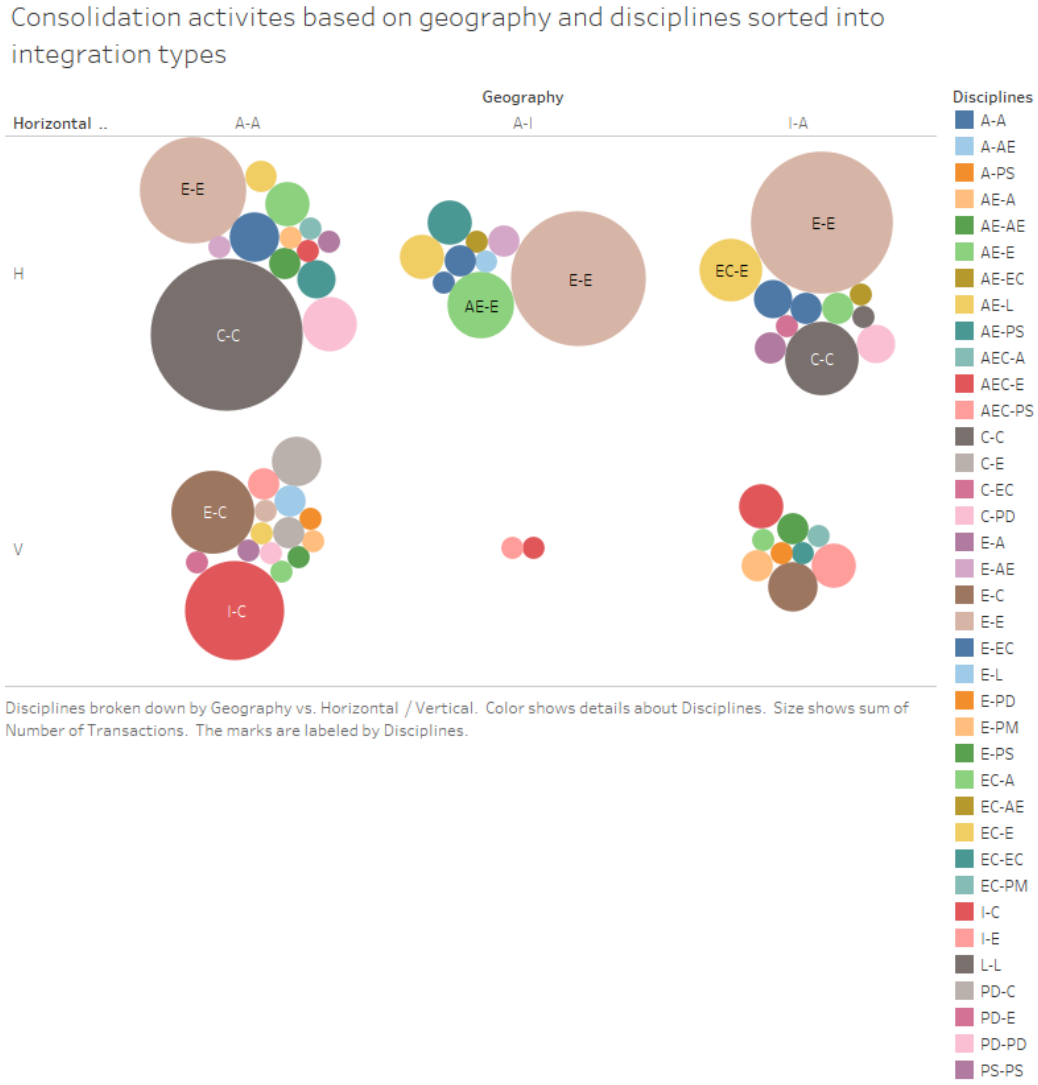

Figure 26: Mergers and acquisitions data model 4.

6.6 SUMMARY

This chapter outlined the primary data collection efforts in terms of the survey, interviews and merger and acquisition data. It was the actual execution of the research design as discussed in the previous chapter. Following the data collection efforts, the data were analysed within the context of the five theoretical pillars. The next chapter discusses the analysis of the interviews with engineering consultants and their clients.

7 ANALYSIS

7.1 INTRODUCTION

This chapter analyses the research interviews (Table 2 on page 78 and Table 3 on page 82) and M&A data (Figure 23 on page 88, Figure 24 on page 89, Figure 25 on page 90 and Figure 26 on page 92). This chapter is divided into seven parts. The first part is the introduction, which discusses how the analytic cycle was conducted. The following five parts discuss the research data based on the five theoretical pillars – CECs, clients (buyers), decision makers (leading the business) and commercial consultancy services. The seventh part concludes the chapter. The analysis considers the power of the CECs and the clients in the market to determine competitive strategies and prices.

7.2 CODING PROCESS FOR RESEARCH INTERVIEWS

As outlined in Section 5.5.3, content analysis was selected as the method of analysis for the interviews. This method was selected for the ease and reliability of interpreting the written text. Dawson (2002), Krippendorff (2004), Richards (2014), Rugg & Petre (2007), and Saldaña (2016) outline different techniques. In order to conduct the content analysis, the interview transcripts had to be coded. Saldaña (2016) advocates a four-pronged approach for coding in qualitative research: first cycle coding (first coding), after first cycle coding (second coding), second cycle coding (third coding), and after second cycle coding (fourth coding). Rugg & Petre (2007) outline a three-part linear process: verbatim, gist and superordinate. The hierarchical layout of the codes follows Richards (2014), Rugg & Petre (2007), and Saldaña (2016) recommendations.

In order to select the different coding methods, appropriate for the research questions, two conditions were evaluated.

> Condition 1: 'Epistemological questions address theories of knowing and an understanding of the phenomenon of interest' (Saldaña 2016, p. 70).'

And

> Condition 2: 'These types of questions suggest the exploration of participant action/processes and perceptions founds within the data' (Saldaña 2016, p. 70).

The research questions ask if micro-economics and/or institutional economics can explain the competitive strategies used by consulting engineering services for built environment projects (Condition 1). They also ask if these competitive strategies are part of a common framework i.e. processes and perceptions (Condition 2). The interviews are

coded using a four-part cycle, which is outlined by Saldaña (2016). Saldaña (2016) wrote a coding manual for qualitative researchers, which discusses different coding styles used in research. This cycle was applied to the seven pilot study interviews to establish and refine the codes. The coding process was repeated for the twenty-six main study interviews. The cycle is shown in Figure 27 below.

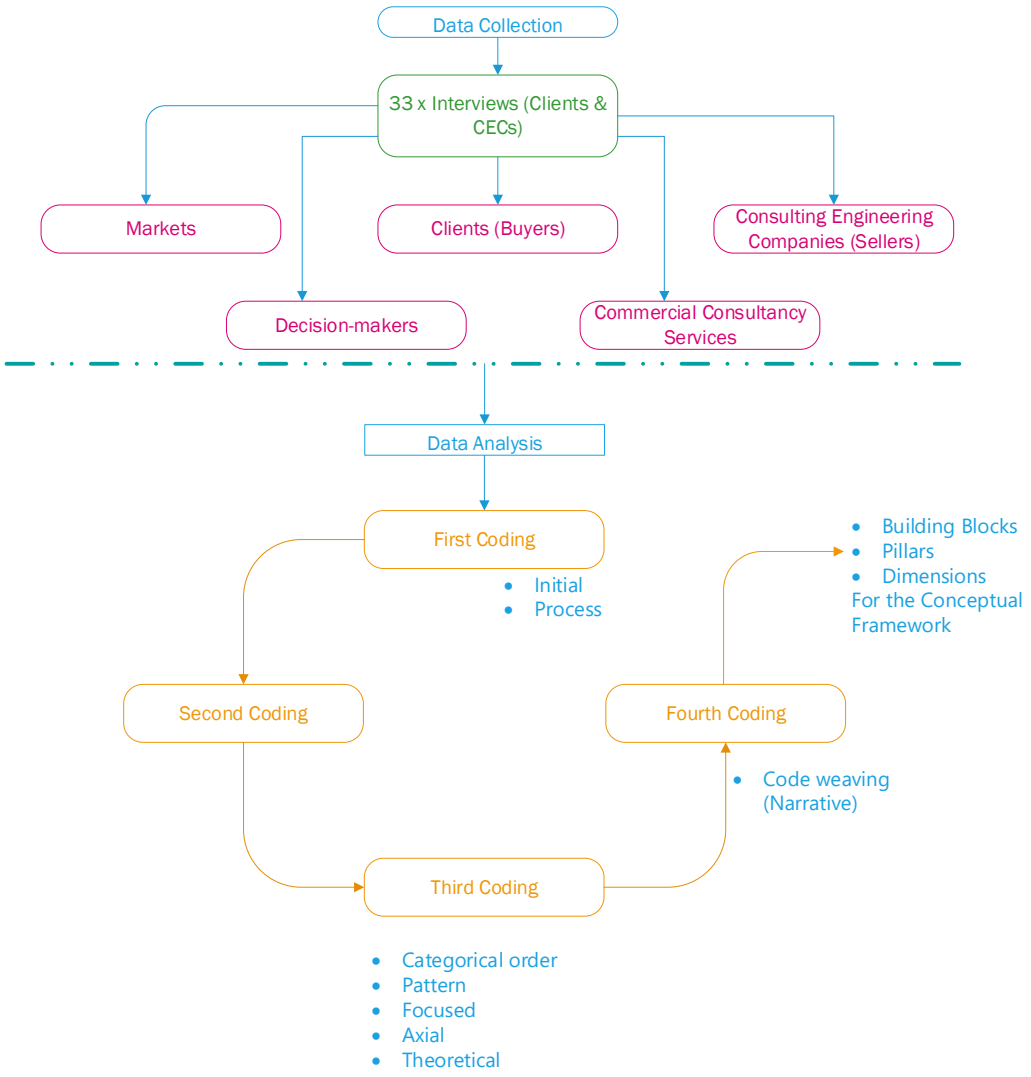

Figure 27: Data analysis - Interview execution map.

The content analysis combined the three-pass linear approach outlined by Rugg & Petre (2007) and Saldaña (2016). While Rugg & Petre (2007) explain the process, Saldaña (2016) gives details of how to conduct coding. An initial list of coding methods are considered: Descriptive, Process, Initial, Versus, Evaluation, Dramaturgical, Domain and Taxonomic, Causation, and/or Pattern Coding plus Theming The Data (Saldaña 2016).

Descriptive coding is more useful for a detailed inventory of the research artefacts, field notes and documents (Saldaña 2016). On the other hand, process coding uses gerunds as codes as it 'connote[s] action in the data' (Saldaña 2016, p. 111). It is used as a technique of attuning the coder to the participants' perspectives and actions. Initial coding is selected as an additional coding technique to provide suitable depth to the analysis. Initial coding reduces the data into smaller components and reviews them for resemblances between smaller components (Saldaña 2016).

Process and initial coding techniques were used in the first coding phase. The initial coding was a line-by-line in-depth review of the transcript. Process coding used gerund forms of the verbs, which functioned as nouns, as the code while the line-by-line review was being conducted. The second coding phase was used to prepare an initial hierarchy of codes. The initial hierarchy consisted of fifteen meta-codes based on the first coding of the interviews.

The third coding phase reduced the hierarchy of fifteen meta-codes into a categorical order of eight meta-codes. This ordering was further streamlined in the fourth coding into the five theoretical themes (five analytical pillars). There are four types of third coding: axial, focused, pattern and theoretical (Saldaña 2016). The pattern type was applied initially to develop the explanatory or meta-codes for the results from the first phase. Focused and axial coding were applied, whereby the codes were transformed into nodes. The nodes were the parts of the hierarchy that represented the different branches of analytical inquiry.

The hierarchy of codes was created from the coding of the interviews in NVivo 11. The most frequent codes were identified, and they were sorted into the different branches, with an identifier node as shown in Figure 28 below. Appendix section 10.4 gives the codebook used in the analysis. The term node is used because of the NVivo 11 coding process. The code is the word or phrase that was used to highlight an idea in the analysis. The node represents a level of summary of the different codes. These nodes can be at the levels of meta-code (highest level or parent node), meso-code (the next level derived from a parent node – child node), and code (the next level derived from a child node – grandchild node). Parent, child and grandchild nodes are equivalent to Krippendorff (2004) and Saldaña (2016) meta-code, meso-code and code hierarchy.

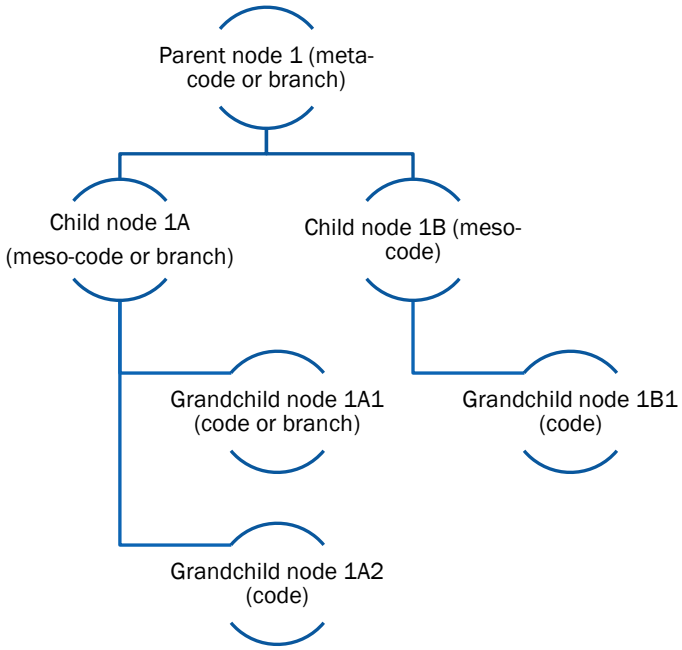

Figure 28: Hierarchy of meta-code, meso-code and code/Parent, child and grandchild nodes hierarchy.

The synonymous codes were combined, and the most suitable names were selected for the different branches. Usually synonymous codes were at the great-grandchild level, which were aggregated and represented by a grandchild node. The hierarchy was analysed again to develop the central categorical identities that best described the problem being investigated. Furthermore, it provided the basis of the discussion of the problem and its solution.

In the fourth code phase, code-weaving was used. The codes (nodes or branches) were weaved into a narrative to explain the problem. The description of each code was expanded and the theoretical arguments for and against the ideas were developed. Chapter 7 expands the materials from the topic sentence (node description) with support from the data collected from the interviews and the M&A data. The material is expanded further into a conceptual framework in Chapter 8.

Next, the first analytical node (market) is discussed within the context of the interviews and the M&A data.

7.3 MARKET

The market pillar discusses the economics associated with the consulting engineering market as shown in Figure 29 below. The figure shows the parent node (meta-code) and the child nodes (meso-codes), which were derived from the coding of the interviews and M&A data. The child nodes of the market pillar are discussed in the various sections. The market boundaries are discussed in terms of the discipline, geographical and economic

sectors. The market boundaries are part of the *market* meta-code or parent node, which is discussed first. The pricing strategies of CECs are discussed. This node also covered how the growths and declines of various sectors of the economy alter how the CECs perform. The Global Financial Crisis (GFC) of 2007 affected the multinational CECs in different ways and they had to make a few adjustments to their competitive strategies (CEC1; CEC2; CEC3; CEC10; CEC15; CEC16). The CECs contemplated whether to bid or not, where they decide if they will bid on projects based on the competition they would face. The subsections discuss these nodes.

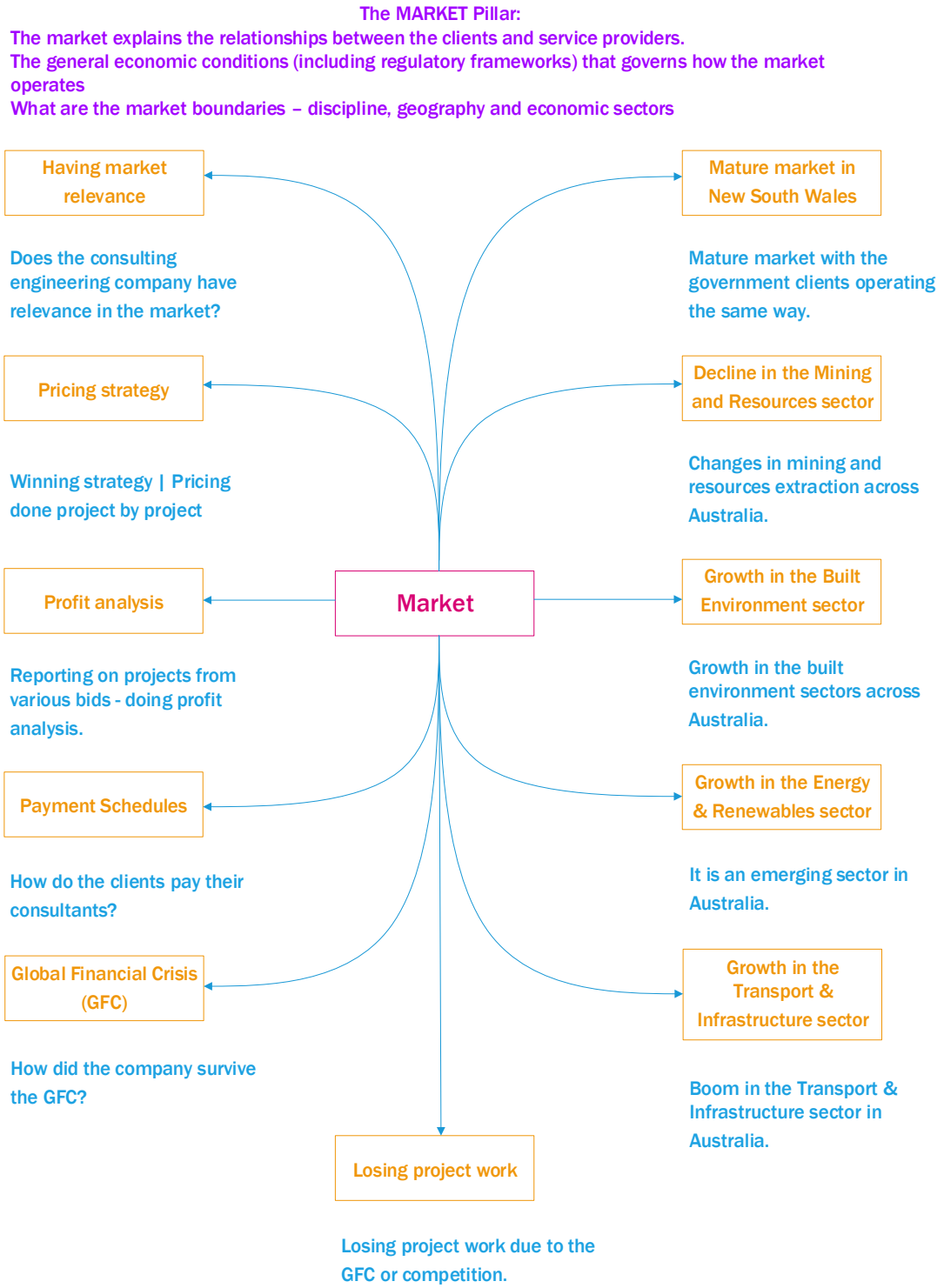

Figure 29: The market pillar (meta-code) and its components (meso-codes).

7.3.1 Market boundaries – geography, discipline and client sectors

The market is classified at different levels of detail. As discussed in Section 1.4, the Australian Bureau of Statistics (2006) Australian and New Zealand Standard Industrial Classification has nineteen different meta-levels for economic activities in Australia. Furthermore, the market for the consulting engineering class of business can be

subdivided into three types: discipline (knowledge), geography (location) and economic sectors (clients).

The operational markets are congruent with the built environment market. The geographical markets are based on the physical locations of where the companies are based and where they do projects (clients' locations). Each of the geographical locations have competitors and different political, legal and cultural nuances, which affect the performance of the CECs. The discipline markets are the different technical areas of consulting engineering (Australian Construction Insights 2017; Engineers Australia 2016; Greeno & Hall 2008). The CECs have their expertise and compete against other CECs. The popularity and uniqueness of the disciplines influence how many competitors are in the market, and the perception of the clients to the discipline (and sub-disciplines).

The sector markets are based on the different client types, where the CECs competed against each other. These sectoral markets were shifting between public sector and private sector clients. The public sector and private sector are very broad classifications, which were further broken down into small sector classifications for more targeted business tactics from the CECs.

The three types of markets were shifting because of the consolidations and divestures amongst the CECs (AA2; AA3; PD1; PD2). The consolidations are were CECs combine with other CECs by being acquired or merged. The divestures are where the CECs are sold off in parts or whole as part of an acquisition or merger. The CECs were acquiring and merging with other CECs, as shown in Figure 26 on page 92. These activities could see the creation of new CECs as intellectual resources split from their old companies because of the consolidations amongst the CECs (CEC13; CEC23). The consolidations and divestures mean the CECs were entering new geographical locations as they absorbed and start up new commercial operations. Additionally, they were acquiring and merging with architecture and construction companies. The client boundaries also shifted as consolidations and divestures happened within the client companies (PD1; PD3; PM1) as shown in Figure 26 on page 92.

Engineering and business-enabling technologies were also changing the landscape of markets. As new engineering technology and engineered materials with their accompanying new construction methods arise, the discipline markets will undergo changes (CEC1; CEC2; PD1). CECs, who are at the forefront, can bring new technologies to the built environment market. However, they must be prepared to lay the foundation since clients are not always ready to adopt or adapt to the newest technologies.

Nevertheless, the changes will cause a shift in the supply and demand functions and the buyers (clients) and sellers (CECs) must adapt.

Therefore, the markets will see different styles of commercial services operations as the CECs execute their strategies across the different markets – discipline, geography and economic sectors. With shifting client boundaries and changing technologies, the CECs must be ready for adaptation where applicable. Their leadership and management styles must adapt to new ways of working, new ways of contracting, and changes in how the client views CECs. This adaptation impacts on the pricing strategy employed by the CECs, which is discussed below.

7.3.2 Pricing strategy

The CECs discussed having a pricing strategy, which influenced their success rate for winning project work from the clients (CEC4; CEC7; CEC14; CEC15). Their pricing strategies were developed from a mixture of computer-based decision modelling and the intuitive judgement of the decision-makers. The decision modelling considers the profit margins, resource histograms, and the costs of use for the assigned resources. Additionally, decisions took into consideration the project risks, effort required and the types of clients. The competitiveness of the CECs related to how well they could command a profitable price for their services.

The CECs, who operate in the commoditised engineering market, raised or lowered their profit margins based on the level of competition they faced. They consider it necessary when there are open tenders, where they were competing against several consultants (CEC1; CEC3; CEC9; CEC10). Additionally, some CECs lowered their fees considerably more than their other competitors to win projects (CEC 13; CEC15; CEC16). This has resulted in some depression in the fees across some of the engineering sectors, for example, general mechanical services. The competitive lowering of fees results in a commoditised engineering market. The undervaluing of engineering work by clients can drive the price down if the CEC accepts the lower price demanded by the clients (CEC5; CEC7). This results in a downward spiral where the consulting engineering firms can experience a reduction in their bargaining power with their clients.

The high-end CECs preferred to bid on projects with a limited set of other CECs (CEC2; CEC11). The high-end CECs were the firms that worked on prestigious projects and could command a higher price for their services when compared to their competitors. If the CEC had a unique service offering, they could charge a premium for the services (AA3; CEC2; CEC7).

Pricing decisions take into consideration various factors. These factors can include the amount of intellectual resources needed for the projects, the quality of the client (easy or difficult to work for), project complexity, the willingness to do the work for the risks involved, and similarity to other projects. Additionally, the decisions involved a review of what type of competition was around the project and where the project would take place. Furthermore, they considered whether the project had a potential to advance the skill sets and knowledge of the staff working on the project or to raise the profile of the company (CEC2; CEC14; CEC15; CEC16).

Depending on the project, some CECs price their bids with a lower profit margin to get their feet in the door with the client. Then they priced new projects with a higher profit margin with the same clients (CEC15; CEC16). On other occasions, the CECs used the opportunity to bid to get themselves in front of the client to be considered for future work (CEC17). A project priced with a too low profit margin may go on for longer than planned and the CEC cannot achieve the desired profit margin (CEC4).

Competitive bids were priced based on the risk level of the project. If the job was particularly risky with a new client or outside of the Australian jurisdiction, the proposed fee would change to account for the risks, usually with a higher price (CEC2; CEC17). If the CEC could reduce the cost of construction and reduce the time with their proposed design, that would be a significant advantage for their builder-client (CEC4; CEC5; CEC22). If the relationship was a trusted and long-term one, the CEC offered favourable pricing for their partner contractor companies. There was usually a bonus payment if the contractor's bid was successful (CEC7; CEC17; CEC22). The CEC's fees were developed from the time required to do the project, percentage of construction costs or the number of drawings to be done. It was noted that the client was not price sensitive when they came for the expert opinion from specialist CECs (CEC2; CEC7; CEC14; CEC15; CEC19).

The competitive (and pricing) strategy for the CECs was based on a combination of expertise, client type, project type and project risks. The different CECs had different pricing approaches available to them based on those competitive factors. Once the projects had been awarded, the CECs had to manage their execution. Each project had a different profit earning potential because of variations in the project environment. The profit analysis is discussed in the section below.

7.3.3 Profit analysis and payment schedules

Since the different engineering projects had different profit-earning potential, the CECs reviewed their competitive strategies. Profit analysis was useful for reviewing competitive actions relating to disciplines, clients and projects. With the different market boundaries,

the CECs were reviewing the profits across their different operating lines. The use of cloud-based analytics software provided greater insights into the performance of the projects based on clients and operating units (CEC1; CEC10).

It was acknowledged that profit margins were the not the same for every project. However, the collective combinations of all projects were reviewed against performance targets at the end of the financial year (CEC10; CEC11; CEC12; CEC14). Additionally, monthly reviews of revenues and profit-and-loss statements provided up-to-date information so the companies could sort out any issues with their clients (CEC17). Payment schedules were important as they impact on the cash flow for the CECs (CEC7). Project management impacted on maintaining a profitable project as it related to client engagement and engineering resources applied to the project (CEC17; CEC5; PD2; PD3; PM1; PM2).

Profit analysis honed the competitive advantages of the firms, as they could understand what factors improve their ability to win work. However, they could still lose project work because of various factors. This is discussed in the next subsection.

7.3.4 Losing project work and the Global Financial Crisis

International CECs are entering into the Australian market through their M&A activities and this increased the competition experienced in NSW (CEC16; CEC17; CEC18; CEC20; CEC23). This was experienced by CECs in the commoditised engineering market. As a result, companies had to work even harder to win the same value of profit as before (CEC3; CEC4; CEC5; CEC9; CEC22). As a result of this increased competition, some of the CECs have lowered their fees to win work (CEC4; CEC5; CEC9; CEC22).

With the changes in economic sectors, CECs must adapt to the changes in their markets. The adjustment was harder for those with exposure in the declining economic sectors, for example, mining, and energy extraction. Other CECs were better off because their specialisations placed them earlier in the design and construction project life cycle (CEC14). For example, if the CEC's discipline(s) were used in the development approval process – environmental or geotechnical engineering. Alternatively, if the CECs were part of an already-started project they face lesser exposure from the economic downturn (CEC11).

Some CECs diversified their client bases in their respective economic sectors (CEC10; CEC12). For example, one of the largest consulting engineering practices stayed afloat and rode out the GFC of 2007–2008 because they were involved in a variety of projects from different sectors: from aged-care facilities, schools and historical building restoration to commercial retail buildings and industrial projects (CEC2). The firm had exposure to the GFC because they had North American and European operations. For international

CECs, the Australasian operations carried the North American and European operations through the economic downturn caused by the GFC (CEC1; CEC2; CEC15). Residential construction remained steady across the Australian economy from the start of the GFC in 2007 and continued steadily to 2018, which provided steady work for CECs and architects in that market sector (Australian Bureau of Statistics 2018, 2019; Ellis 2017b; Infrastructure NSW 2018).

7.3.5 Mature market in New South Wales and market relevance

The competitiveness of the NSW market meant not all CECs could win work every time they made a bid. The market in New South Wales was considered mature and the firms competed to be relevant among the clients. Maturity comes from the fact that, to grow, the companies needed to buy access to new clients and knowledge. Consolidations in the market means the remaining firms compete to maintain market share. Are the firms relevant to the clients' needs in the market? As a result, the CECs were increasing their visibility in the marketplace. They looked at business development opportunities where synergies between their commercial engineering practice areas and clients' needs could be achieved. This meant tailoring their client acquisition and retention efforts based on the clients' priorities. This niche targeting was linked to their competitive strategies. They channelled their market intelligence into winning more work from clients (CEC4; CEC10; CEC17; CEC22). The firms were focusing on their market relevance as the different economic sectors experienced different growth rates, as discussed in the next subsection.

7.3.6 Decline and growth in economic sectors

The downturn in the mining and resources sector affected several CECs. The downturn was caused by the drop in mining commodities' prices and the decline in the demand for non-renewable energy sources. The mining and resources sector was a key tenet of the Australian economy because of the investments in the sector (Lowe 2017). In 2018, the mining and resources sector contributed 8%, and the construction sector contributed another 8%, to the economic output of Australia (Reserve Bank of Australia 2018).

If the CECs had offices in Western Australia and Queensland, and were exposed to mining and resources sectoral projects, there were organisational layoffs (CEC1; CEC4; CEC13). There were some impacts in New South Wales, with the coal mining operations in the Hunter region and Port Kembla facing economic challenges because of the downturn (CEC5; CEC13). However, there was growth in the renewable energy sector (CEC1). While mining investment (capital expenditure) declined, there were still mining operations and exports, for example, Liquefied Natural Gas (LNG) exports (CEC7; CEC16; Ellis 2017b).

There was a constant positive outlook for the building sector in New South Wales by the various CECs (CEC1; CEC2; CEC10; CEC12), which was supported by the client companies (PD1; PD2; PD3; PM1; PM2). They believed there was work available in the building sector. This was followed by the growth in the transport and infrastructure sectors, with investments across New South Wales, Australia Capital Territory and Victoria respectively (CEC1; CEC5).

The market pillars discussed how the market was delineated by discipline, geography and economic sectors. The CECs adjusted their competitive strategies based on the economic conditions in the various economic sectors. This resulted in different pricing strategies and profits based on varying project environments. With competitive market subdivisions, the CECs competed in a mature NSW market and for market relevance with their clients. The CECs had a probability of winning or losing project work based on the competitive strategies. With the various market conditions, the CECs attempted to sell their services to the potential clients. Those sellers are discussed in the next section.

7.4 CONSULTING ENGINEERING COMPANIES (SELLERS/SERVICE PROVIDERS)

This section discusses changing economic conditions caused by consolidations and divestures in the industry (M&As). The CECs changed their competitive strategies because of the economic changes as they faced an increasingly commoditised engineering market. The professional relationships between the competing CECs and the relationships between CECs and with clients are discussed in this section. Figure 30 (below) shows the *consulting engineering companies* meta-code (parent node) and its sub-components (child nodes) from the coding of the interview data and M&A data models.

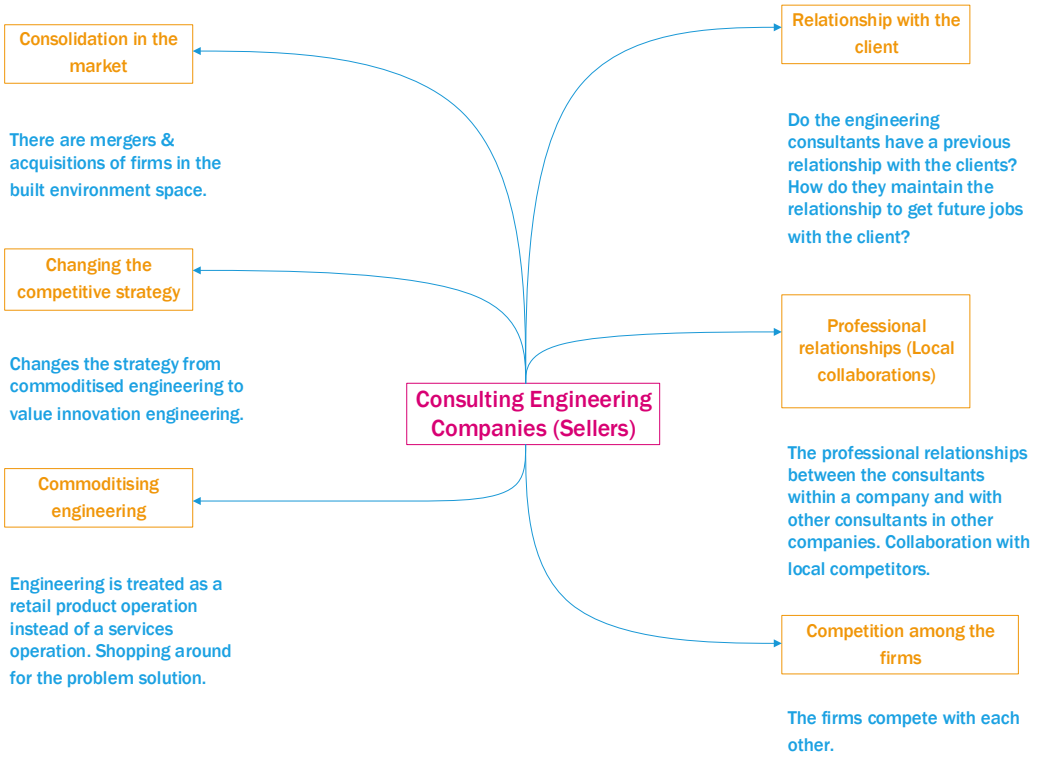

Figure 30: The consulting engineering companies (sellers) pillar (meta-code) and its components (meso-codes.

7.4.1 Consolidation in the consulting engineering market

Consolidation in the consulting engineering market changed how the CECs compete. It changed the power dynamics across the industry as it rearranged the market relevance of the different firms. The CECs merged into bigger firms or CECs bought other CECs to form bigger firms (CEC13; CEC14; CEC20; CEC22). Senior people left their CECs to establish their considerably smaller companies. Discussions in the interviews centred around the large CECs versus small CECs, and the differences between specialised CECs and multidiscipline, multi-sectoral CECs in terms of the number of disciplines and economic sectors they operate in the built environment. The size refers to Swanepoel & Harrison (2005) business size classification.

CECs added new engineering disciplines via organic expansion (hiring new staff), acquisitions, and merging with other engineering practices. They expanded their commercial discipline ranges by including architecture, construction, environmental management, facilities management, planning, and quantity surveying (CEC3; CEC10; CEC17). Some of the CECs became publicly-listed companies in Australia and on other international stock exchanges (CEC3; CEC10). Nevertheless, there were still some local CECs operating only in Australia (CEC4; CEC5; CEC6) and some operating in their state of origin only (CEC8; CEC9; CEC13).

The consolidations in the consulting engineering market were cyclic; small and medium-sized firms were absorbed by bigger firms. When the market tightens up, smaller boutique firms split off from the bigger firms in a wave of divestures. Then the M&As started back up again. These M&As increased the size of the projects that the firms were capable of handling. They also increased the in-house expertise of the firms so they could tackle their clients' current and emerging engineering problems.

With consolidations, the large-sized CEC is divided into different business units. Each of the different business units run like a small business within a larger business unit (Australia). For example, the larger business unit would be the Australia-based operations, but each state is a smaller business unit. This was found in the CECs with international offices (CEC1; CEC2; CEC16; CEC17; CEC18; CEC19; CEC21). Each of the business units had their various key performance indicators (KPI) in terms of monthly earnings, profit margins, headcounts, operating costs, active projects, and projects in the pipelines, to name a few. The Australia-only CECs followed the same model as well in terms of maintaining KPIs for their different disciplines or business units. The cultures of the merged or acquired firms had to be integrated into the new entity (CEC1; CEC7; CEC10). The way of doing business could alter as new leadership and demands were put on the current local operations. Companies that were now part of a publicly traded company, had to adjust their operating cultures as there were certain requirements on financial reporting and meeting financial targets that were expected of publicly traded companies (CEC10).

However, the organic growth of some CECs meant they could specialise in certain discipline combinations without becoming an international giant. They decided not to expand outside of their specialisations but became the largest firm in terms of engineering intellectual resources in a particular specialisation. Nevertheless, they were still competitive with their larger international CECs (CEC2; CEC6; CEC7; CEC11; CEC15).

The consolidation of the engineering industry impacted on the size of the CECs. It impacted on their competitive strategies, responses to competition amongst the firms and the rise of commoditised engineering. This is explored further in the next subsection.

7.4.2 Changing the competitive strategy, Commoditising engineering, and Competition among the firms

The CECs changed their competitive strategies considering the consolidation in the market and the changes in the competition amongst the firms. CECs diversified their service offerings of disciplines, moving to become multidiscipline and multi-sectoral

companies. This diversification required changes in their competitive strategies. They got new clients based on the new service lines they offered (CEC6; CEC16).

Some of the multidiscipline CECs made it a point to be selective in the areas where they were competitive (CEC2; CEC7; CEC21). Additionally, the CECs shifted their competitive strategies by working on innovative and difficult projects. Innovative projects are those with new architectural designs, new engineering materials, green designs and sustainable technologies. The difficult projects are those that require a new way to design and construct the built environment artefacts. They were moving from commoditised engineering (transactional engineering projects) to innovative engineering project, although, the power of their clients still drove this type of engineering (AA3; CEC1; CEC2; CEC3; CEC13; CEC15; CEC16; CEC17; CEC23).

The CECs are engaging in more value co-creating with their clients' needs (AA3; AA4; CEC2; CEC12; PD1; PD2). This could be done by funding research, which could impact on their engineering practice and on their clients (CEC15). The research adds new knowledge to their design practice, which could then be incorporated into the design for the clients. Alternatively, they could cultivate highly skilled domain experts with unique skills that other CECs did not have (CEC10; CEC11; CEC14).

The commoditised engineering market is all about pricing, that is, having the lowest fee for a particular project (CEC10). The competition in the market has driven the CECs, who operate in the commoditised market, to be conscious about their profit margins (AA3; CEC1; CEC10; CEC12; CEC14; CEC15; CEC21). However, it can lead to depressing of prices and lower profits for the firms as they feel the pressure to lower their rates to win work (CEC5; CEC7; CEC10; CEC12). This can cause a race to the bottom on fees, where the discipline or geographical market is not as profitable as before. The CECs lose power to set their prices as they are driven to reduce their price to meet clients' demands for lower priced engineering services. Nevertheless, there are some areas where CECs are able to charge a higher profit margin, which is in the area of expert witnesses and domain experts for policy areas (CEC7; CEC11; CEC20).

Changing competitive strategies can lead to firms working with their competitors to deliver engineering services to their joint clients. This professional relationship is discussed further in the next section.

7.4.3 Professional relationships

CECs were collaborating with their competitors, and not only competing (CEC2; CEC16; CEC17; CEC19). Some of their competitors could be management consulting companies who were hiring engineers as well. The CECs provide the technical expertise and the

management consulting companies provide the brand recognition and management expertise for the clients (CEC16). Early contractor involvement provided opportunities for partnerships between the CECs and construction companies on the design and construct contracts to compete for work with clients on large projects (CEC19; CEC22). They concentrated on what they are good at doing. The partnership is about pooling intellectual and financial resources. They could approach them as joint-ventures or contractor–subcontractor relationships (CEC3; CEC16).

With sector-focused organisations, multidiscipline CECs had greater collaborations amongst their different engineering disciplines. Additionally, they aimed to train more of their people in order to provide more subject matter experts (CEC8; CEC19; CEC23). The CECs could be clients of each other. They could hire another company to do part of an engineering design, act as a speciality peer reviewer, or provide advice on a highly specialised area, where the hired company is the leading expert (CEC3; CEC14; CEC20; CEC23). The professional relationships between CECs fuses into the competitiveness of the CECs as they can build on the professional expertise of one another. This can impact on the relationship with clients as they benefit from the collaborative relationships amongst the CECs.

7.4.4 Relationships with clients

Relationships are factored heavily in the selection of the engineering consultant, especially those in non-competitive scenarios. The professional knowledge provides a competitive advantage to the CECs who are in the value innovation market space (CEC1; CEC2; CEC15). The relationships between the CECs and the client companies are usually based on the individual relationships between the engineering consultant and client representative (architect, project manager, commercial manager) (II1; PD2). Even if the engineering consultant moves around to another CEC, the client will move with him/her as long as they are happy with the quality of service (AA3; AA4; CEC20).

Clients usually have decisions to make around splitting their engineering contracts – do they go with multidiscipline consulting engineering contracts or do they go with single discipline contracts. For example, CEC8's two-discipline engineering consultancies and CEC11's four-discipline consultancies do not see it as a major concern in competing with multidiscipline firms, as they know that clients usually split their engineering consultancy contracts by disciplines. This split may happen because the clients want to guarantee that they will get dedicated consultants at their coordination meetings (CEC8; II1; PD1; PD2). However, the larger multidiscipline CECs acknowledge that they are competing with

smaller single discipline CECs (CEC14). This is usually the case when they are competing for speciality engineering contracts (CEC2; CEC11; CEC14).

The relationships between some CECs and their clients are affected by the consolidation experienced in the industry. Some of former principals of the CECs do work for the company after the purchase of their firm, while others may set up another competing CEC at the end of their 'golden-handcuff' arrangement (AA2; CEC7; CEC10; CEC14). The golden-handcuff arrangements refer to the non-compete exclusivity agreement where the principals of the bought-over CEC stay on to work for the new firm for a period. Because of the relationships they have with their clients, their clients can also leave with them or assign them smaller jobs depending on the nature of the consultancy (AA1; AA2; CEC22). Clients were willing to give jobs to the newly established CECs because they had become dissatisfied with some of the bigger CECs after a previously smaller firm had been acquired. This can change the relationship between the client and the engineering consultant (CEC7) because they want the one-on-one relationship with the particular engineering consultant for each discipline (CEC8; II1; PD2). Eventually, these smaller operations grow again into small and medium-sized CECs and they become competitive with their larger contemporaries.

Clients were willing to work with engineering consultants across borders. It was not just about being physically located in the same area as the client (CEC4; CEC6; CEC15; CEC22). The client's perception of the CEC was important as it influenced the probability of winning international work (CEC4; CEC11; CEC15). This was also supported by using off-shoring engineering design centres and virtual communications technologies by some of the larger CECs (CEC1; CEC3; CEC5; CEC16; CEC17).

This was the basis of the relationship between the CECs and the clients. This was influenced by how the engineering market was affected by the consolidations, changing strategies, and relationships. Every relationship has a power dynamic. Next, we review the clients and their power in the relationship.

7.5 CLIENTS (BUYERS)

The *client (buyers)* pillar discusses the organisations that are clients of the CECs. The pillar discusses how the clients procure and manage consulting engineering services. It also discusses the changes in the contract delivery between the CECs and their clients. This section discusses the power of the client in terms of how they influence the decisions of the CECs. This is show in Figure 31 below. It was derived from the parent node (clients/buyers) and the child nodes.

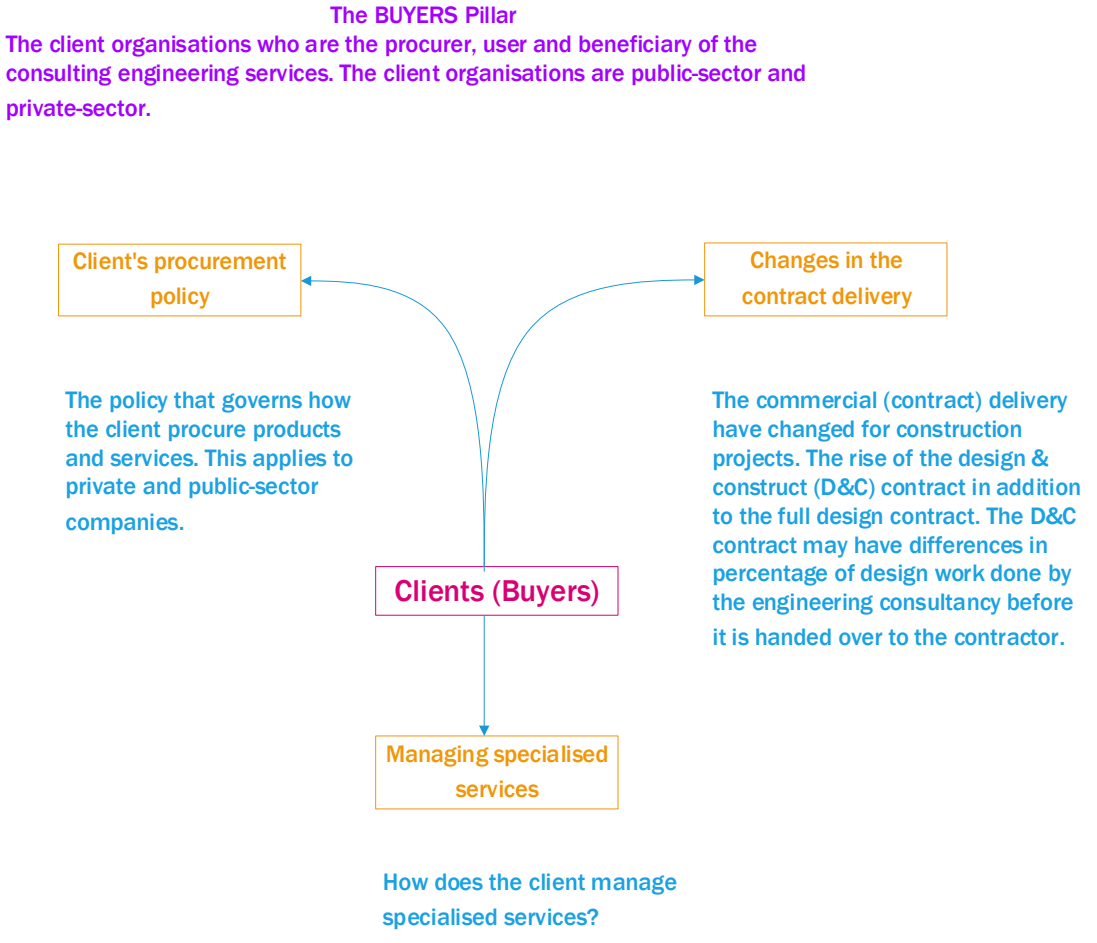

Figure 31: The clients (buyers) pillar (meta-code) and its components (meso-codes).

7.5.1 Client's procurement policy and Managing specialised services

The client's decision-making is influenced by its procurement policies and practices. Through their procurement policies, the client can demonstrate their power on the market. When the clients select CECs, they signal to the market which of the CECs' competitive strategies work. Their procurement policies indicate what the clients are looking for when evaluating CECs' competitive bids. The CECs are subjected to the procurement policies and this impacts how their competitive strategies work.

The decision-makers in the client companies had different backgrounds – architecture, business, engineering, law and supply chain. Some client companies had in-house engineers to help evaluate the various bids in order to make their selection (II1; PD1; PD2; PD3). They performed peer reviews on the submitted designs from the engineering consultants. When the clients' project managers were selecting the engineering consultants, they asked for the opinions of the in-house specialist engineers (II1; PD1; PD2; PD3). They selected CECs that have the resources to deliver on major projects. They

knew who the big players were in the state and they went to the best suited CECs for the projects. Depending on the project, the clients' project managers may have decided if they will lump the different services (disciplines) into one engineering consultancy contract. The multidiscipline approach is good for design management and coordination. There is one point of contact for the project manager. However, structural engineers were usually stand-alone contracts (CEC8; CEC11; PD1; PD2). They are key engineers in building projects.

The complexity of the project influenced the selection of multidiscipline versus single discipline CECs (CEC2; CEC8; CEC11; II1; PD1; PD2; PD3; PM1). Some clients preferred to split their complex projects into single engineering discipline contracts while others preferred the coordination benefits of using multidiscipline firms (AA3; AA4; PD1; PD2; PM1). The client companies explained what they classified as complex projects. For example, complex built environment projects were those that included new construction materials, nonconforming or alternative designs, historical significance, availability of space around the project site, and potential impact on local environment (CEC2; CEC11; CEC14; PD1; PD2; PD3). These complex projects influenced the client companies to look at the capability of the CECs and not necessarily on price for the services (AA1; AA2; AA3; PD1; PD2; PD3). Additionally, the presence of sensitive stakeholders influenced the selection decision of the CECs (CEC7; CEC14; II1; PD3; PM1).

The value-add is considered in the selection process of the CECs. The best situation for the CECs is repeat work from a previous client. The clients would have a core group of CECs that they use for consulting engineering services. The clients got a reasonable fee for services, with a suitable profit for the CECs (CEC17; CEC18).

7.5.2 Changes in the contract delivery

In the interviews, the major contract delivery method discussed and mentioned was the design and construct (D&C) contract type. The analysis does not deny the existence of alternatives; however, it focuses on the most frequently mentioned contract type in the interviews.

Architects were contracted by the clients to manage the CECs as design managers on built environment projects. These design management contracts were becoming more complex based on the factors identified in Section 7.5.1 (AA1; CEC2; CEC11; CEC14; PD1; PD2; PD3). Some of the clients were risk averse and attempted to transfer project risks to the various consultants and the builders. This risk aversion impacted on the contracts for CECs. As a result, the engineering consultants had to decide if they should bid or not

as the costs became higher with the increasing complexity or the time requirements for the tenders and of the contracts (CEC4; CEC5; CEC17; PM1).

There is always a level of uncertainty associated with built environment projects. The different stakeholders dealt with the different risks and uncertainty. From a project risk management perspective, the more risks the client tried transfer to somebody else, the more expensive the project became. It can be difficult to estimate the costs of taking on the risks when doing a bid (AA1; PM1). This impacted on the price the engineering consultant decided to charge the client. It was better and cheaper for the clients to take 'a more collegiate and collaborative approach, which is the proportional risk approach' (AA3).

The adversarial approach made projects more expensive. The adversarial approach means the building contractors are responsible for the project risks, which may include ones beyond their control. The building contractors would charge more for their services to include the responsibility for the risks, especially as they must take out more insurance for the added risks (AA1; AA2; AA3; AA4; CEC22). With the proportional risk approach, everyone takes responsibility for the risks within their ability to control, avoid the risks where possible, share the risks among the stakeholder and reduce the risks where possible (AA2; AA3; PM1).

Construction contracts were packaged in various ways (CEC12; PD1; PD2). The rise of the design and construct (D&C) contracts transfer the risks from the client to the consultants and builders. The percentage of the design and documentation done by the clients' engineering consultants before being handed over to the builders and their engineering consultants may be from 25%–50%. This design is the basis of the tender for the construction. The client sends it out as a design and construct contract, so the builder takes responsibility for the final construction design (AA3; AA4; CEC3; CEC5; CEC8; CEC12). The construction companies would hire the engineering consultants to be their engineering designers for D&C contracts (CEC5; CEC8; CEC12; CEC22). Therefore, there are twice the opportunities for CECs to gain consultancy projects – first with the client and second with the construction contractors.

Clients have some level of power in the market by determining which competitive strategies of CECs are successful as they accept the bids of the CECs. The power comes from their procurement policies, management of the engineering services and the delivery of the engineering contract services. The next section discusses the powers of the decision-makers in the market(s).

7.6 DECISION-MAKERS (LEADING THE BUSINESS)

The business decisions for the CECs and client companies impact on the commercial outcomes for the different business units. The business units can be local or international commercial operations. These different operations impact on the competitive strategies of the CECs. Figure 32 (below) shows the *leading business/decision-makers* (parent node) and the child nodes. The hierarchy follows the topology outlined in Figure 28 on page 97. The decision-makers pillar was developed based on institutional economics. Decision-making is made through institutional structures and legitimised by the organisational standing of the decision-makers themselves. The legitimacy of the decision-makers comes from the powers that they are imbued with based on their positions in the organisation(s). Their decisions stick around in the organisations and in the market. The decision-makers in the CECs and client companies interact with each other based on the competitiveness of the market.

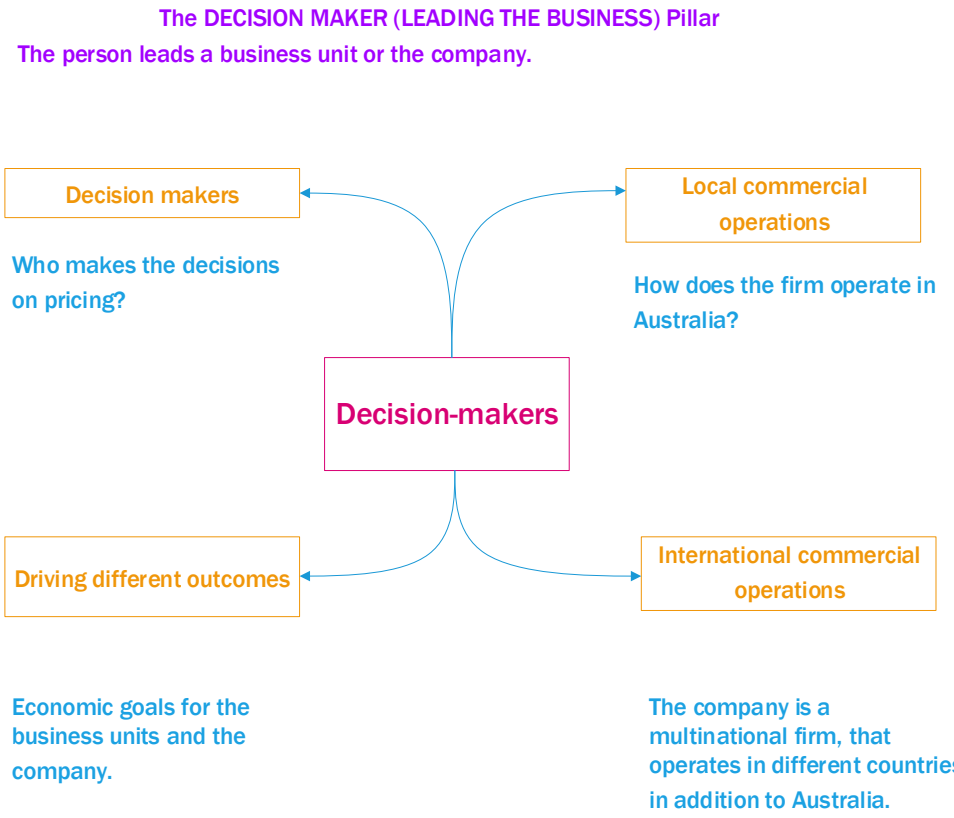

Figure 32: The decision-makers (leading the business) (meta-code) and its components (meso-codes).

7.6.1 Decision makers of CECs who are driving different outcomes

The leadership teams in CECs make decisions all the time when it comes to their companies. They have the power to change the direction of their companies in response

to the economic conditions they face. They must balance between keeping their staff utilised and performing adequately on their commercial projects. Proper project resource management influenced project cash flows and profitability. The leaders had to review their active jobs to ensure that they had enough resources to work on the current projects and on the future projects that they were bidding for (CEC2; CEC14; CEC22).

The management structures of the CECs differed from each other. This affected how they institutionalised decision-making in the firm. Some firms gave the authority to make the pricing decisions for projects to directors (CEC8; CEC12), and others push it to the lowest level (team leaders) where possible to encourage ownership of the projects (CEC2; CEC21). Where the authority was pushed down through the organisation, the final decision was made at the appropriate hierarchical level based on the threshold project value of financial authority (CEC10; CEC11; CEC17). The pricing decisions became collaborative decisions as the different discipline/market leaders worked together to balance the different issues around their company's pricing decisions.

When commercial decisions are made, they are taken within the context of an organisational risk management system. The consulting engineering managers considered the commercial risks and the type of job when they determined their pricing for a job. This was governed by the overall competitive strategy they were using at that time. They considered who the other competitors for the job(s) were and how the clients would make their own decisions. Additionally, they looked at how nimble they were in responding to requests for prices from their clients. The decision-making model of the CECs must be ready for negotiations and adjustments where required. Using the threshold level for risks and liability, they were able to set the level of scrutiny required for particular jobs and escalation through the organisation (CEC2; CEC17). While the project (job) could be properly priced, it also came down how the project was managed in its execution that determined the overall project profitability. Consulting engineering managers must monitor how they deliver the projects against their project plans and business targets.

The architects, project managers and property developers (client-owners) had to make selection decisions when it came to consulting engineers. They would have formalised rules and guidelines that guided their decisions. Even if the decision model was an informal one, it was governed by heuristics. Heuristics are mental models used for making decisions when the decision-maker dos not have all the information (Gagliardi 2008; Hall & Taylor 1996). For some projects, there was a formal tendering process the project manager and architects had to follow in order to recommend the CEC to the client for final approval (AA3; PD1; PM1; PM2). The formal decision models involved a structured and

codified process that was written down and followed by the organisation. The informal decision model involved unwritten rules, which were codified by oral traditions. It could be changed easier by the decision-makers than the formal process.

The decision-makers were looking at how they could drive commercial outcomes from their different sections of the organisation. In the multidiscipline engineering companies, each of the market or disciplines sections operated like mini-business units, which had their own business targets to meet (CEC4; CEC5; CEC10). This was applicable to property developers, who operate across different markets as well (PD1; PD2; PD3). They made decisions regarding their competitive strategies (CECs) and their services selection practices (property developers/client-owners). The spread of the decision-making was determined by whether the company was spread over local and international areas. The next section discusses the local commercial operations and how impacts on decision-makers in the CECs and client companies.

7.6.2 Local commercial operations of CECs in the AEC market

The decision-makers in the CECs run the local commercial operations in NSW. They make decisions on how to compete in the engineering markets. When there is a lot of commercial work available, CECs can be selective and choose what projects they can work on but they become less selective when the market tightens (AA2; CEC14). The CECs had to make a conscious decision if they wanted to grow (CEC1) or they wanted to stay a manageable size based on the amount of work in the sectors (CEC7; CEC11; CEC12).

Local commercial operations of CECs can undergo changes when the CEC merges with or has been acquired by another firm. If the local operations of a CEC were taken over by an international company, the local office's commercial culture could be influenced by the acquiring company's commercial culture (CEC1; CEC3). Nevertheless, the leadership of the companies had to work to establish a common culture across the local commercial operations, especially, if they were geographically spread across the state (CEC5; CEC6), country (CEC4; CEC7) and the globe (CEC1; CEC2). Another way for organisational culture to remain consistent was to invite employees to own shares in the company. Several CECs have various ways of encouraging staff ownership – through a trust, partnership shareholding (director-track), or employee shares ownership plan (non-director track).

The local commercial operations have responsibilities over the discipline, geographical and sectoral markets in the New South Wales. The local commercial operations of the CECs can be a part of larger national or international commercial operations. This is discussed below.

7.6.3 International commercial operations of CECs in the AEC market

Several interviews were conducted with CECs that were also part of international (multinational) commercial operations. As a result of being subsidiaries of larger, international CECs, these CECs were influenced by their international superiors in terms of their competitive strategies. The international commercial operations provided additional intellectual resources for the local operations, which could then be leveraged when bidding for projects (CEC1; CEC2; CEC16).

Local commercial operations can also play host to the regional headquarters for the multinational commercial operations of the CECs. If they operated in Australia, New Zealand, Pacific Islands or in the Asia region, they could base their offices in Australia. In that scenario, there existed two or three operational headquarters: the local state (NSW), country (Australia), and regional (Australasia/Pacific/Asia) headquarters. They use their Sydney-based offices to manage their commercial activities across the countries in the Asia-Pacific region (CEC1; CEC2; CEC10; CEC16; CEC17).

With the joint headquarters hosted in Australia, there can be two forms of operational leadership roles. They are usually around technical (discipline) leadership and economic sector leadership. The technical leadership roles focus on the engineering disciplines and the economic sector leadership roles focus on the business development activities in each sector for the CECs. In some companies, there were separate persons for the technical leadership and economic sectors leadership roles (CEC17; CEC18). In others, they were held by the same person (CEC2; CEC16). These roles are duplicated at the local level and the regional levels (CEC17; CEC21).

Some did not necessarily have offices in the other countries, but they operated there on projects and had their staff work from Sydney, NSW (CEC7; CEC11; CEC15; CEC19). Since the money was repatriated to Australia, the earnings were accrued in New South Wales. This contributes to the New South Wales economy and counts toward the local commercial operations' profits. With the use of communications technology, the CECs could work with international clients from their Sydney offices. This was not limited to the large CECs with 1000+ full time employees (CEC1; CEC2; CEC3; CEC10) but also to small and medium-sized CECs who had clients across the globe (CEC15; CEC19; CEC23).

The decision-makers are the leaders of the CECs, who determine how the CECs respond in the local and multinational commercial environment. They have to make decisions on the competitive strategies they to apply to the different markets in which they are competing. The power of the CECs and the clients are based on the services on sale –

that is, commercial consultancy services. The commercial consultancy services are discussed next.

7.7 COMMERCIAL CONSULTANCY SERVICES

The *commercial consultancy services* of the different companies are what the interviewed companies sell. They are the services in the AEC sectors that contribute to the construction of built environment artefacts. Commercial property development services create the need for engineering consultancy services and project management services. Property development firms hire the engineering and project management firms for their construction property investments. The engineering and project management firms deliver their services for payment. These services face technology changes, which affect how they are delivered to property development clients. Figure 33 shows the commercial consultancy services (parent node) with the child nodes.

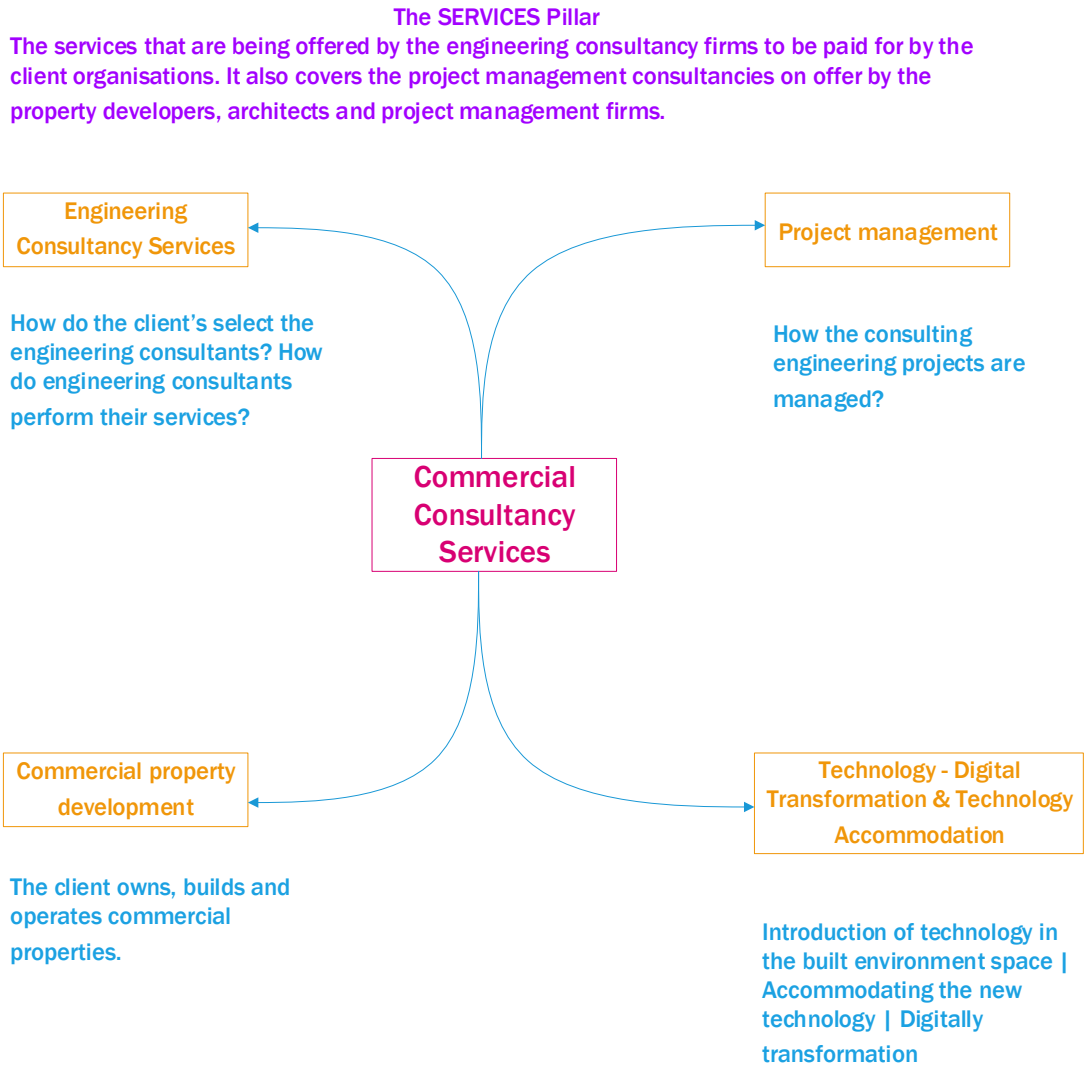

Figure 33: The commercial consultancy services pillar (meta-code) and its components (meso-codes)

7.7.1 Engineering consultancy services

During the interviews, there was a demarcation between commoditised engineering and innovative engineering practice (CEC1; CEC2; CEC4; CEC5; CEC9; CEC11; CEC15). The commoditised engineering practice designed the same thing repeatedly, while the innovative engineering practice looked at creative ways to design the built environment. For architects, it was about getting the engineering to align with their design quality vision to make the architecture both attractive and liveable (AA1; AA3; AA4). The architects gained a sense of the creativity through partnerships in design competitions with the CECs. Both architects and CECs gained market relevance by increasing their brand presence through design competitions (CEC11).

The number of disciplines that CECs offered determined what skills sets they had. They could have a narrow focus (four or less disciplines) or they could have a broad reach (five or more disciplines). If they were narrow focused, the services centred around complimentary disciplines. The broad reaching CECs were spread across the architecture, engineering and construction spectrum. The CECs that channelled their expertise into a nationally recognisable or statewide recognisable brand, could earn work based on merit or pre-eminence. For the value innovation type engineering company, this was key to their branding (CEC2; CEC7; CEC14; CEC15). Other CECs focused on the volume of work, which means they focused on the right price to win the job (CEC4; CEC5; CEC9; CEC11).

The CECs look at a project to see if it is in line what they usually do, or if it would give them the opportunity to expand their range. If the project is iconic enough, the engineering consultant can become a specialist in that area by just doing the project (AA4). Such a specialised project, with its public relations boost, acts as a good way for the CEC to increase its clientele and market presence. And they can continue to do work in that technical space building up their knowledge of the speciality, which would help them to win more work with the clients (CEC10). This approach was used by CECs that were in the value innovation engineering space. Their competitive advantage was working on signature, landmark projects (CEC2), difficult engineering problems (CEC5; CEC11), engineering design practice guidelines (CEC14) or high-end brand-specific projects (CEC15).

The CECs were also leveraging their engineering knowledge into advisory services, for example, feasibility studies or capital investments (CEC10; CEC14; CEC15; CEC16; CEC17). These advisory services were targeted to clients who had potential projects. They provided the preliminary investment analysis and advice before the client decided to implement the project. The advisory services could be joint collaboration projects with other advisory services such the Big Four advisory services companies (Deloitte, Ernst & Young, KPMG and PricewaterhouseCoopers) (CEC16). Through the advisory services, the CECs could land more projects since they had business insights of the clients' need. They would have a pre-price advantage over other consultants since they were aware of the project before their competitors.

Commercial property development is usually one of the starting points for engineering consultancy services to become involved in the built environment projects. This is discussed briefly in the next subsection.

7.7.2 Commercial property development

The client company interviews focused on commercial property development. However, some of these commercial properties were part of private–public sector partnerships (AA4; PD3) The ownership of these commercial properties provided the opportunities for the architecture, consulting engineering and project management companies to sell their services. The property development company builds, owns, rents, sells and manages properties (PD1; PD2; PD3). Some of the property developers built for other client-owners as well as for their own internal investment purposes, that is, they own and operate (PD1; PD3), while others only built for their internal investment purposes (PD2).

7.7.3 Project management

Collaboration work among stakeholders in the AEC industry is enabled by project management. They work towards the completion of a built environment artefact (building, highway, railway, etc). They promote a collaborative approach to the projects versus an adversarial approach. For the CECs, the project risks and uncertainty in design and construct contracts were higher than in integrated project delivery contracts (CEC13). The defining of the scope for designers was important because it determined how much was done by the CEC in the design and construct contract (CEC1; CEC12).

Project management extends to managing the bid process (CEC1; CEC12; CEC16) – as the companies have to win the bid in order to make money. The CECs used the scope to determine how much effort to put into the bid. Also, it gave them an idea about how much of their technical engineering resources they needed to allocate to a project if they won their bid. This was where they built up their fees for the preparation of the bid (CEC2; CEC3). These project resource plans were submitted to the clients as part of the bid documents (CEC2). Once the bid is won, it is used to track the resources work on the project and reporting to the client. The CECs used project managers internally to manage the commercial performance of their projects, which was necessary when it was a multidiscipline contract (CEC5). This resource management is discussed in Section 7.6.

7.7.4 Technology – Digital transformation and technology accommodation

The AEC sector has undergone a digital transformation with the introduction of computer-aided drawing, computer-aided design, construction simulation, documentation management, facilities management and workflow management technology solutions. Architects, consulting engineers, project managers and property developers all must use these new technologies (AA1; AA2; CEC1; CEC3; PD1; PD2; PD3; PM1). The industry has moved away from the paper-based designs to digital-based designs and documentation.

However, this did not always translate to success when one takes into consideration the time for coordination between the offshore centres and onshore design teams and clients.

Documentation management is managed through cloud-based and server-based solutions. Everyone on the project team who needs access can gain access to the designs and documentations wherever they are. It allows for greater access and control of design information (AA1). The physical modelling of buildings and infrastructure has made way for digital modelling, augmented reality and virtual reality, which makes it easier to show the designs to clients and collaborators (AA2; CEC1; CEC5). The coordination between the different engineering disciplines has increased, especially with clash detection technology (CEC3; CEC5; PD3). The technology enables the digital delivery of designs, which has been a significant change in the industry. It impacted on the skill sets needed by consulting engineers (CEC1; CEC3), architects (AA1; AA2), project managers (PM1; PM2) and clients (CEC3; CEC5; PD1).

Digital communications technology enables CECs to expand the geographical locations of their jobs. It was not just the international multidiscipline CECs who did work across borders (CEC19; CEC21) but also smaller, single-discipline companies as well (CEC22). Even with the adoption of digital communications technology (e.g. Skype) to interact with clients and colleagues, there was always a need for physical interactions with the clients and colleagues (CEC17; PM1). Clients could require co-location of the design teams, especially if there were security requirements. In other cases, they used Intranets to communicate internally with the team, which was part of the push to a paperless office (PD3). The innovations in financial systems, which can deal with cross-border taxation, help multinational companies with their international clients. The technology innovations helped the CECs to be unified in their systems as they diversified across market boundaries.

7.8 SUMMARY

This chapter analysed the data collection interviews and M&A data. The five pillars were the overarching meta codes for the analysis: marker, consulting engineering companies, clients (buyers), decision-makers (leading the business) and commercial consultancy services. From the analysis, the markets for consulting engineering were defined by three boundaries: discipline, geography and economic sectors. These markets impacted on the competitive strategies deployed by CECs to win project work and maintain profits. The engineering market is a mature one in New South Wales with the firms competing for market relevance. The commercial consultancy services, which serve as a backdrop for the commercial success of the CECs, can be further expanded to the wider architecture,

engineering and construction industries. The decisions of firm leaders drive the local and global commercial operations in terms of their competitiveness. The power of clients and CECs was determined by several factors. The clients exercised power through their procurement policy, contract delivery and services management. The CECs excised power based on the consolidations in the AEC, changes in the competition in the industry and relationships. The power of clients and the CECs were always influx because of the changing economic conditions, which impact on the prices for services.

Next, the conceptual framework on the competitive strategies is developed and discussed. This provides theoretical insights into the competitive practices of the CECs.

8 CONCEPTUAL FRAMEWORK OF THE COMPETITIVE STRATEGIES USED BY CECS IN NEW SOUTH WALES

8.1 INTRODUCTION

This chapter discusses the theoretical findings of the research. It incorporates the results from the literature review, data collection and data analysis chapters into a cohesive conceptual manner. The results can be generalised for the consulting engineering industry in New South Wales since a cross-section of CECs were interviewed and because of the analysis of the merger and acquisitions activities. As defined by the Australian and New Zealand Standard Industrial Classification, the focus of this analysis is related to the Class 6923 institutional units, that is, firms who provide Engineering Design and Engineering Consulting Services (Australian Bureau of Statistics 2006). Class 6923 units do interact with other institutional units in other classes, groups, subdivisions and divisions to deliver their commercial services to their clients.

From the research, it was identified that CECs implement three types of competitive strategies: (1) commoditised engineering, (2) innovative engineering and (3) hybrid engineering. CECs participate in markets, which are determined by the technical expertise of the CECs, geographical locations of the CECs and their clients, and to what economic sectors their clients belong. This is the structural demographics. The competitive strategies are modulated by the CECs' business environment factors – commercial operations, principal–agent relationships, and technology adoption and adaptation. The discussion outlines a conceptual model, which incorporates micro-economics, institutional economics, value and strategy theories.

The discussion answers the research question (RQ1) if the current micro-economics theory of pricing holds for CECs. The theory holds when the overall engineering market is broken down to very smaller markets constrained by the boundaries of discipline, geography and economic sectors, and intellectual resources. It also answers the research question (RQ2) of what modifications are needed to the current micro-economics theory of pricing to make it more applicable to the CECs. The power of CECs to determine their prices in their respective markets is countered by the power of the client companies to drive the price of the services. Institutional economic models have been used to discuss the changes in the competitive strategies being used by the CECs, which answers another research question (RQ3). Micro-economics explain the strategy being used for a specific instance, but institutional economics explain how the changes to the competitive strategies happen. Furthermore, it answers the research question (RQ4) of whether

competitive strategic practices used by the CECs are a modified form of a common framework.

The economic behaviours of the CECs are jointly interpreted using the theoretical frameworks from the literature review and the empirical evidence (data collection and analysis chapters). The market(s) for the CECs are established and are aligned using micro-economic structures. The CECs differentiate themselves in their market(s) based on their competitive strategies. These interpretations provide opportunities to modify the micro-economic and institutional economic models to accommodate the CECs, their commercial services operations and clients. The aim for the competitive strategies is to provide market power to earn a profit, the chapter provides a discussion around how on they do it.

The next section briefly reviews the theoretical frameworks that influenced the development of the conceptual framework.

8.2 CONCEPTUAL FRAMEWORK

The conceptual framework is derived from micro-economics and institutional economics, and is supported by strategy, value creation and pricing theories. The economic behaviours of the CECs fall into multidimensional spaces, as shown in Figure 34 (below). The figure shows the multidimensional layers of the framework. It shows how the competitive strategy for a single CEC is mapped across the different dimensions of the competitive markets. This framework is revised into different configurations to understand the theoretical positions in this discussion. These different configurations mean the model is adaptable to the various economic conditions faced by the CECs.

The conceptual framework for the strategies centres on the CECs selling their intellectual knowledge to their clients. Their ability to determine the prices for these knowledge services depends on the power they have in the market. Power is manifested by the competitive strategies used by the CECs. Depending on the market, the firms can earn a large market share and earn supernormal profits. This marketplace dominance arises from the firms being able to command a large share of the work in demand, the highest profile jobs or the best paying jobs. The firms' ability to command the highest prices and the most prestigious jobs are linked to the intellectual resources they have in the respective firms. However, the strategies are modified to suit the market each of the CECs faces. The conceptual framework being proposed seeks to capture all the variety of these strategies. It provides the generalised headings for the strategies: commoditised, innovative and hybrid engineering.

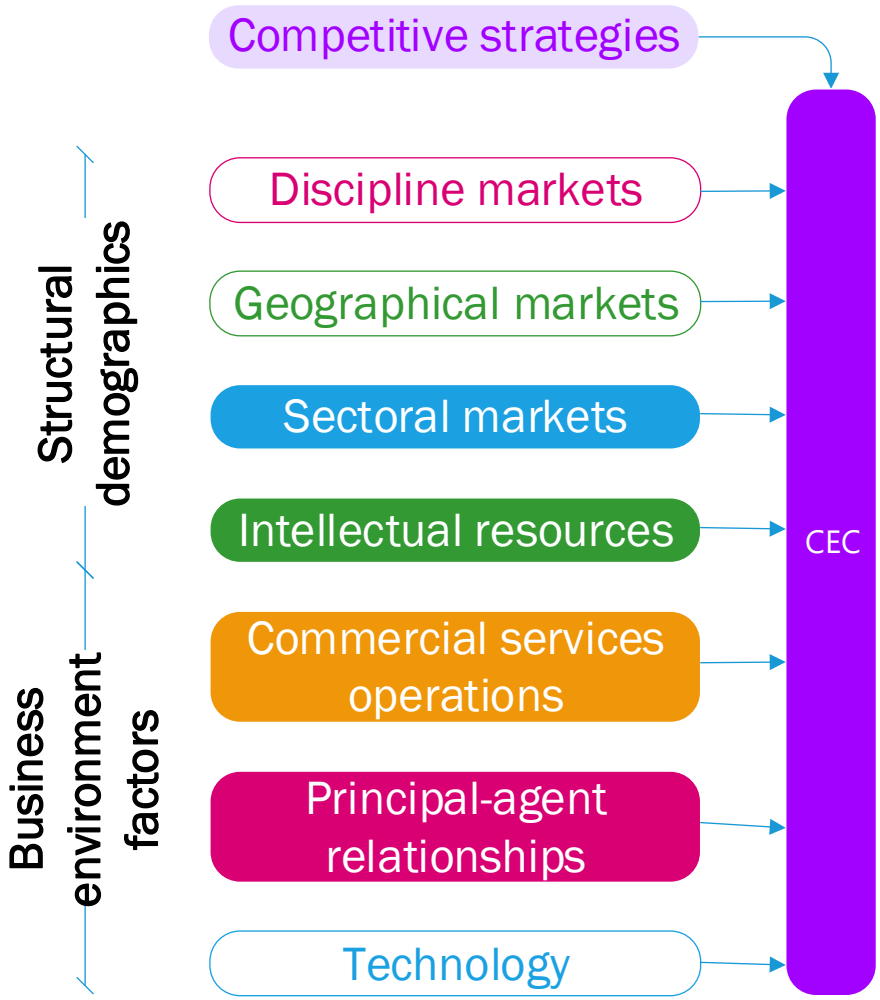

Figure 34: Multidimensional conceptual framework of the competitive strategies used by CECs.

The framework is grounded in business strategy theories. Strategy theorists expound on the idea of value innovation versus commoditised business strategies. Kim & Mauborgne (2005) advocate for the value innovation (blue ocean) business strategy over the traditional commoditised (red ocean) business strategy. They proposed an alternative to the seminal piece on business strategy by Porter (1979, 1996, 2008). Furthermore, Jacobides, Knudsen & Augier (2006) posit how organisations benefit from innovation through value creation. In applying value-as-a-strategy, the intellectual resources in the firms are harnessed to deliver a perceived quality of services to their clients. The value-as-a-strategy theory is applicable to the consulting engineering class of businesses.

On one hand, micro-economic theories use individualism to analyse and theorise decisions made in the market (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; OpenStax College 2014; Perloff 2014). Individualism is the invisible hand argument that is used to explain decisions made in the market. An alternative theoretical strand for this framework is the application of historical and comparative institutional

perspectives to analyse the decisions made in the market (Aoki 1996, 2007; Greif 1998). The companies used in the empirical investigations can be considered as institutions (Australian Bureau of Statistics 2006). Historical institutional analysis interprets past actions in the market, which influence current practices. The comparative institutional analysis technique is used to interpret the institutionalised behaviours of the individual firms in comparison to the other firms. Chapter 3 explains in greater detail about the institutional analysis techniques. This research looks at how institutional decisions have been made and used to enforce the market structures in the consulting engineering market (Aoki 2007; Duina 2011; Kapp, Berger & Steppacher 2011; Perloff 2014; Williamson 2000).

The conceptual framework incorporates contingency theory into its application. The competitive strategies of the CECs are contingent both on the internal and external factors. These factors are the dimensions. The CECs can choose to exclusively use one strategy or use both strategies. The framework is flexible to account for the multidimensional nature of decision-making. The next section discusses how the micro-economic theory is applicable to the conceptual framework.

8.3 MICROECONOMIC THEORETICAL POSITIONING

Structural demographics are used to separate the CECs into statistical clusters (as shown in Table 6 below). They outline the competitive conditions that CECs face, that is, markets and intellectual resources. These competitive conditions influence the power that the CECs and clients have. Their market power changes based on the combination of structural demographics, which depend on the types of markets, the competition amongst the CECs and the type of clients they serve changes. Based on the intellectual resources found in the CECs, the CECs differ on how competitively they deliver their services to the client. A theoretical position (Position 1) can be stated as follows:

> The power of CECs in the marketplace is based on the influence of their intellectual resources on: (1) the engineering disciplines, (2) the economic sectors of their clients, and (3) the geographical location of their operations and their clients' operations.

Table 6: Structural demographics - markets and intellectual resources.

Discipline market	Geographical market	Sectoral market	Intellectual resources
Based on the technical	Based on the political and natural	Based on private & public sector	The intersection of disciplines, geography or

Discipline market	Geographical market	Sectoral market	Intellectual resources
demarcation of the engineering field Market are linked to the different construction technology and engineering materials Influenced by public policy. E.g., building regulations create new forms of engineering practice like sustainability engineering	environmental boundaries in a location Rural vs. urban Different business rules in the different locations Projection of force – multiple geographical regions served by one headquarters location E.g. coastal engineering markets exist mainly in coastal regions	differentiation in the economy Markets are linked to the economic classification and functional areas of the economy, e.g. education, finance, etc. Markets are linked to client boundaries Some sectors require the intellectual resources to have certain qualifications and competencies, e.g. rail infrastructure Sectoral experts based on uniqueness of the sector, e.g. structural engineering in rail transport sector of the transport market	sectors require the intellectual resources to be deployed across the various markets The deployment is governed by what the market needs The employees hired by the CECs

Perloff (2014) and McTaggart, Findlay & Parkin (2013) discuss the market structure (micro-economic theory) as being in terms of monopoly, monopolistic competition, oligopoly, and perfect competition. These market structures were based on the power to set prices. CECs that are applying the commoditised engineering competitive strategy face a monopolistic competitive environment. The CECs are the same or delivering similar services by the clients. The only difference is the price of their services. Their power to set prices for their services is reduced by the power of the clients to accept the price on offer. The clients have the power because they have many alternative CECs to choose from.

CECs that are applying the innovative engineering competitive strategy exist in an oligopolistic market structure. In this market structure, they have a small number of competitors that can perform the specific type of consulting engineering services. The

CECs have more power on the price they charge their clients. The clients do have power to choose their service providers and accept what price they are charged. Some CECs may have a monopoly, especially if they are creating a new form of engineering and are commercialising those efforts for the first time. They are applying an innovative engineering strategy. CECs that are applying hybrid engineering competitive strategy face monopolistic competition, oligopoly and monopoly market structures as they operate in different market spaces. The micro-economic theoretical market structures are applicable in those situations.

As established in Section 7.3.1 on page 99 in the analysis chapter, the market can be divided into three types – discipline, geographical and sectoral. The type of intellectual resources means that CECs position themselves in the different markets and present themselves in certain competitive manners to achieve their business targets. At the industry level, the different markets intersect to create different conditions and the competitive strategies would adapt or be the same. The conceptual framework from Figure 34 has been reworked to show the different components are centred.

8.3.1 Intellectual resources

Consulting engineering is considered as a credence service, that is, it depends on the credibility of the service providers to meet the value expectation of the service recipient (Plewa, Sweeney & Michayluk 2015). The consulting engineering sector is a high contract risk environment because it is subjected to externalities in the market. It is knowledge-intensive and staffed by a variety of professionals, who have to keep abreast of science and technology development trends (Huang & Hsueh 2007). The CECs grow by three different means: (1) organic growth by hiring staff, (2) corporate marriages by merging with other firms, or (3) purchasing firms (Boxall & Steeneveld 1999; Kreitl & Oberndorfer 2004).

The M&As provide an opportunity to add new expertise, clients and markets. The M&A activities of a CEC are more of the consolidation of intellectual (intangible) assets rather than the consolidation of physical plant and equipment assets (Huang & Hsueh 2007; Kreitl & Oberndorfer 2004). The M&As do not necessarily mean the staff will stay with the company. But remaining in a bigger firm means prestige and the opportunity to work on new or bigger projects. Small companies are not smaller version of bigger companies (Coviello & Martin 1999). They compete in different markets (Boxall & Steeneveld 1999; Coviello & Martin 1999).

Huang & Hsueh (2007) make the distinction of intellectual capital, which is divided into human, relational and structural capital from financial and physical cpaital. They

investigated ‘the influence of the intellectual capital on bususiness performance in the engineering consultancy,’ and ‘the acquistion and development of intellectual capital in the consulting engineering industry’ (Huang & Hsueh 2007). Intellectual capital refers to all of the knowledge, abilities, structures and relationships that the staff contribute to the economic benefits of the firm. Human capital is the expertise, skills and creatviity of the people involved in the business.

Both Boxall & Steeneveld (1999) and Huang & Hsueh (2007) advocate that human capital grows if it is harnessed, trained and nutured to grow for the benefit of the company. Structural capital is the system, structure, strategy and culture that promotes knowledge creation and sharing. Structural capital can be combined in the value creation frameworks and institutionalism works of Ekman, Raggio & Thompson (2016), Koskela-Huotari & Vargo (2016), Marcos-Cuevas et al. (2016), and Martelo-Landroguez & Martin-Ruiz (2016), respectively. They pursue the idea of the systems/institutional context of value creation from the service-dominant logic. The relational capital is the relationship linkage established among the economic agents in the market.

The CECs must adapt their competitive strategies based on the four structural demographics as shown in Figure 35 below. Figure 34 is reworked into Figure 35. This version of the conceptual framework shows its multidimensional nature. It is considered an elaboration of the framework. This rework shows the adaptability of the model to different conditions. The innovative engineering strategy is tied to the expertise of the intellectual resources. The CECs use their intellectual resources as their power moves to win projects from clients and have a greater say on the price. In the commoditised engineering strategy, the intellectual resources are deployed by the CECs. However, they are constrained by the price they can charge and are not necessarily used as power moves by the CECs. How the resources are deployed across the markets is an output of the competitive strategies. The next three subsections discuss the three types of markets.

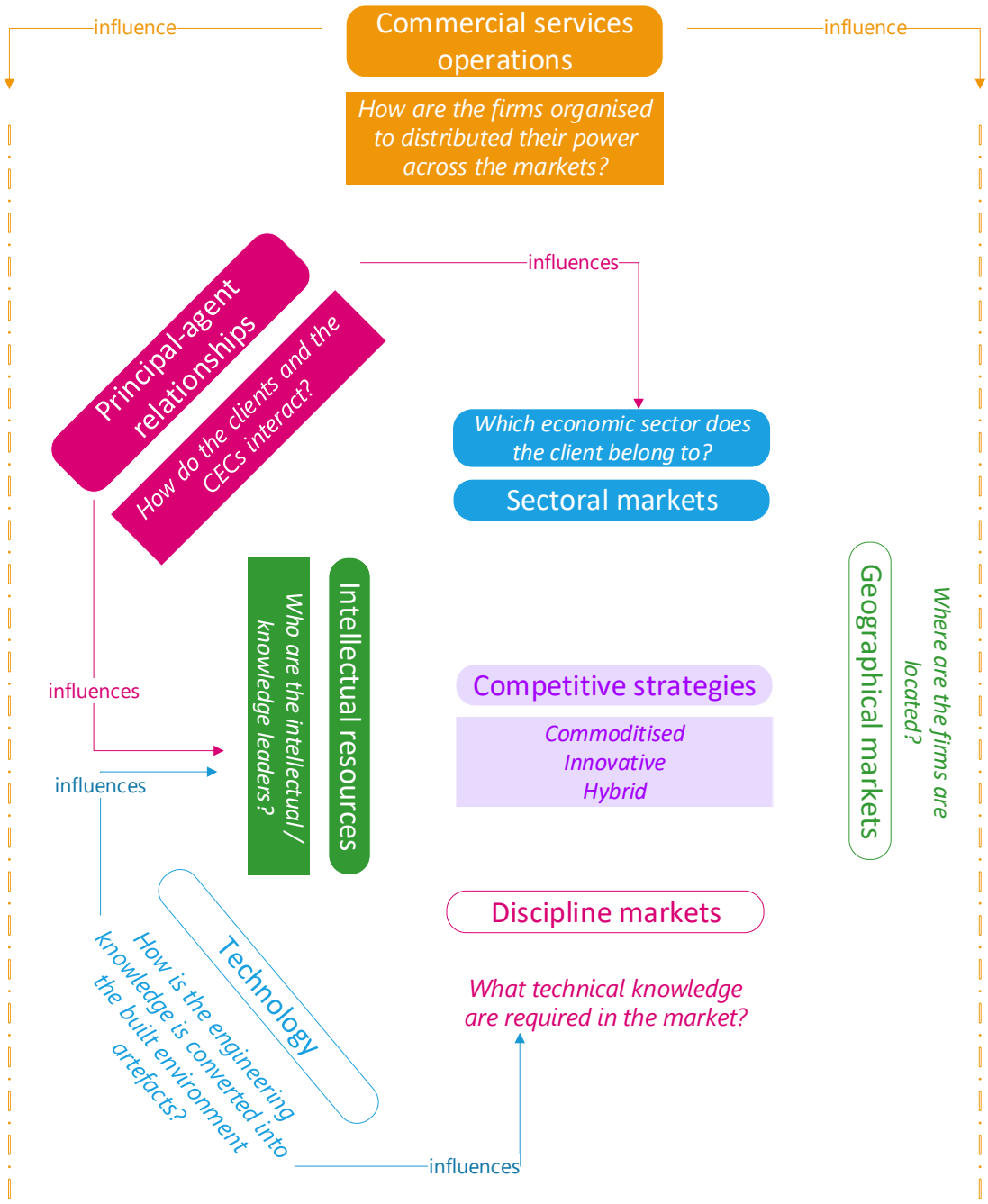

Figure 35: The multidimensional conceptual framework with a focus on the intellectual resources and disciplines.

8.3.2 Markets - disciplines

The intellectual resources across the industry are tied to the professional disciplines found in the CECs. The CECs sell their services based on what disciplines are found within their companies, as shown in Figure 35 above. The disciplines they have in the consulting engineering firms determine what markets and subsequently what competitive forces they are exposed to. The CECs can be multidiscipline or single discipline consulting engineering firms.

The multidiscipline consulting engineering firms can be based on the alignment of similar or complementary engineering disciplines. They can be assigned as building services (electrical, mechanical, fire and hydraulics), civil and environment (civil, structural, transport, façade, geotechnical, environmentally sustainable design), architectural, and specialised niche (audiovisual, IT, lighting design, digital design (BIM)). The different engineering firms create consulting practices based on: (1) a technical engineering discipline; (2) commercial market-based practices, for example, building, mining, industrial, transport; or (3) a client type, for example, government, education, defence, property investors and developers. A CEC's practice orientation is determined by its technical expertise. Whether it is a commoditised or value innovation engineering strategy, how it competes is determined by its technical capabilities.

CECs have added new engineering disciplines via organic expansion (hiring new staff), acquisitions, and merging with other engineering practices. They expand their commercial discipline ranges by including architecture, construction, environmental management, facilities management, planning, and quantity surveying (Carillo & Chinowsky 2006; CEC17; Fox 2006; Kamara et al. 2002; von Branconi & Loch 2004). With the introduction of new engineering disciplines, the companies design new practice areas or add to their consulting practice areas. This can expand their range of clients and markets via geography, which is discussed next.

8.3.3 Markets - geographical

Geographical markets are tied to the location of the CECs' offices and where their clients are based. The geographical spread of a firm determines how they compete. Some firms only compete in the New South Wales market. Other compete in New South Wales and along the eastern seaboard states – Queensland, New South Wales, Victoria and Tasmania. Others are spread across Australia and include New Zealand. Other firms operate in the Asia and Oceania-Pacific markets, with their offices either based in countries within those markets or projected from their New South Wales offices. Other consulting engineering firms find themselves operating in the North American, Caribbean, South American, European and African markets. Each of these locations have cultural, legal and political differences, which influence how the CECs operate and compete for business.

Additionally, the geographical markets are based on specific natural and physical environmental conditions. For example, coastal engineering discipline is applicable to locations near to coastlines and flood engineering is applicable to locations prone to flooding. The structural engineering discipline specialising in high-rise buildings are found

in urban areas and not necessarily in rural areas. Engineering disciplines are competitive in some regions because of the specific geographical conditions where the clients are located. This leads to markets that are demarcated by the respective client-type, which is discussed next.

8.3.4 Markets - sectoral

The different demographics of the CECs create different forms of engineering firms. This an expression of the isomorphism of the engineering firm (institutional economic themes) (Duina 2011; Kapp, Berger & Steppacher 2011). Whether they are applying a commoditised, value innovation or hybrid engineering strategy, the engineers compete for clients. There are also different isomorphs of clients, which are dependent on the economic sectors they operate in. This is outlined in Figure 3 on page 8.

The clients are also classified using Australian Bureau of Statistics (2006) Australian and New Zealand Standard Industrial Classification system. Each of these clients from the different divisions have different needs from their built environment artefacts. These clients can be in different economic sectors and require consulting engineering firms to design built environment artefacts. In the creation of the built environment, there will be different clients based on their position in the supply chain and value chain. The end user may be different from the hiring client, who pays for the CECs services. For example, in an aged care facility, the end user (the aged resident) is different from the hiring/paying client/prinicipal (aged-cared service provider).

The clients are not all the same. They must be assessed, classified and marketed to. Under commoditised engineering strategies, the market segments are defined and the CECs work within the boundaries (Clegg et al. 2011; Kim & Mauborgne 2005). In a value innovation engineering strategy, the CECs can establish new market segments by focusing on alternative solutions and creating new clients (Clegg et al. 2011; Kim & Mauborgne 2005). Since many of the firms operate in a commoditised competitive strategy environment, firms can operate with both strategies – hybridisation. The different competitive strategies can be applied in the same firm at the same time. Just as they can have multiple disciplines, they can have multiple competitive strategies. It depends on the market niches that are being created.

The economic sectors create different needs for the clients. While the CECs might have the necessary disciplines, they must know how to design for the specific sectoral conditions. CECs specialise not only in a discipline but in the application of the discipline for a specific type of client. For example, building services engineering for an educational

facility may have differences to a medical facility. CECs can channel the marketing of their services based on the client's business.

The different clients combined with their location and the discipline required creates intersections for different markets. This impacts on the commercial strategy being applied. This is discussed next.

8.3.5 Intersection of structural demographics – micro-markets

Each of the market dimensions intersects to create micro-markets where the CECs compete. The competitive strategies can be adapted to each micro-market. A consulting engineering firm may decide to apply commoditised or value innovation competitive strategy across all its micro-markets. Alternatively, it can take on a hybrid competitive strategy approach based on the differences in the micro-markets. These micro-market intersections can create an alternative version of the conceptual framework, which is shown in Figure 36 below.

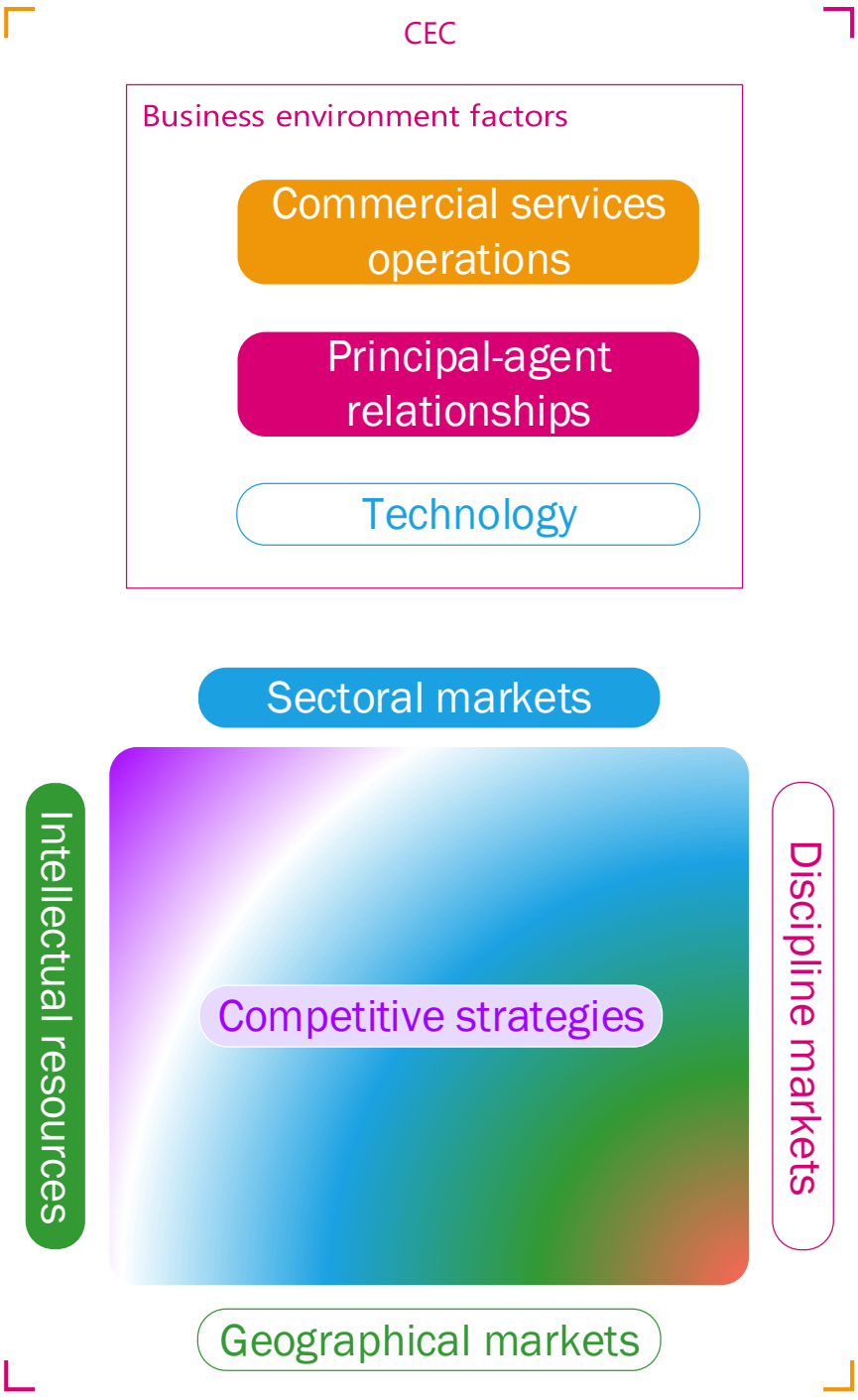

Figure 36: The multidimensional conceptual framework based on intersection of the markets.

The geographical market is based in the New South Wales (Australia). It influences the strategies if the company works on projects in other Australian states or in other countries. The geographical markets are determined by where the client is located. The client may favour CECs that are based in its location. This enables them to support locally based CECs. This is found with public sector clients like local councils – an intersection of geographical and sectoral markets. This is where the CECs would compete. Their strategy can be commoditised engineering since the local councils have limited budgets.

However, if the project requires an expert opinion and it is publicly contentious, the dynamics of the project and by extension micro-market will have changed. A firm that can provide an eminently qualified expert would be able to charge a premium; they are applying a value innovation strategy. The expert would be the top person in the discipline. This is an intersection of intellectual resources, sectoral and discipline markets – a specific micro-market is created.

These intersections create micro-markets. The CECs can apply hybrids of competitive strategies. In one of the micro-markets, a CEC may face a commoditised engineering market but then also faces an innovative engineering market because of a change in one of the factors in the markets, for example, a change in sector or change in discipline, but at the same location. The determining demographics are the intellectual resources. The innovative engineering competitive strategy depends on the type of intellectual resources in the firm. It is not applied unless the CECs have the necessary qualifier – the knowledge resources to meet to the clients' needs. The next subsection discusses the economic modelling that incorporates these four dimensions.

8.3.6 Economics modelling incorporating the structural demographics (consulting engineering market)

The prevailing micro-economic theory for firms is they are profit-maximising institutions (Lee 2000; McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; Perloff 2014). The consulting engineering business cluster/class is not a single homogeneous market despite their amalgamation in economic statistics under the Professional, Technical and Scientific Division (Australian Bureau of Statistics 2009, 2018). The consulting engineering cluster of business is diverse (Australian Construction Insights 2017; Consult Australia 2015a, 2015b, 2016). The dynamics of the M&As in the CEC business class create a changing market environment. Additionally, the intersection of structural demographics creates different micro-markets. The supply and demand functions found in micro-economics cannot be applied across the entire consulting engineering market. Each micro-market has its own supply and demand functions.

Market frameworks usually divide the markets based on discipline, geography and economic sectors (Australian Construction Insights 2017; Consult Australia 2015b, 2016). However, they do not combine all three market dimensions and the intellectual resources dimension to show the multidimensional market structure. The traditional framework only reviews the consulting engineering markets as one dimensional versus a multidimensional framework, model or tableau. Lancaster (1966) attempts market analysis using a multidimensional approach. However, it is a goods-dominant logic versus

the services-dominant logic advocated in this research. The creation of the niche micro-markets means micro-economic theory can be applied to the smaller competitive environment. However, it will be difficult to apply micro-economics when aggregating to the entire consulting engineering market. The power dynamics change across the different micro-markets.

In this research, the goods-dominant logic of micro-economics gives way to a services-dominant logic of value creation and value-as-a-strategy (Ekman, Raggio & Thompson 2016; Galvagno & Dalli 2014; Ordanini & Pasini 2008). As a result, an economic model or tableau is developed where the intellectual resources are monetised (Alam 2003; Farr 2001; Institution of Civil Engineers 2015; Kreitl, Urschitz & Oberndorfer 2002; Sturts & Griffis 2005; Tang, Lu & Chan 2003). The power of the service provider in the market can be accounted for including the intellectual resources into the market structure frameworks. The power of the service provider comes from the client perceiving the intellectual knowledge of the suppliers (CECs) as being superior to the clients' in certain areas (engineering). The clients are paying for the use and output of this intellect (Carillo & Chinowsky 2006; Farr 2001; Filiatrault & Lapierre 1997; Singer & Adkins 1984). Based on this perception, the CECs can charge a price for the use of their intellectual property. The higher the perception of value is with the clients, the more power the CECs have in the market.

The next subsection discusses the competitive strategies applied by the CECs – commoditised, value and hybrid engineering

8.3.7 Competitive strategies: Commoditised, hybrid and value innovation engineering

A firm's strategy determines how it executes its business plan, how it establishes its organisational structure, and how it earns money. Additionally, the strategy chosen by a firm determines how it interacts with its clients, competitors, collaborators and the rest of the market. In this section, the competitive strategies of the CECS are discussed based on the conceptual framework (Figure 36). The traditional versus reconstructionist views on strategy further explain the theoretical underpinning of the framework. The three strategies are: commoditised, value innovation (innovative), and hybrid engineering. These strategies are institutionalised, which leads to their application across the market because of the M&As. These strategies influence the pricing strategy employed by the CECs.

A theoretical position (Position 2) can be made:

> Consulting engineering companies deploy different competitive strategies (and pricing strategies) to meet the different commercial requirements of their clients.

These strategies are deployed based on the specific market conditions they face. These strategies are used and adapted based on the market structure, continued acceptance by their clients, positive reinforcements by winning work and legitimacy of their contractual arrangements.

The theoretical position for the commercial strategies is derived from micro-economics and expanded by institutional economics. The micro-economics provides the basis for the commercial transactional nature between the CECs and their clients (Betancourt & Gautschi 2001; Lambrecht et al. 2012; McConnell, Brue & Flynn 2012; Skitmore, Runeson & Chang 2006; Williamson 2005). Institutional economics explains the different structural models, legitimacy, stickiness, learning and isomorphisms of these strategies (Acs et al. 2018; Aoki 2007; Dequech 2009; Duina 2011; Kapp, Berger & Steppacher 2011).

Micro-economics is useful to describe the commoditised engineering strategy. The CECs can be forced to adopt a commoditised engineering strategy because of their clients' procurement policies and decision-making. Micro-economics makes assumptions based on an individual basis. It involves value-in-exchange and goods-dominant positions. Microeconomic theory is useful for the snapshot/point estimate of the market before and after a merger or an acquisition.

The desired strategy is the value innovation engineering strategy, where firms have more power in the market to set their prices. The value innovation engineering strategy is better described as the value-as-a-strategy theory advocated by the service-dominant logic theorists. Institutional economics accounts for the political, economic and sociological perspectives of the competitive strategies. It provides a suitable base to analyse the dynamics of the markets as they undergo continued changes because of the M&As – what institutions changed during the transition.

The hybrid engineering strategy is a mixture of both the commoditised and value innovation engineering strategies. The hybrid engineering strategy is used when the CECs faces different markets because of their structural demographics. They apply both strategies in the different micro-markets.

8.3.8 Traditional versus reconstructionist views on strategy

The traditional view of competitive strategy is that it is a zero-sum game and written from the perspectives of military stratagems (Clegg et al. 2011; Kim & Mauborgne 2005). It involves winning and losing in the bid to acquire clients and markets, and to achieve profits. However, contemporary strategy writers have proposed an alternative viewpoint,

where no competitors exist, and the business creates new areas to deliver value to their clients.

Kim & Mauborgne (2005) posit a reconstructionist viewpoint where the firms determine the structure and limits of the market based on their actions – the blue ocean strategy. The alternative is the red ocean strategy, which assumes that market is fixed in its boundaries and the firms have to compete with each other – the traditionalist view. Under the blue ocean strategy, the firm has a systematic approach where the firm's utility to its customers, the prices charged, and cost to serve are aligned holistically (Kim & Mauborgne 2005). The blue ocean strategy is not just winning at all costs but a philosophy on how to operate a business.

When the competitive strategies of the NSW-based engineering firms are analysed, they can be theoretically assigned to the blue and red ocean strategies labels. Alternatively, the engineering firms use only a commoditised engineering or value innovation (innovative) engineering strategy. They can apply a hybrid engineering strategy. The commoditised engineering firms are firmly competing within market boundaries based primarily on a cost-recovery basis, that is, a micro-economic perfectly competitive equilibrium. The value innovation (innovative) engineering firms are the ones that are creating new engineering streams based on the evolution of technology or with non-traditional clients. Other engineering firms may operate with a hybrid competitive strategy. They may have some clients with whom they develop their engineering solutions because of the value innovation strategy, and for other clients, the engineering solutions might be based on a traditional commoditised engineering strategy. Table 7 below outlines a snapshot of these competitive strategies, which is expanded further in Sections 8.3.9, 8.3.10 and 8.3.11, respectively.

Table 7:Competitive strategies: Commoditised, hybrid and innovative engineering.

Commoditised Engineering	**Hybrid Engineering**	**Value Innovation (Innovative) Engineering**
Has the intellectual resources capacity to do a lot of work Price sensitive clients Price is the main decision factor Wins projects mainly by competitive tenders	Operates across a wide variety of markets with varied price sensitivity Mixture of standard and creative design projects Competes on both price and design value More flexibility on what to charge	Intellectual resources are the industry experts or trend setters in the market Works mainly on creative design projects Selected based on the expertise and reputation of the intellectual resources

Commoditised Engineering	Hybrid Engineering	Value Innovation (Innovative) Engineering
Regular and standard engineering designs Monopolistic competition	Must tender for work to maintain full staff utilisation Monopolistic competition, oligopoly and monopoly	Less price sensitive clients Most flexibility on setting their fees Oligopoly and monopoly

8.3.9 Commoditised engineering strategy

The firms that follow a commoditised engineering strategy compete mainly on price. They are usually winning work based on tenders and adjusting their fees to win a job. The client company's procurement policy influences how heavily it considers the price in selecting the CEC. Interviewees from client firms confirmed that they looked mainly at price in determining which engineering firms to select (AA2; PD2). Some of the CECs outsource the design functions to lower-cost countries outside of Australia. This approach reduces the costs of doing the design and documentation for their client. However, it can affect the quality of work. Some of the firms are better able to channel this approach if they have offices across their different international operating regions (CEC1; CEC5). Other firms do not have that option; they compete with their Australia-based engineers (CEC6; CEC9).

The commoditised engineering firms can be from the micro-business (1 – 4 FTE) to the large business (200+ FTE) – using the Australian Bureau of Statistics system of classification (Swanepoel & Harrison 2005). The firms compete in a monopolistic competition market, where the firms are selling the same services. They differentiate themselves, but they are invariably tied to the price of the services. Here, the purchasing power (market power) of the client is higher. The firms' pricing can be heavily influenced using rigidly set competitive tenders by the clients. Additionally, the CECs' pricing is determined by selling engineers' time and by attempting to determine what the other competitors will price.

8.3.10 Value innovation (innovative) engineering strategy

The innovative engineering companies position themselves as having special skills and knowledge. They establish themselves as engineering consultants that compete on new ideas and value creation for their clients. They have intellectual knowledge, which they channel into commercial success. These firms create the market in which they operate – looking for areas that are not being explored by other engineering firms (Kim & Mauborgne 2005). They operate in a monopoly or oligopoly market. This is the ideal

strategy as the CECs have the most choice in what they can charge their clients. They have more power in the market as they are the experts.

This was best explained in the words of one of the interviewees (CEC7):

> "If you look at our portfolio of services, compared to the biggest engineering companies, who are trying to do everything. We are selectively choosing the services that we provide to meet more niche needs in the marketplace. That is a key part of the strategy. We are not trying to compete head on; we are trying to look for the niches. And in particular, we are trying to find those areas in the marketplace, where there are very few competitors but there are high value services that we can provide. As soon as you start competing with the major engineering consultancies, it ends up being a race to the bottom in terms of fees for particular service areas."

An architectural firm (AA1) views these innovative CECs as firms who:

> "are looking for alternatives and they are proactive in suggesting alternatives. I call that value-adding – going beyond just the straight engineering and actually taking on some moral responsibility for what they are doing."

The value innovation strategy for CECs is established and carried out by firms, who work on the creative, future-looking and unique projects for like-minded clients or clients who have a unique built environment project. Usually, these engineering firms are boutique firms, which market themselves as being creative design engineers (CEC14; CEC15). However, a value innovation engineering firm can also be a large international firm, which have grown based on working on the creative designs for built environment projects around the world (CEC2). The firms apply novel and useful engineering products and processes into the designs of the built environment artefact (Sepasgozar, Loosemore & Davis 2016; Shalley & Gilson 2017; Singh & Holmström 2015).

8.3.11 Hybrid engineering strategy

Hybridisation can form in instances where a company operates in two or more different micro-markets. The majority–minority mix depends on where most of their clients are derived from, that is, the innovation market or commoditised market. For example, a CEC has established a reputation in a niche area where there is a little competition. They have developed their expertise and are pushing the boundaries with combining engineering research and technology applications. This is considered to be an oligopoly (McTaggart, Findlay & Parkin 2013; Perloff 2014). Here, they are known for their knowledge and do not necessarily compete on price. They can also have other engineering discipline

practices where they are competing on price with other consulting engineering firms. The micro-market structure is a monopolistic competition (McTaggart, Findlay & Parkin 2013; Perloff 2014). Where most of their projects originate from determines the hybridisation, for example, whether they are using a commoditised–innovative or innovative–commoditised engineering strategy mix.

The competitive strategies are institutionalised based on the business model selected by the firms. They become embedded in the company. As the firm become larger, there is a need for some commoditisation to bring in the work to maintain the utilisation of the resources in the company (CEC1; CEC2; CEC10). A firm can have the two competitive strategies being employed simultaneously to give a hybrid approach. This hybrid strategy exists because there is not always a pure market system where the firm may exist exclusively in the innovative engineering market or in the commoditised engineering market. The determination of strategies is based on the ratio of work that is earned by commoditised and innovative projects.

While some engineering firms are market leaders because they are discipline experts, they operate using a hybrid competitive strategy. They still must compete because their main clients have market power. However, they can achieve oligopolistic and, at times, near monopoly power on certain micro-markets, which they create through their value innovation strategies. Discipline experts are developed from the knowledge acquired by design practice. The intellectual talent in the CECs get more experience as they practice their skills. This is how knowledge is created through practice or in performance of the service for the clients (Dougherty 2004; Kornberger & Clegg 2011). Therefore, there is the ambiguous nature of creating innovation in the services while performing the services as part of the commercial service operations (Dougherty 2004). This is the duality of value-innovation engineering, where firms need specific projects to acquire and hone their knowledge.

8.3.12 Industry consolidation and competitive strategies

The M&As of the AEC industry have created more consolidated firms in the market. Based on the consolidation activities, the competitive strategies of the firms will adapt based on the changes in the market. The power dynamics change in the market as the firms compete in a changing commercial environment. However, this change has created opportunities for future work by smaller, nimbler firms. Consulting engineering is an intellectual exercise and there is work for the different firms (Arias-Aranda 2003; Arias-Aranda, Minguela-Rata & Rodriguesz-Duarte 2001; Krull, Smith & Ge 2012).

M&As reduce the number of competitors and increase the power of the firms to set prices. M&As and micro-economic theories indicate that consolidation increases the concentration in the industry. The Concentration ratio (C_R) and the Hirschman-Herfindahl index (H) change with the consolidation of the firms in the industry (Clarke 1985; Kwoka 2015; McTaggart, Findlay & Parkin 2013). From the M&A and interview analyses from the research, the Concentration ratio and Hirschman-Herfindahl index do not increase over the long run. In the short run, there is an increase in concentration as the firms stabilise after the consolidation and adjust to their new market share. Even with the continuous M&As occurring (Section 6.5), there are new firms being formed in the industry. Competing CECs attempt to disrupt this equilibrium by getting more market share from the newly consolidated CECs. Furthermore, it takes some time for the smaller CECs, which are created following the consolidation, to start making an impact in the (micro-)market. There is a constant flux of CECs forming and consolidating, which impacts on the competitiveness of the industry.

A theoretical position (Position 3) can be stated:

> The consolidation of CECs in the engineering industry results in a changing competitive environment: (1) it rearranges the distribution of intellectual knowledge across the industry, (2) it changes the power dynamics of the firms relative to their competitors and clients, and (3) it creates newer firms in the marketplace.

The power to set prices comes from the relationships with clients and the intellectual capacity of the CECs. The sustained M&A activity does change the competitiveness in the market (Kreitl & Oberndorfer 2004; Kreitl, Urschitz & Oberndorfer 2002; Rosch 2014).

The idea of the firm is to make a profit for the shareholders (Clegg et al. 2011; Ekman, Raggio & Thompson 2016; Galvagno & Dalli 2014; Ordanini & Pasini 2008). However, the question arises about how much work is needed to reach a profit. With the tighter margins found in commoditised CECs, they have to work on more jobs to keep the workforce employed (CEC10). The commoditised CECs can be found among the various sizes of consulting engineering firms. From large multinationals, which are listed on stock exchanges, to small single-operator CECs.

Large multinational CECs can become commoditised firms based on their financial structure. The larger firms, which are on the stock market, must meet short-term and long-term goals on their return on investment for their shareholders. The pressure to perform means the CECs must compete heavily to win jobs. When they are competing with other equivalent large-sized CECs, they compete mainly on price. The consolidations in the

industry increased the capacity of the CECs to do more work. Their increase in size gives them the opportunity to increase the market power to set prices.

Alternatively, there are larger CECs that operate in the value innovation space. They remodel their competitive strategies along those lines as they grow bigger (CEC2; CEC7). They can market their position as being innovative and unique in their commercial positioning. They face competition from equally large and smaller sized CECs. In the value innovation space, they are competing based on the reputation of their expert consultants. The consolidations were used to acqui-hire talent and increase their market power through their intellectual capacity (Augier & Sarasvathy 2004; Coyle & Polsky 2013).

As consolidation permeates throughout the architectural and engineering services group of companies (as classified by ANZSIC 2016), it changes the intensity of the competition. Small engineering firms can be competing with bigger engineering firms for the same jobs based on the discipline being awarded. A knowledgeable engineer can form a small firm and still be profitable. However, the bigger firms would have the manpower to work on bigger projects. In this situation, the decision clients are making is whether the job is too big for a small engineering firm or too small for a big engineering firm. Some engineering firms can manage this situation by having a manageable number of disciplines and controlling the number of disciplines they offer on a competitive basis.

For example, building services engineering might have electrical, fire, hydraulic and mechanical engineering as the core services, with audiovisual design, environmental sustainable design, and lighting design as complimentary engineering disciplines being added (CEC5; CEC12). Alternatively, a firm may focus on civil engineering, which expands to include façade, structural, transport and water engineering (CEC11). This can easily make the engineering firm expand from a single discipline to a multidiscipline engineering firm. As the expansion into numerous disciplines happens, it can be hard to remain an innovative engineering firm. As more disciplines are added, they must be able to competitively offer these services to the different clients. However, this expansion is doable; it depends on the leadership of the firm, the engineering talent in the firm, the cost-to-serve the clients, the prices charged, and the services valued by the client.

As the competitive strategies change, the pricing strategies must be adapted as well. They are discussed briefly in relations to the competitive strategies in the next subsection.

8.3.13 Pricing strategy

In discussing pricing strategies, there is always room for negotiations with prices. The prices commanded are a result of the strategy being employed by the firm (Bertini & Wathieu 2010; Bruno, Che & Dutta 2012; Hinterhuber 2008; Lambrecht et al. 2012;

Nagle, Hogan & Zale 2011). Table 8 below shows how the competitive strategies of the CECs can be aligned to their pricing strategies in establishing what is the value of the work, what is the cost-to-serve, what is potential value of the work to the client, the client's willingness to pay and the room for negotiations.

Table 8: Pricing strategies aligned to the competitive strategies used by CECs

Commoditised Engineering Strategy	**Hybrid Engineering Strategy**	**Value Innovation Engineering Strategy**
Tendering Cost is a deciding factor At-cost pricing used to win work in very competitive environments, especially during economic downturns Difficult to maintain constant profitability if projects are priced close to cost with little margin Little room for error in project costs and duration estimation	Mixed pricing based on structural demographics (markets and intellectual resources) The firm's work is spread across different sectoral markets with different willingness-to-pay Not all markets are open to value pricing Competitive bidding used to win project awards Commoditised pricing used for staff utilisation Value pricing used for profit top-up As more intellectual resources reach expert level, use more value pricing	Price as high as competitively possible based on the clients' perceived net value The closer the perceived net value is to the expected net value, the higher the supplier profit Value as a brand Maintain profitability over a longer term Ability to cover variation in project cost or duration estimation Higher risk involved since different engineering designs are required Different pricing based on different clients' willingness-to-pay for the same job Depends on credibility of intellectual resources

8.3.14 Principal–agent relationships

The principal–agent theory (PAT) explains the power of principals (clients) and agents (CECs) as well as the incentives used to motivate them in the market (Grossman & Hart 1983; Holmstrom & Milgrom 1991; Sappington 1991). The incentives involve the pricing approach by the CECs in relation to their clients. The PAT explains the level of risk-sharing between the principal and the agent (Grossman & Hart 1983). The commercial behaviour of the professional services firms based on their position in the built environment's supply chain and value chain can be viewed from the PAT perspective (Christopher & Gattorna

2005; Gosling & Naim 2009; Nagle, Hogan & Zale 2011). The supply chain is used for transactional aspects and the value chain is used for the transformation of knowledge of the creative and innovation process. The theoretical principal–agent relationship can be discussed from the property-rights perspective (capitalistic view of economics) (Aoki 2007; Tsoulfidis 2017; Wäckerle 2014). Property rights come from intellectual property, which is sold to the clients by the CECs. The knowledge embedded in the CECs with their consultants is the intellectual property of the firm (Nonaka, Toyama & Konno 2000).

In the built environment project, the main client (property owner) usually hires an agent to represent them in their dealings with the head contractor(s) and consultant(s). This can be a project manager, architect or engineer. Then that main agent hires other agents/sub-agents along the supply and value chains to execute other areas where they do not have expertise. The client's main agent acts as a principal to the other consultants in the supply and value chains. This comes down to the procurement service used by the client to hire their consultants.

CECs create engineering solutions based on the design brief as requested by the client(s). The CECs have a certain level of autonomy to carry out their functions. They have the intellectual resources to understand what they are doing. They are hired for their expertise since their principals do not have the knowledge. They have their agency because they are the experts in the field. This expertise influences how they interact with their clients.

The CECs adjust their competitive strategies and prices based on the client and the principal–agent relationship. The relationship is governed by contracts, which determine the amount of power everyone has and how they are compensated (Argyres & Mayer 2007). Power is derived from the fact that the CECs have technical knowledge that the principal (client) does not have and the principal has to hire someone who does (Arias-Aranda, Minguela-Rata & Rodriguesz-Duarte 2001; Fellesson & Friman 2018; Koch 2003; Miller 2005; Sappington 1991). It comes from the information asymmetry in the relationship (Miller 2005; North 1989; Pickering 2015). The principal incentivises the agent to perform in the best interest of the principal while compensating the agent for their services.

A theoretical position can be stated in relation to the principal–agent relationships in the conceptual framework (Position 4):

> The principal-–agent relationship in the consulting engineering industry is governed by: (1) the power of the firms in terms of the information asymmetry between the client and the CEC, (2) the availability of other competing CECs who have the required information, and (3) the propensity for risk sharing in the firms.

This information asymmetry leads to the clients hiring a CEC. The competitive strategies used by the CECs are modified by how much risk will be shared in the contract between the client and the CECs.

8.3.14.1 Procurement policy – risks in the principal–agent relationship

Procurement policies are designed to guide how an organisation obtains its goods and services. They also indicate how the organisation views risks as they influence the way it contracts for services (Akintoye 1994; Argyres & Mayer 2007; Berends 2000; Lee 2000; von Branconi & Loch 2004). Changes in these policies over time reflect changes in the way the market procures. Some clients are multinational firms, which have cross-country procurement practices that are applied at the local level in NSW and nationally across Australia. Additionally, they provide an insight into how power is split between the principal and the agent.

The legal and supply-chain environments determine how the client procures and contracts for the consulting engineering services. This also influences how the CECs implement their competitive strategies in the marketplace. The competitive strategies extend to the way they price their services for clients. A major factor that has arisen in the sector is the increasing transference of risk from the client (principal) to the contractors (agents) (AA1). In a risk transference situation, the party who is taking most of the risks can charge more for their services.

One of the architects (AA1), who acts an agent for the client owner, opined:

> "It is all about lawyers trying to offload risks. Often, they do not understand the building process. They try and have the same thing [as] if you are buying bolts or if you are buying stationery. They would try to have the same kind of contracts to try to make it all the same. And this does not apply to a consultancy because everything we do is bespoke where the risks are different and less predictable."

Sometimes the client may request the engineers to charge at the cheapest price, but with the risks the engineers are facing, the rewards are not favourable to the CECs (AA3; PM1). It has been suggested that clients are pushing the fees lower while the engineering consulting firms are taking on the more of the risks. The situation depends on whether the firms are innovative or commoditised engineering firms. The commoditised engineering firms will experience a price squeeze since they are competing mainly on price (CEC9). The value innovation strategy means both the principal and the agent take on more risks, which can account for a higher price in the contract. The commoditised CEC will have less power than the value innovation CEC. The incentive for the latter type of firm is its commercial reputation is based on pushing design boundaries for the client.

Therefore, the principal is willing to accede power to the CEC to make autonomous decisions since the CEC has more knowledge than its principal in the consulting environment (information asymmetry). The principal compensates its agent for the risks taken in the innovation design requirements. For firms in the value innovation market, there is less pricing pressure because the clients hire them for their speciality area(s) (CEC2; CEC7; CEC14). The commoditised CEC faces pressure to keep their prices within the client's willingness to pay.

The aversion to risk by both public and private sector clients has created the design and construct (D&C) and public–private partnership (PPP) contracts. With the PPP, the public sector contracts the private sector to design and construct the built environment artefact, which can be funded by different models. The use of the D&C contract has pushed the responsibility of the project risks across to the contractors instead of being shared with the clients (AA1; Akintoye 1994; Berends 2000; Lee 2000; PD1; PM1). From a risk management perspective, this is an attempt to share the risks.

Another interviewee (AA4) summed up the mix between risk and pricing of services:

> "I think that clients think that building and design is transactional. What it involves is relationships. If you think that you are just going to buy coffee and hand over your money and get it back. That is not the process. It is not geared that way. If you are going to build a building that is going to potentially stand for 100 years, why don't you form relationships? Pay the right money to the right people and you will certainly almost get a better building. And probably at no extra costs. You are not burying all of that money in unnecessary insurances and risk strategies but rather in a collaborative approach."

The next subsection discusses the pricing within the principal–agent relationship.

8.3.14.2 Pricing within the pricing–agent relationship

The expansion of a firm can lead to the repositioning of the company in terms of their specialisation or disciplines, clients, and geographical spread (Castaldi & Giarratana 2018; Dias & Tebaldi 2012; Gupta & Di Benedetto 2007; Lancioni, Schau & Smith 2005). As they reposition themselves, they must evaluate their commercial practices. The CECs have to review pricing of their commercial services, which creates the incentives for providing the particular consulting service (Golding & Slutsky). With the new disciplines, new business outcomes must be set (CEC7; CEC10; Gupta & Di Benedetto 2007; Kornberger & Clegg 2011). This produces new demand on the commercial service operations of the CECs. These new disciplines provide the new engineering consulting

services to their clients. Clients may be better inclined to use the services of the same engineering firm, but it depends on decision-makers in the client firm (AA2; PD2).

Contract design is important as it determines how the relationship will be delivered (Argyres & Mayer 2007). Argyres & Mayer (2007) make the case for different involvement from the engineering, management and legal teams when it comes to the design of the contract between a CEC and their client. However, the disconnect among the teams regarding what is required can lead to unyielding contracts that drive up the transaction costs (Argyres & Mayer 2007; PM1). This was discussed in the quote from the architect in the previous section.

The commoditisation of the consulting engineering industry has advanced because of the increased use of tendering to select CECs. The CECs are forced to compete within the boundaries set by the client's tender(s). As a result, they are constrained to be a cost leader in their response to the tender. In this response, the are presenting the lowest cost to the proposed client. Alternatively, the value innovation strategy positions the CECs as being able to charge a premium price for their services. However, it also requires that the CECs have clients who are willing to pay the premium prices (Baker 2011). The pricing for the service is adapted based on the competitive strategy being used.

One of the hybrid engineering CECs explained their pricing approach (CEC18):

> "We have two ways that we price. We give a fixed fee. We get the documents from the clients outlining the scope and what they expect the job to look like. They either ask for a fixed fee based on the scope that they have given, or hourly rates. We give an indication a lot of the time of what we feel that it is going to take. But things [have] changed a lot in the work that we are doing in the infrastructure market, especially in New South Wales at the moment. Things change so rapidly. The timing element of our clients is so fast, and they need things done so quickly to report to government, that generally we work on hourly rates. We just give an indication of how many person hours it is going to take."

The interviewees consistently mentioned D&C contracts as the major contract type, which they deal with and which impact on their operations. It does not take away from the other contract types used in the built environment projects. In the D&C contract, the engineering firm is contracted by its client to provide only part of the design and documentation. The full design is shared between different engineering firms. The design process is divided into (1) preliminary design for development approval, (2) design for tendering, and (2) design for construction. The preliminary design engineers are not guaranteed to be novated by the client-owners to the contractors as the designers for tendering and

construction. The preliminary design engineers are not *entirely* wedded to the design since another engineer will complete the design for construction. They are just contracted to do the preliminary development approval design. They do not have to do the most intricate design because they are not getting paid to do the full design. The second engineer who works for the construction firm is the one who gets to apply the differentiated engineering designs, especially if their design solutions can reduce the construction costs and time.

Nevertheless, this motivation problem can be turned on its head if the preliminary design engineer is novated across when the Design and Construct (D&C) contract is signed by the head contractor. The motivation of the CEC is part of the principal–agent theory in terms of incentives. The head contractor is selected by the client. In the traditional D&C contract, the head contractor will bid for the construction component with engineering firms as part of their team for the project. The head contractor may also have the subcontractors who have to hire their own engineers for their particular areas (CEC4; CEC5). This introduces more commoditisation into the engineering market as the head contractor will be tendering based on costs to win the project. The engineering firm will be pressured to provide a lower cost in order to help the head contractor consortium win the construction bid (CEC22). Some engineers are able to charge a higher fee in this instance if their design can reduce the overall construction costs and make the consortium's bid more profitable (CEC7; CEC22).

Because of the CECs' intellectual knowledge, they have power as agents of the clients. They can demonstrate their value. CECs who practice value innovation engineering demonstrate their power by taking on riskier projects for their clients. The clients compensate the CECs for the risks taken. The CECs still exercises their agency, but the level is different depending on the strategy being deployed. The commoditised engineering firm does have power; but they are more price-takers in the micro-economic sense. Their power is less than those of the innovative engineering firm. The hybrid engineering firms, who apply both strategies, are adapting to a changing market. They have power in between the commoditised and innovative engineering firm. The principal–agent relationship pushes the firms to determine how they price based on their competitive strategies within the dynamics of commercial relationships.

This section explained how micro-economics is applied to the conceptual framework. The next section explains how institutional economics is applied to the conceptual framework.

8.4 INSTITUTIONAL ECONOMICS THEORETICAL POSITIONING

Betancourt & Gautschi (2001, p. 159) make the point that 'all organisations are institutions but not all institutions are organisations.' This provides a good viewpoint in analysing the consulting engineering market. The market structure aligns to the structuralism of institutional economics (Duina 2011; Kapp, Berger & Steppacher 2011). The structural demographics are the building blocks of the conceptual frameworks, outlined in Figure 34, Figure 35 and Figure 36.

However, the isomorphism exhibited by the various firms means a multidimensional framework should exist to explain their behaviour. The isomorphs are discussed further in Section 8.4.3 on page 155. An individual CEC can exist in various micro-markets because of the composition of its structural demographics. The modification of micro-economic theory is that the individual CEC experiences various market conditions because of its structural demographics. When it is aggregated to the market, there are hundreds of micro-markets faced by the various engineering firms. They are aggregated to produce a four-dimensional market framework, as constructed in Figure 36 above.

These four questions determine how the market is structured and how the competitive strategies are applied:

1) What is the required engineering discipline?
2) Where is the location of the potential project?
    a) Where is the client located?
    b) Where is the CEC located?
3) In which economic sector(s) does the client participate?
4) Who is/are the proposed engineering consultant(s) on the potential project?

The micro-markets become legitimised when the CECs win projects based on their structural demographics. For example, new engineering disciplines are created, and firms win work based on the new disciplines. These new engineering disciplines create new options in the discipline market dimension. As a result, there are new touchpoints where the CECs can differentiate themselves and this develops into new micro-markets. With the value innovation engineering strategy, the CECs can establish a monopoly or near monopoly over the particular micro-markets (Åkesson et al. 2016; Jacobides, Knudsen & Augier 2006; Salunke, Weerawardena & McColl-Kennedy 2018; Teece 2010).

If the CECs can keep the knowledge inside a single or a few firms, they can control the market and reduce the entry of competitors. The industry sees the formation of oligopolies because of mergers and acquisitions (del Carmen Haro-Domínguez et al. 2007; Gundlach & Moss 2018). Micro-economic theory argues that monopolies do not have incentives for

innovation because they do not have any competition. However, value-as-a-strategy literature counters that argument, where service providers create new markets because of innovation and they exist as monopolies (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; OpenStax College 2014). The CECs that practice value innovation engineering or hybrid engineering strategies recognise that by innovating they can continue to have more market power (Alipranti, Milliou & Petrakis 2015).

The production, distribution and consumption of the services output of CECs are separated by space and time. This separation is proposed by Betancourt & Gautschi (2001) in their product innovation in services framework. The outputs of the CECs' creative processes are their engineering design, analysis and advice, which are the intellectual property of the CECs. The clients want to use this intellectual property to create their built environment artefact(s) and they must pay for the use of this knowledge. The competitive strategies employed by the CECs are designed to get the clients to select their services over other competitors (Åkesson et al. 2016; Eisingerich, Rubera & Seifert 2009; Newman, Prajogo & Atherton 2016; Soni, Vinayak & Tyagi 2017). The clients would have a certain degree of choice in the selection and this gives them power. When the clients select a CEC, the CEC performs as an agent of the clients to design their built environment artefact. This is discussed further in Section 8.4.3 on page 155.

The next section discusses the institutionalisation of competitive strategies used by the CECs across the industry.

8.4.1 Institutionalisation of the strategies across the industry

Competitive strategic decisions, made by the leaders of the firms, are made as individual decisions. The decisions are aggregated into organisational decisions (Augier & Sarasvathy 2004). These are connected as the individual decisions are made from the legitimate power of the leaders. The decision-making bodies, which can be collegiate endeavours, are institutional practices in the consulting engineering firm. There is a tie-in between the Simonian perspective of individualism in organisational strategy decisions and institutional economic thought around the legitimacy of the decision-making process (Augier & Sarasvathy 2004; Duina 2011).

Based on the strategic decisions of the leaders, organisational artefacts stick around in the organisation (stickiness is another pillar of institutional economics). Additionally, institutional economics can explain how the same strategies can be seen in different engineering firms. By moving from one firm to another, engineering leaders bring their institutional memories from the previous firm(s). If the CEC is firmly embedded into commoditised engineering, the strategic decisions would be based on the belief that the

market is fixed in its boundaries and that they are competing for the same clients with other engineering companies. However, the introduction of the value innovation strategy requires the presence of an advocate to move beyond the current market boundaries. In the interviews, two engineering firms introduced the value innovation strategy at two different stages of the firms' development. One engineering consultant introduced it when he started his firm (CEC15) while the other introduced it when his firm merged with another engineering firm (CEC7).

Engineering firms design the various built environment artefacts. These artefacts are an interaction of their outer business environment (clients) and their inner business environment (commercial services operations). The CEC can create a new market based on its design practices, through educating its clients about the new possibilities and changing their preferences (Augier & Sarasvathy 2004). This lends itself easily into the blue ocean strategy of creating new markets (Kim & Mauborgne 2005).

The architects who work on high design quality projects want to work with engineering design consultants who can think outside of the box (AA2; AA4). One of the engineering consultants spoke about working on iconic buildings. The firm usually takes on jobs, where their intellectual resources can expand their knowledge and grow professionally (CEC2). Here the CEC is creating artefacts based on its internal environment (talent) based on its outer environment (desires of the client). If the artefact is such an iconic one that it creates a new market and new customers, the engineering firm has practiced a value innovation competitive strategy.

The NSW State Manager for a CEC, who applied a value innovation engineering strategy, stated (CEC2):

> "But in an overarching sense, I would say we set out to be a premium brand. We do not sell on price and we do not expect to sell on price. I do not think our clients expect us to be the lowest price. They do not come to us because they want a low price. We set out very clearly a value proposition, which is around quality, excellence, values. And I guess time has told us over the years for us is if we do that and we do that right, then we will win work without having to be the lowest price."

Intellectual knowledge (of the engineering firm) is the competitive advantage of the professional services firm (Augier & Sarasvathy 2004; Huang & Hsueh 2007). The institutionalisation of knowledge comes from (1) the knowledge already processed by the individual in the organisation, and (2) the addition of new individuals into the organisation who have new knowledge to add (Nonaka, Toyama & Konno 2000). The former is done in

an organic process of hiring people. The latter is done by merger and acquisition, otherwise known as acqui-hiring (Coyle & Polsky 2013). The second method is popular as there has been a solid activity of consolidation across the industry in the past ten years, as discussed in Chapter 6 and Chapter 7.

8.4.2 Business environment factors

Business environment factors insert additional dimensions into the conceptual framework. They modify how the CECs and clients execute their power in the market, interact with each other, and absorb new knowledge into the market. They underscore the operational dynamics of CECs (commercial services operations), the operational boundaries between CECs and their clients (principal–agent relationships), and the changing knowledge landscape (technology). The common framework for the competitive strategies used by CECs involves the institutionalism of the business environment factors. These factors persist throughout the market because they become legitimised as being an accepted practice. This is outlined in Table 9 below.

Table 9: Business environment factors.

Commercial services operations	**Principal–agent relationships**	**Technology**
Organisational structures related to service delivery Organisational structures related to competitive strategies, e.g. discipline-focused, sector-focused (cross-disciplinary) Consolidation (M&A) requires reordering of how services are delivered in the larger CECs and the newly formed small CECs Medium-sized firms are competing with large-sized and small-sized firms Hybrid competitive strategies being employed	The agency of the CECs in relation to their clients The clients change based on where the CECs are on the supply chain and value chain for the built environment project CECs can have the owner, building contractor or another CEC as their client Power is different among the different principal–agent relationships based on what is required, who the principal is and who the agent is CECs can change their power based on the competitive strategies with value innovation having the most power followed	Public policy requires new technologies to be integrated into the infrastructure, e.g. NSW Infrastructure Strategy, building code prescribing new engineering materials, procurement policy prescribing construction technology The CECs design and document in collaborative design environments with clients and collaborators Communications with clients, collaborators and competitors are mediated by digital communications

Commercial services operations	Principal–agent relationships	Technology
	by hybrid and then commoditised	

The micro-economic theory of price is built on the idea of the invisible hand, which influences the decisions of the individual actors in the market. Aggregating the entire consulting engineering markets makes it difficult to apply micro-economics. The power dynamics changes across the micro-markets as the specific dimension changes. The power dynamics are influenced by how the actors are organised. This organisation is manifested in the commercial services operations of the CECs. The commercial services operations can be modelled under the institutional economics theories. The principal–agent relationships between the individual CECs and their clients can be modelled using micro-economic theories. However, the collective relationships across the micro-markets and overall markets are better analysed using institutional economics. While the technology adaptations and accommodation factor into the shift of demand-supply functions for individual micro-markets, micro-economics works well. For aggregation purposes across the entire consulting engineering market, institutional economics works better to explain their behaviour.

The overall competitive strategies for the industry are based what value the CECs bring to their clients. The value-in-exchange strategy is the commoditised engineering strategy and the value-in-use strategy is the value innovation engineering strategy (Arslanagic-Kalajdzic & Zabkar 2017; Farr 2001; Hinterhuber 2017; Kohtamäki & Rajala 2016; Phillips 2005; Sturts & Griffis 2005; Terho et al. 2017). The hybrid engineering strategy combines both value-in-exchange and value-in-use strategies. These theoretical strategies are not executable unless the CECs have suitable business environment factors.

8.4.3 Commercial services operations of CECs

The commercial services operations of CECs are delivered via their intellectual resources. The organisational structure of the CECs determines how the intellectual resources are arranged to provide the service to their clients. The organisational structures are part of the execution of a competitive strategy. The power of the CECs in the market is deployed by their intellectual resources (i.e. consultants). The structures can be analysed using the principles of institutional economics. Additionally, the consolidations of CECs change the organisational culture of the firms, which influence the competitive strategies.

8.4.3.1 Organisational structures

Strategy execution is based on a firm's organisational structure. The CECs can be structured on the market dimensions – discipline, geography, and sector (client) (Bartlett & Ghoshal 2003). The organisational structure influences how decisions are made and where the power and influence lie in an organisation (Clegg et al. 2011). It determines how competitive strategies are deployed. The strategy can be applied either mainly from the technical leadership (discipline) or more of the cross-disciplinary leadership (geographical/sectoral) (Aoki 2007; Bartlett & Ghoshal 2003; Bouquet & Birkinshaw 2008; Clegg et al. 2011; Mitsuhashi & Greve 2004). These structures are structural institutional models that exhibit isomorphisms (Duina 2011).

All three organisational structures (discipline, geographical or sectoral) can be commoditised based on the belief that the market is fixed. The fixed market boundaries follow the commoditised engineering strategy. This strategy is aligned to the traditional style, or red ocean strategy (Clegg et al. 2011; Kim & Mauborgne 2005). However, they can also be channelled into executing an innovative engineering competitive strategy. The firm can create new engineering disciplinary combinations, new sectors and new clients (Kim & Mauborgne 2005). They can create markets based on the changing inputs of technology and clients (Alipranti, Milliou & Petrakis 2015; Betancourt & Gautschi 2001; Kim & Mauborgne 2005). The innovative engineering firm integrates its clients' needs with its commercial services offerings.

However, the sectoral organisational structure brings about the best outcomes as it becomes a collaborative effort to create new markets for the firm. Just focusing on the engineering disciplines has the firms thinking of their services as retail products (commodities) instead of components of engineered solutions (innovations). The engineered solutions are innovations that solve a client's problem(s). These are packaged for the client based on the value created for or with the client (Ekman, Raggio & Thompson 2016; Galvagno & Dalli 2014; Kohtamäki & Rajala 2016; Marcos-Cuevas et al. 2016; Salunke, Weerawardena & McColl-Kennedy 2018). The value co-created with the client means the client is engaged within the process (CEC1; CEC14). It is understood that not all clients may necessarily go for this type of solutions-packaging. Those clients can be served by the commoditised business lines until the clients become no longer commercially sustainable. It is better to release a client that is becoming expensive to maintain, especially if they are not in line with the new value innovation strategy (Baker 2011).

The service lines of CECs mean the profitability is tied into the relationship with the engineering consultants and their clients (Baker 2011). The service-dominant logic theory applied from marketing provides a useful avenue about how to approach the economic modelling of the competitive strategies of the firms (Ekman, Raggio & Thompson 2016; Galvagno & Dalli 2014; Ordanini & Pasini 2008).

With sector-focused organisations, multidiscipline CECs will have greater collaborations amongst their different engineering disciplines (CEC1; CEC2; CEC16; CEC17; CEC18). The geographical leadership acts as one of the branches of the matrix, since the locality of the market affects how the project is bid and paid for. The organisational leadership determines how the projects are executed. The discipline organisational structure centres power across the different disciplines. The disciplines lead the strategy for the CECs. They target their potential clients based on the disciplines; therefore, this works as an effective way to gain clients. However, the discipline organisational structure does not tap into the cross-disciplinary benefits of the sectoral organisational structure (CEC1; CEC2; CEC16; CEC17; CEC18). The sectoral organisation structure permits the CECs to deliver the engineering design via solutions for each client. The cross-discipline approach has a wholistic aspect. Also, it is useful for the different disciplines to help each other in winning project work.

One of the interviewees (CEC16) explained his matrix leadership role, which incorporated geographical (Asia-Pacific), discipline (transport engineering and environmental geoscience) and sector (Infrastructure):

> "My role is the regional director for Consulting Engineering Company 16 – Infrastructure for Australia, New Zealand, and broad Asia-Pacific. That role encompasses managing a transport capability and an environmental geoscience capability across the states of Australia and into New Zealand. A few projects that are based in Asia incorporating predominantly engineering capabilities. In addition to that, we have operational and safety, human factors, transport planning capabilities as well. And the environmental geosciences and geotechnical experts. And the general environmental specialist as well.
>
> The second role that I have is as the country manager for Consulting Engineering Company 16 for Australia, which is a business development coordination role. With the infrastructure sector that I represent plus the power sector, which is predominantly a renewables capability in Australia, the mining and metals sectors, and the oil and gas sectors. Among all four sectors, it is sort of my role to represent the organisation at the corporate level. And to ensure that we are

coordinated in our business development approach where we have cross-sector team opportunities for certain clients."

Consolidation impacts on the commercial service operations are discussed in the next subsection.

8.4.3.2 Consolidation in the industry and commercial service operations

Both client companies and CECs have discussed how one of the major changes in the sector is the consolidation in the industry. The larger firms are acquiring smaller and medium-sized firms, who have speciality practice areas and a profitable clientele. Additionally, the industry has seen the creation of smaller firms, who are formed when former staff from the big consultancy firms leave and create their own consulting engineering offices. Some of the smaller firms have refused to sell as they prefer to exist as an independent CEC. The competitive strategies are still commoditised, innovative or hybrid.

Consolidation does not necessarily only take place because of large multinational firms. Medium-size firms can consolidate to create large locally owned firms. Or they can grow organically to becoming large firms in the market. Consolidation has two modes: acquisition or merger. There are four parts to the consolidation in the industry: (1) local-to-local acquisition, (2) local-to-local merger, (3) multinational-to-local acquisition, and (4) multinational-to-local merger. The input from multinational acquisitions brings new expertise from outside of the region into Australia. The expansion of the firm's areas of operation can open the doors to new countries and opportunities.

Each of these consolidations impact on the competitive strategies of the new firms and the remaining firms in the NSW market. Consideration must be given to the possibility of reduced competition in the marketplace as the firms are consumed (Clarke 1985; McTaggart, Findlay & Parkin 2013). However, additional considerations can be given to the introduction of new talent and knowledge into the market with the consolidation (Bligh 2006; Kreitl & Oberndorfer 2004; Kreitl, Urschitz & Oberndorfer 2002). For some, consolidation introduces opportunities for synergies between technical disciplines and their clients. Since the acquired firms are bought for their professional and intellectual capabilities, the new staff members are hired via acquisition. Also, the consulting engineering firms also acquire the branding, client and projects of the bought firm (Kreitl & Oberndorfer 2004; Kreitl, Urschitz & Oberndorfer 2002). The buyer is buying market share with its new acquisition. The adjustment to culture with the new ownership of the engineering firm changes how the firm operates commercially (Bligh 2006).

The consolidation in the industry has seen the number of competitors decrease as the firms become larger through M&A activities. However, this is only for a while as new competitors are established when consultants leave their recently consolidated firm to form their own CEC. Not all firms decide to pursue a merger and acquisitions route. This can lead to cleavage in the business characteristics – large firms versus small firms, with a smaller number of medium firms to straddle the two firm sizes. The cleavage also shows up in the specialisation of the firms. The larger, usually multinational or country-wide firms become multidiscipline firms with more than five disciplines. Many have ten or more disciplines on offer, while the smaller firms may have between one and five.

A company executive (CEC7) expressed this observation about the state of consolidation in the industry:

> "Our competitors have changed. We have been through cycles. It is a continuing cycle that I have seen. I have worked in this field now for over thirty years. You see a cycle of small companies being bought out by bigger companies. We are nearing the end of that cycle now. And then we will see the disappearance of lots of Australian companies, which we have. If you look at the engineering consulting business across Australia now, it is dominated by big American or overseas companies.
>
> We will see over time, and we are starting to see it now with our major clients becoming dissatisfied with the service provided by those bigger companies. And we get the growth of smaller companies coming up. We're actually starting to see in the marketplace now, senior people in those bigger companies going off on their own and setting up their own companies. They are usually one- or two-man bands but most of those ones survive. But some of those will survive and grow into small and medium-sized consulting engineering companies over time. It is the cycle we see."

Commercial service operations are affected by the organisational structures and consolidations. The competitive strategies of the CECs are influenced by the commercial service operations. Additionally, the firms must incorporate technology into their strategies, which is discussed in the next subsection.

8.4.4 Technology – digital transformation and adoption

Engineering is the application of science and technology into practical solutions. Engineering technology is the bedrock of the intellectual resources in the CECs. The competitive advantages of the CECs are tied to their intellectual resources adapting to the engineering technological change. There are two technology changes that influence

the competitive strategies of the CECs. The first technology change is the impact of the design policy on technology adoption in engineering designs. The second technology change is found in the engineering design practice, which has transformed by digitisation of design.

8.4.4.1 Economic models incorporating technology

Betancourt & Gautschi (2001) framework accounts for technology, competitive boundaries (micro-markets), and services institutions. This is summed up by one of their own propositions (Betancourt & Gautschi 2001, p. 178):

> "Technological change allows the emergence of service institutions that: (1) separate primitive economic activities across space and time; (2) provide variety and novelty in satisfying given consumption aims; (3) redraw the competitive boundaries of various markets."

The primitive economic activities can be modified as engineering knowledge is replaced by technology. The variety and novelty come from the innovation provided by the intellectual resources while the competitive boundaries are derived from the disciplines, geography and sector markets. The position can be rephrased in the context of the consulting engineering industry as (Position 5):

> Technology change allows for the emergence of consulting engineering companies that: (1) create, deliver and perform engineering consultancy aided by technology, (2) provide variety and novelty of their services based on their intellectual resources, and (3) create, modify and compete in dynamic competitive markets bounded by their disciplines, geographies and economic sectors.

The expansive view of technology employed by Betancourt & Gautschi (2001) is applicable in this research in terms of digital transformation and technology adoption. Their framework accounts for the value-in-exchange and value-in-use relationships in the industry (CECs and their clients). The conceptual framework (Figure 36) aligns with the Betancourt & Gautschi (2001) framework.

Technology changes the nature of the exchange and the power exercised by the players in the economic game. The economic game is defined within the comparative institutionalists' perspectives (Aoki 2007; Dequech 2006, 2009; Duina 2011; Greif 1998; Kapp, Berger & Steppacher 2011; Williamson 2005). Technology adoption impacts on the production, distribution and contribution of the CECs' services output. There is a constant tension between consistency and creativity in design and technology (Shalley &

Gilson 2017). The power of the CECs and the clients in the market are affected by the technology changes.

Technology changes can be modelled using the technology acceptance model (TAM) and technology-organisation-environment (TOE) framework (Gangwar, Date & Raoot 2014; Son, Lee & Kim 2015). Although Sepasgozar, Loosemore & Davis (2016) argue that there needs to be a more comprehensive construction technology adoption model, it is outside of the scope of this research to create one. These two frameworks are usually modified to account for the additional internal and external factors that influence the adoption of technology into an organisation. However, the TAM is not practical for a dynamic technology environment when compared to the TOE framework. The TOE framework adapts to the technological context, where there are various variables influencing the industry's adoption of technology. The organisational context considers the influences of internal institutions and resources on the technology adoption. The environmental context considers externalities like the competitiveness of the market, government intervention, market maturity and commercial relationships. The TOE framework aligns with the proposed conceptual framework as it considers the internal and external institutions in its evaluation of technology adoption. Technology adoption impacts on the competitive strategies employed by the CECs in the market.

Micro-economic theories hold that innovation impacts on the competitiveness found in a market (Schumpeter 1939; Schutz 1995; Sepasgozar, Loosemore & Davis 2016). A change in technology can shift the supply and demand functions (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; Perloff 2014). Innovation can be one of these five types: market, organisational, product, process and input. Technology innovation that is found in the consulting engineering micro-markets can be described in any of the five types. Innovation takes any creative idea and brings it into practice in the market, organisation, production, process and/or inputs (Sepasgozar, Loosemore & Davis 2016; Shalley & Gilson 2017). Innovation can be applied both internally (commercial services operations) and externally (knowledge delivery by intellectual resources) by the CEC. As a result, technology innovations apply to the competitive strategies deployed by the CECs.

For monopolistic competition and oligopoly market structures, it can give the firms with the changing technology an advantage over their competitors. The technology change can add a shift in the supply and demand functions and create a new micro-market. Using Kim & Mauborgne (2005) and Alipranti, Milliou & Petrakis (2015) frameworks, and the conceptual framework proposed here, the new markets are created and the power of the economic players changes. The profitability of CECs and the benefits to their clients are

enhanced by technology adoption (Betancourt & Gautschi 2001). Betancourt & Gautschi (2001) and Kim & Mauborgne (2005) are the closest to a multidimensional framework that accounts for both the micro-economics and institutional economics theories. This was seen in their incorporation of technology in their tableaux. The proposed conceptual framework in this research was designed specifically for a diverse market like consulting engineering.

8.4.4.2 Design policy influences on technology adoption

The built environment is governed by regulations that instruct on the minimum design requirements for built environment artefacts (Greeno & Hall 2008). These regulatory mandates influence the technology accommodation in the designs (Fuller 2011; Newell, MacFarlane & Walker 2014; Puopolo, Teti & Milani 2015; Waier 2011). The regulatory agencies promote technology innovations through their policies, rules and advisories (Singh & Holmström 2015). These agencies act as innovation champions to promote innovations that can improve overall industry performance (Singh & Holmström 2015). When the regulations change, the CECs must be ready to implement them into their built environment designs. These regulatory actions can be considered as externalities or environmental perturbations, which impact on the competitive strategies of the firms (McTaggart, Findlay & Parkin 2013; Perloff 2014; Rogers, Chong & Preece 2015; Singh & Holmström 2015).

In one of the project management companies interviews, the interviewee (PM1) stated how government policy influenced the selection of BIM by the consultants:

> "In the UK, the government has mandated it for projects I think over £15M. Something like that … It is probably still five years behind with BIM adoption, roughly. Some of the [government] agencies are starting to mandate it like [NSW] Health. [NSW] Health has said anything over A$15 million, you must use BIM. However, they don't strictly enforce it as much as they should. What we are finding is that unless a client mandates it and says you must use it, then it tends not be used as much because there is a cost element."

Additionally, the CECs must keep up with the latest trends in construction technology. By extension, they have to educate their clients on the new technologies, which can help the consulting engineering firms create new markets (market innovation) (Sepasgozar, Loosemore & Davis 2016). Although Sepasgozar, Loosemore & Davis (2016) argue that the combined AEC industry is resistant to technology change, the industry adopts the technology if it improves their competitiveness and profitability. Product innovation can occur when the CECs propose new engineering materials (Sepasgozar, Loosemore &

Davis 2016). This product innovation is useful, especially if it reduces the construction cost or increases the sustainability of the built environment artefacts (Edwards & Francis 2012; Tobias 2009; Tobias & Zimmer 2009; Tsai et al. 2014). Innovation comes from the ability to apply these new technologies in a practical way so that the clients can use them in their construction designs (Shalley & Gilson 2017).

A quote from one of the interviewees sums up the viewpoint on integrating construction technology (CEC5):

> "The construction industry has lagged behind other industries in terms of productivity. We still build buildings the same way we have done for hundreds of years, essentially. Technology has not really impacted on that. [It] is because there is no ability for us to innovate and to spend time on design and prototyping digitally. It is all done schematically. It is then left to people on site to figure out. There is a lot left on the table there."

Having the ability to apply new engineering materials across the design would be advantageous. If there are a limited number of firms with the expertise, a CEC can create the micro-market. The CEC applies a value innovation or hybrid engineering competitive strategy. This can create a monopoly or oligopoly (McConnell, Brue & Flynn 2012; McTaggart, Findlay & Parkin 2013; Perloff 2014). For example, cross-laminate timber (CLT) has been in use in Europe for over forty years but it has only been introduced into Australia in past five years. The number of engineers who can apply the technology is limited in the NSW market (PD1). The CECs with CLT engineering knowledge can create a near monopoly/oligopoly market structure.

The CECs can decide to be at the forefront of engineering materials and construction technologies. Some of the bigger firms use the M&A route to get the lead. They acquire the knowledge, which permits them to pursue a value innovation/hybrid engineering strategy. Technology adoption follows an innovation diffusion spectrum: the firms that are first to use the new materials and technologies are usually risk-takers, enthusiasts and opinion leaders (Singh & Holmström 2015). The newer engineering materials that are used for construction are usually used in the newer buildings commissioned by clients who are also risk-takers, enthusiasts and opinion leaders (Goh & Yang 2010; Miller & Buys 2008; Ortiz, Castells & Sonnemann 2009). However, with the formation of the multidiscipline, multi-sectoral companies, there has been greater alignment with advancements in engineering materials and their uses in construction. These firms work across the spectrum of the architecture, engineering and construction (AEC) economic sectors.

This technology adoption due to design policy can impact on design practice, which is discussed below.

8.4.4.3 Design practice & technology adoption

The availability of design technology creates challenges to architecture, engineering and construction firms in their design practices (Sepasgozar, Loosemore & Davis 2016; Singh & Holmström 2015). Technology adoption and innovation diffusion models can be applied in this research as the different CECs, collaborators and clients have different transition states. The transition states represent how much these firms amend their design practice based on new technology. The success in the adoption is related to the effectiveness of the technology being integrated into the organisation, that is, process and organisational innovation (Sepasgozar, Loosemore & Davis 2016). Institutional economics theories are also applicable here as they account for how the culture, rules and practices of the CECs adapt to the technology adoption.

Technology adoption is a form of socialised change where socialised learning is used to understand the new technology (Duina 2011; Nonaka, Toyama & Konno 2000; Sepasgozar, Loosemore & Davis 2016). It is propagated via peer association and multidisciplinary association, which are forms of peer-mediated institutionalised learning (Singh & Holmström 2015). Peer association is the peer pressure experienced by an actor to gain approval by adopting new innovations and to be within the 'in-group' of their peers. Multidisciplinary association is the peer pressure experienced by an actor to gain approval by adopting new innovations used by and gaining access to a network of actors. Multidisciplinary association can relate to the principal–agent relationship in terms of contracts and bargaining power of the CECs and their clients. The speed of the technology adoption is affected by these commercial relationships (Alipranti, Milliou & Petrakis 2015; Asare, Brashear-Alejandro & Kang 2016). The use of digital design tools by the CECs is a result of these peer and multidisciplinary associations (Singh & Holmström 2015). These motivational needs and technology adoption frameworks incorporate the competitive strategies used by CECs and by extension their collaborators and clients.

The adoption of the new design practices because of technology impacts on organisations and their processes. Therefore, there is some integration into the commercial services operations of the CECs. The firms adopt the new design technology and modify their design practices to retain market leadership and competitive advantages. The design practices are part of the commercial services operations. There is institutional knowledge embedded in how the CECs conduct design and what technology they use. The firms can either be risk-takers, who can afford the innovation, or they are forced to do so to stay

ahead of competition (Sepasgozar, Loosemore & Davis 2016; Singh & Holmström 2015). Additionally, firms who are thought leaders in the field work on complex built-environment projects (Sepasgozar, Loosemore & Davis 2016; Singh & Holmström 2015). Technology innovation provides the necessary improvements into design practice, that is, the way that any type of AEC firms delivers their services (Sepasgozar, Loosemore & Davis 2016).

The CECs see the digitisation of the design practice as the new normal (CEC1):

> "[It] is the production of our designs. It is automated on drawings and 3D visualisations and virtual reality. Sort of the new age technology in the digital technology space."

The newer iconic properties that are being built across New South Wales and other Australian states are using state-of-the-art materials and new constructability designs (AA3; CEC1; CEC2; CEC8; PD1; PD2; PD3). The pace of construction in the Central Business District (CBD) in Sydney means there are multiple construction sites near to each other. They are also doing construction work near to other occupied buildings. The CECs must employ design simulation software to detect the various clashes between the different engineering disciplines in the design (CEC1; CEC2; CEC8; PD2). This must be done before construction starts. Increasingly, CECs are expected to use building information modelling (BIM) technology to incorporate their designs with other architecture and engineering consultants on the project (CEC8; PD2; Rogers, Chong & Preece 2015; Son, Lee & Kim 2015). The building information models are incorporated into facilities management systems for the client (AA1; PD2). The design practice improves because of better document control, reduced design cycle time and improved design communication (Son, Lee & Kim 2015).

Design practice has become more digital as the technology has evolved and become more accessible. The institutional responses by the CECs have been to adopt them to provide a faster coordinated service delivery to the client. As digital design practices become more mainstream, it increases the affordability of the technology solutions for the different CECs. The competitive strategies determine how quickly they adopt technology and adapt their design practices. The value innovation and hybrid engineering strategy firms adopt technology earlier since they are usually the risk-takers, enthusiasts and opinion leaders, while commoditised engineering firms are usually pragmatists being in the early majority. However, they can be in the innovators and early adopters if they can see the profitability of adopting the new technology into their design practice.

The digitisation of design practice has also moved to client firms. The quote below is an extract from the research notes from a property development company's interview (PD3):

> "However, the technology has changed in terms of design. The design communications with regards to the use of 3D modelling and BIM. The company no longer uses paper. It has enabled efficiency. The way of working physically in the office has changed with the emergence of hot desks, looser hours of work and flexibility of the working environment. The introduction of the paperless working environment has changed how they work. It is more difficult to print, and the company does not have a plotter. The purpose of doing it is to eradicate paper and waste. The company uses web-based intranets to help communicate within the team. The innovation in the business pushes them to improve and how to do things differently."

From the conceptual frameworks, the technology dimension deals with the digital transformation and technology accommodation. The digital transformation from incorporation of digital design tools modifies how CECs execute their design practices. On the other hand, technology accommodation focuses on how creativity in engineering and construction are promoted by public policy and applied by technology innovations.

This section outlines the institutional economics related to the conceptual framework. The competitive strategies can be governed by both institutional economics and micro-economics. The theoretical positioning of the NSW consulting engineering market is discussed using micro-economics and institutional economics. It uses the conceptual framework to bring a theoretical understanding of the market.

8.5 NSW MARKET – THEORETICAL POSITIONING

The NSW consulting engineering market is a fragmented market, which consists of competitors, collaborators and clients. There are different economic models and competitive strategies to describe the CECs. The overall market is divided into four dimensions, which creates a multidimensional space or a variety of micro-markets. These four dimensions are discipline, geography, economic sectors and intellectual resources. Each dimension provides a specific way to analyse the market. The dimensions work with micro-economics to discuss how the market is structured, how the individual firms exercise power in the market, and what competitive strategies are applied.

However, when all four dimensions are added together to be analysed, micro-economics becomes less able to describe the dynamism of the micro-markets. Micro-economics can be used to discuss the transactional nature of the micro-markets. On the other hand, institutional economics can be used to describe the dynamism across the consulting engineering micro-markets. The markets are shifting with the consolidations and are still

experiencing competitive forces. Historical institutional analysis provides a sense of the past market state in relation to the current state (Greif 1998; Klüppel, Pierce & Snyder 2018; North 1989; Tsoulfidis 2017), while the comparative institutional analysis provides comparison between competing firms in the same marketspace (Aoki 2007; Greif 1998; North 1989; Wilber & Harrison 1978).

The power shown by the CECs in the market is always modulated by competitive strategies, structural demographics and business environmental factors. The level of power is described based on in micro-economic context. However, institutional economics determines how the organisations are structured to wield this power in the market. Technology adoption and adaptation impacts on the power of the CECs in the market. The clients accept new technology in their built environment that improves their operating profits and reduces their operating costs. As the CECs are knowledge-based firms, their knowledge of newer technology influences how their competitive strategies are deployed. Knowledge is power in the context of a professional services firm.

The consulting engineering market has faced numerous consolidations and divestures (M&As), which impact on the redistribution of intellectual knowledge across the firms. This is noted during the ten-year period of M&A analysis (Section 6.5). This impacts on the delivery of services to clients. It also determines how competitive strategies are applied across the market. The CECs differentiate themselves in the market through their competitive strategies – commoditised, innovative and hybrid engineering strategies. These strategies are a mixture of traditional and re-constructivist views of strategy (Clegg et al. 2011; Dobni & Sand 2018; Kim & Mauborgne 2005; Nagle, Hogan & Zale 2011; Porter 1996; Salunke, Weerawardena & McColl-Kennedy 2018; Thakur, Hale & Al Saleh 2018). These strategies differentiate how they interact with clients, competitors and collaborators.

Micro-economic theory gives the structure of the NSW industry at a specific point in time. However, the consolidation in the industry brings a lot of changes. Institutional economics is better suited to account for the changes. It acknowledges the different forms of institutions – people, culture and organisations – that are part of a market. It provides a plausible explanation for how the businesses are run and how the competitive strategies are implemented. It gets around the invisible hand argument of micro-economics.

Micro-economics discusses markets in a static equilibrium state. It talks about the power of the various firms in relation to each other in terms of setting price, earning profits and gaining market share. Institutional economics discusses markets as a collective ecosystem that moves in dynamic equilibrium. When the market experiences dis-

equilibrium, institutional economics creates institutions that accommodate the dis-equilibrium (Aoki 1996, 2007; Gagliardi 2008; Hall & Taylor 1996; Kasper & Streit 1998). Micro-economics is useful when the market is stable, while institutional economics is useful when the market is flux. The consolidations across the consulting engineering market causes the market to go from a period of stability to a period of flux before stabilising again.

Next, the summary recaps briefly what was discussed in the chapter.

8.6 SUMMARY

This chapter outlined the conceptual framework for the competitive strategies used by CECs in NSW. The conceptual framework consists of eight dimensions. Each of the dimensions brings a different theoretical focus for current and future economic conditions faced by the CECs. The dimensions were organised into three parts: competitive strategy, structural demographics and business environment factors. The multidimensionality of the conceptual framework lends itself easily to theoretical interpretations from micro-economics and institutional economics. The other theories – strategy, value and pricing – were incorporated into the micro-economics and institutional economics discussion. There were several theoretical positions established under each dimension where applicable.

The CECs were classified based on the three types of markets that the CECs operate in – discipline, geography, and sectors. With their intellectual resources, the CECs can compete across the three market types via micro-markets, which are intersections of intellectual resources and the three markets. The markets are governed by micro-economic theories of monopolistic competition, oligopoly and monopoly. This leads to Position 1, which stated:

> The power of CECs in the marketplace is based on the influence of their intellectual resources on: (1) the engineering disciplines, (2) the economics sectors of their clients, and (3) the geographical location of their operations and their clients' operations.

The competitive strategies are commoditised engineering, innovative engineering and hybrid engineering, respectively. The value as strategy theory influenced how the competitive strategies were developed. This leads to Position 2, which stated:

> Consulting engineering companies deploy different competitive strategies (and pricing strategies) to meet different commercial requirements of their clients. These strategies are deployed based on the specific market conditions they face.

> These strategies are used and adapted based on the market structure, continued acceptance by their clients, positive reinforcements by winning work and legitimacy of their contractual arrangements.

The consolidations in the market affected the power dynamics and knowledge distribution and impacted the competitive strategies. As a result, Position 3 was derived and stated:

> The consolidation of CECs in the engineering industry results in a changing competitive environment: (1) it rearranges the distribution of intellectual knowledge across the industry, (2) it changes the power dynamics of the firms relative to their competitors and clients, and (3) it creates newer firms in the marketplace.

The competitive strategies face modifications based on business environmental factors: commercial services operations of the CECs, the principal–agent relationships between the CECs and their clients, and the adaptation of technology. Institutional economics discuss institutions in terms of structural models, filtering institutions, legitimacy, stickiness and isomorphism. The institutional models are useful to explain these modifications. However, micro-economics is useful in discussing the power dynamics, internal factors and externalities as they relate to the ability to price for the services and earn profits.

Position 4 was based on the principal-agent relationships dimension:

> The principal–agent relationship in the consulting engineering industry is governed by: (1) the power of the firms in terms of the information asymmetry between the client and the CEC, (2) the availability of other competitors who have the required information, and (3) the propensity for risk sharing in the firms.

Position 5 was based on the technology dimension:

> Technology change allows for the emergence of consulting engineering companies that: (1) create, deliver and perform engineering consultancy aided by technology, (2) provide variety and novelty of their services based on their intellectual resources, and (3) create, modify and compete in dynamic competitive markets bounded by their disciplines, geographies and economic sectors.

The next chapter focuses on conclusions and future work and answers the research questions and the research objectives. It also discusses the limitations of the research, recommendations on how the conceptual framework can be applied and what are the future research areas.

9 CONCLUSION AND FUTURE RESEARCH

9.1 INTRODUCTION

This chapter outlines the research objectives, questions and findings. It summarises how the conceptual framework, developed in Chapter 8 above, provides a multidimensional conceptual framework that explains the competitive strategies used by CECs in New South Wales. The research established five theoretical positions, which governed the eight dimensions (pillars) of the multidimensional conceptual framework. They are summarised alongside the modifications of the conceptual framework. The research extends the use of institutional economics to analyse behaviours of the CECs in the market. It breaks the hegemony of using microeconomic theory as the principal market behavioural theory. The research provides a basis of multidimensional conceptual framework that is adaptable to the changing nature of consulting engineering industry in New South Wales, Australia.

Furthermore, the chapter discusses the future direction of the research. These directions cover areas that were identified during this PhD research that were outside of the scope of the thesis but identified as having potential. They are broadly discussed under three headings: mergers and acquisitions, technology adoption, and commercial services operations in consulting engineering companies. Those research areas can be expanded to architectural services companies and construction companies as part of the built environment market. The multidimensional nature of the conceptual framework provides the opportunity for five theoretical strands to influence the future research areas: microeconomics, institutional economics, strategy, value and pricing. The framework demonstrates that dynamic nature of consulting engineering as potential avenue for future research.

The next section summarises the research objectives, questions and findings.

9.2 THE RESEARCH QUESTIONS, OBJECTIVES AND FINDINGS

In developing the conceptual framework (Chapter 8), the research was able to answer four research questions (RQ1–RQ4) and the six research objectives (RO1–RO6). The research questions and objectives provided the directions for the three literature review chapters (Chapters 2 – 4). The Research Design (Chapter 5) was developed to answer the questions. The Data Collection (Chapter 6) and Analysis (Chapter 7) collected and interpreted the data within the context of the research questions and objectives. Chapter

8 combined the literature reviewed, data collected and analysis from the previous chapters to develop the multidimensional conceptual framework

9.2.1 RQ1: Does the current micro-economic theory of pricing hold for CECs?

The research established that micro-economics holds when the consulting engineering market is divided into micro-markets. This is explored in sections 7.3.1, and from 8.3.1 to 8.3.5 in the previous chapters. Therefore, the current micro-economic theory of pricing holds for CECs, which is applicable in the economic modelling as discussed in section 8.3.6. The CECs apply different competitive strategies and pricing positions contingency on the micro-economic conditions. The theory is used to explain the structuring of the micro-markets based on the different clients. The consulting engineering market is fragmented because of structural demographics. The structural demographics apply different conditions, which change the competitiveness of the micro-market(s). The CECs face different market structures since the number of competitors and the supply and demand functions change with each dimension as discussed in sections 7.4 and 8.3.12.

Micro-economics also deals with the power of firms in the marketplace. Different firms have power relative to their commercial strategies. The CECs have the power to set the prices of their services and the client firms have the power to accept a price for the engineering services (refer to sections 7.4, 7.6 and 8.3.14). The CECs that are using the value innovation and hybrid engineering strategies expect their clients to accept the price points for their services. The willing-to-pay is higher for clients who have a high expected net value on services rendered. The firms with the value innovation type of strategy have a higher probability of winning higher paying engineering work and earning supernormal profit. This is because their clients are more willing to pay more for engineering services. The willingness to pay is discussed theoretically in sections 4.6 to 4.8.

The competitive strategies also align to the micro-economic market structure. The micro-markets are classified as monopolistic competition (commoditised/hybrid), oligopoly (value innovation/hybrid), monopoly (value innovation/hybrid). The pure competition structure is not valid as the CEC is a highly technical services and the pure competition market structure does not easily lend itself to the services differentiation of CECs (see Chapters 2 and 8).

9.2.2 RQ2: What if any modifications are needed to the current micro-economic theory of pricing to make it applicable to CECs?

The overall consulting engineering market cannot be explained by one market structure (as discussed in sections 7.3 and 8.3). It is divided into micro-markets, so they can be applicable to the CECs. These micro-markets make the analysis more feasible for micro-

economics theory. The data analysis chapter (chapter 7) was conducted using the analytical framework with the five pillars: market, consulting engineering companies, clients, decision-makers and commercial consultancy services. When the conceptual framework was developed, a theoretical position was composed. Position 1 uses the micro-economic theories of power and market structure:

> The power of CECs in the marketplace is based on the influence of their intellectual resources on: (1) the engineering disciplines, (2) the economics sectors of their clients, and (3) the geographical location of their operations and their clients' operations.

The general invisible hand argument from micro-economics means the theory is not useful for dynamic situations. The entire consulting engineering market is fragmented and is in a constant state of flux because of the mergers and acquisitions (see Sections 6.5, 7.4.1, 8.3 and 8.5). Micro-economics can work with the structural demographics and the micro-markets of the conceptual framework. The power dynamics and pricing behaviour based on the supply and demand functions apply. The pricing comes down to the cost to serve, willingness-to-pay, perceived net value and expected net value (see Chapter 4). These are all applicable in a micro-economic sense. Microeconomics does not need modification when the level of the market is being analysed at the micro-economic level. In aggregating to the business class level (ANZSIC 2006 classification), micro-economic theory does not work. This is where institutional economics becomes more applicable.

9.2.3 RQ3: Are there alternative economic theories such as for instance institutional economics theories that better explain the behaviour than micro-economics theories?

Institutional economics theories provide a solid footing for the business environment factors in the conceptual framework developed in chapter 8. Institutional economics gives the behavioural insights into why the decision-makers act the way they do. This strand of economics fills the gap left by the neoclassical micro-economic idea of the 'invisible hand' to explain economic actions. With the institutional economics, the different structures and persistence of competitive strategies can be explained (as discussed in section 3.3). In each of the eight dimensions, there are institutions that influence and explain the actions of the CECs in their competitive activities. See section 8.4.

The competitive strategies are three isomorphs of each other – commoditised, value innovation and hybrid. Institutional economics is better able to handle the dynamism of the consulting engineering market. The dynamism refers to the maturity (section 7.3.5), declines and growth in the economic sectors (section 7.3.6), and consolidations (section

7.4.1). While competition can be described using micro-economics, the persistence is analysed better with institutional economics. The strategies become institutionalised in the firms. Position 2 shows the use of institutional economics to explain the competitive strategies but also takes in micro-economic concept of power with the ability to set prices:

> Consulting engineering companies deploy different competitive strategies (and pricing strategies) to meet different commercial requirements of their clients. These strategies are deployed based on the specific market conditions the consulting engineering companies face. These strategies are used and adapted based on the market structure, continued acceptance by their clients, positive reinforcements by winning work and legitimacy of their contractual arrangements.

Organisational learning around the commercial services operations dimension is better analysed using institutional economics. The commercial services operations are analysed using the historical and comparative institutional analyses techniques (as discussed in sections 3.2.1, 3.2.2 and 8.4.3).

The principal–agent relationship dimension is derived from the principal–agent theory (PAT). PAT is embedded in the transactional nature of commercial behaviour(s), incentivising agents by their principals, and the competing interests of the principals and their agents. These are micro-economic principles. However, the individual components of the principal–agent relationships are institutions themselves. The contract between principal and agent is a legal institution (legitimacy) with different forms (isomorphism). The different market behaviours of the principals and agents along the built environment's supply and value chains are part of institutional culture (learning and persistence). See Chapter 3 for a fuller discussion of the five components of an institution.

The technology dimension is about deploying intellectual knowledge (power) and institutional learning. The consulting engineering firms adapt their designs for their clients based on design policies advocated by the government. The CECs learn how to adopt the new design guidelines into their design for the built environment. Also, they must apply new designs practices (innovations) into their commercial service operations. The different types of innovation have institutional implications. Institutional economics provide the basis to understand how the peer pressure causes firms to adjust their design practices with the inclusion of new technology. See Sections 7.7.4 and 8.4.4. The peer pressure relates to other firms adapting new technology because other firms have adopted it.

9.2.4 RQ4: Are the competitive strategic practices being used in the CECs a modified form of a common framework?

Yes, the conceptual framework developed from this research demonstrated how the competitive strategies are modified. These strategies are influenced by underlying structural demographics and business environment factors. Figure 34 (page 126) demonstrates how the focus of the different dimensions can bring modifications to the conceptual framework. However, competitive strategies are applied based on the same framework (contingent factors). It is up to the firm to decide if it will apply a (1) commoditised engineering strategy, or (2) value innovation engineering strategy to all its micro-markets. Alternatively, it can apply a (3) hybrid engineering strategy where some micro-markets experience commoditised and other micro-markets experience value innovation engineering strategy. This is discussed further in sections 7.4.2, and from 8.3.7 to 8.4.1. The eight dimensions of the framework are constant.

However, the individual conditions of each dimensions create a different scenario adapted for the CECs. The CECs are operating in NSW. They can operate in other parts of Australia or internationally as well. The framework can be modified for use across the rest of Australia or the international market. The modifications can be studied in future research work (see section 9.4). The competitive strategies are used by the CECs to channel their market power to win projects and earn a profit. The power is used with the aim of earning supernormal profits. This is the ideal scenario for the CECs to earn a supernormal profit. The power to earn this profit is kept in check by the power of other competitors and clients. The other competitors can provide a better offering for the client in terms of price or quality. Alternatively, the client can also demand a reduced pricing from the CECs because it is a major client, or the client has numerous other options for engineering services.

The research was executed through the following objectives:

9.2.5 RO1: Establish the market(s) that the firms work in – theoretically and empirically – through interviews and analysing mergers and acquisitions data

The micro-markets for the CECs were established and discussed in the conceptual framework. The markets were established as being fragmented into micro-markets (See section 8.2). The micro-markets are divided by disciplines, geography, sectors and intellectual resources. The CECs exhibit their power based on their competitive strategies – commoditised, value innovation and hybrid engineering (section 7.4).

Intellectual resources are used as differentiators. The differentiation of the clients is advocated by Baker (2011) and Nagle, Hogan & Zale (2011). This is demonstrated by the

coexistence by all three strategies in the consulting engineering market. CECs who used the commoditised engineering strategy operate in one market selling the same services, while the CECs who used the value innovation engineering operate in another market selling differentiated services. If the CECs use the hybrid engineering strategy, they operate across the markets. The clients can be part of the commoditised or value innovative markets of both markets.

Additionally, the market faces changes from the consolidations and divestures of the CECs. The markets may enter a period of stability before it changes because of M&A activities. Firms get bigger but smaller firms are established when the principals split from their former companies. This dynamism impacts on the market and was dealt with in Position 3:

> The consolidation of CECs in the consulting engineering market results in a changing competitive environment: (1) it rearranges the distribution of intellectual knowledge across the industry, (2) it changes the power dynamics of the firms relative to their competitors and their clients, and (3) it creates newer firms in the marketplace.

9.2.6 RO2: Examine the behaviour of the firms in the market(s)

These micro-markets influence the competitive behaviours in terms of strategies and pricing. The CECs price their services based on the cost-to-serve, market competition and value of the services and information asymmetry. The CECs' ability to price the service is based on the power of the client to accept the prices offered by the CECs. Clients have different perceptions of the value of the services, which tied into the information asymmetry of principal–agent relationships. This is related to the expected net value of the service. If the clients have a high expected net value for the engineering services, CECs can deliver a differentiated price. Position 4 covers this power dynamic:

> The principal–agent relationship in the consulting engineering market is governed by: (1) the power of the firms in terms of the information asymmetry between the client and the CEC, (2) the availability of other competing CECs who have the required information, and (3) the propensity for risk sharing in the firms.

The market reacts to the inclusion of new engineering and technology innovations. The consulting engineering firms introduce new engineering materials and construction technology to their clients. The clients are keen to use the innovation if it promotes a building composed of environmentally friendly materials. This is considered in addition to having a building with a lower construction cost. However, the CECs may be mandated by government policy, guidelines and rules to include new building materials and

construction technology. These act as externalities and influence the competitive decisions in the CECs. The CECs can be risk-takers, opinion leaders and market leaders with the funds to invest in the new building and design technology.

The technology adoption rates are based on the level of risk-taking used by the various firms. The CECs' competitive strategies are tied to their ability to take on risks. Position 5 was based on the technology dimension:

> Technology change allows for the emergence of consulting engineering companies that: (1) create, deliver and perform engineering consultancy aided by technology, (2) provide variety and novelty of their services based on their intellectual resources, and (3) create, modify and compete in dynamic competitive markets bounded by their disciplines, geographies and economic sectors.

9.2.7 R03: Establish, if necessary, how the micro-economic and institutional economic models need to be modified, to accommodate the specific nature of these firms, their services, and their clients

The conceptual framework demonstrated how micro-economics and institutional economics were adapted to align with the framework Micro-economics and institutional economics are complimentary to each other. Micro-economics are used for the market structure, power of the firms, supply and demand functions, pricing and principal–agent relationships. However, institutional economics deals with the dynamism of the consolidations in the overall market. The principal–agent relationships are governed by various institutions, the commercial services operations are institutional structures, and technology adoption are mediated by institutional learnings. These institutions lead to their persistence in the market. The competitive strategies impact on micro-economic behaviour but they are also they are institutional isomorphs themselves.

9.2.8 R04. Establish if CECs can create market power through differentiation to earn higher profit

The value innovation engineering and hybrid engineering competitive strategies give the CECs the opportunity to position themselves, differently. The clients aim to earn high profits by exceeding the expected value of the clients and meeting the perceived value. However, this would require a trial-and-error approach until they achieve the right mix of services and clients. The stratification of the market into the micro-markets permits this experimentation. The CECs require the intellectual resources – people who have the knowledge and market reputation to pull off the value innovation and hybrid engineering strategies.

The organisation must be set up to harness intellectual knowledge. Once the CECs build up their institutional authority and reputation, they can charge more for their services. If the clients perceive a higher value than their expected net value of the consulting engineering services, they have a higher willingness to pay. The ability to earn supernormal profit is based on the power of the firm. This power is based on the intellectual knowledge. The differentiation comes from the CECs changing the way they operate, engage with clients, and embed new technology into their designs. They can also develop new solutions for their client based on existing technology.

9.2.9 RO5: Outline the implications of the research findings for the academics, the industry, and the clients in a conceptual framework of a competitive strategy framework for CECs

The competitive strategies used by CECs in New South Wales can be best described using the multidimensional framework as discussed in Chapter 8. The competitive strategies are based on three archetypes – commoditised, value innovation and hybrid engineering. The structural demographics relate to the commercial markets and intellectual resources. The business environment factors are described in terms of commercial service operations, the principal–agent relationship and technology.

The competitive strategies are supported by theoretical positions advocated by Clegg et al. (2011), Porter (2008), and Kim & Mauborgne (2005), respectively. The commoditised engineering strategy is found in CECs that view their market boundaries as being fixed. While acknowledging their professional skills, their pricing strategy is based on a cost-recovery position. The firms that apply a value innovation engineering strategy are positioning themselves on value as a strategy. These firms compete based on meeting and exceeding the expected net value of their clients. The value-as-a-strategy, value-in-use (services-dominant logic), value-in-exchange (goods-dominant logic) and value as a service have been advocated by various researchers (see Chapter 4). This thesis adds to the value theory by applying it to service-dominant firms like CECs. Additionally, CECs can combine the two types of strategy to deploy a hybrid engineering strategy. This is useful as the CECs compete in micro-markets based on structural demographics. The different micro-markets may require different strategies, so the company applies them to capitalise on the opportunities in the different micro-markets.

Structural demographics are governed by microeconomics and institutional economics. The micro-economic concept of market structure was applied – the markets can be divided into monopolistic competition, oligopoly and monopoly, respectively. The three market structures can be applied to the micro-markets in which the consulting

engineering firms are competing. While there is an overall consulting engineering market, the individual firms are competing in micro-markets established by the structural demographics as outlined in the conceptual framework. When modifications to these characteristics occur, the micro-market can change. The dynamism of the markets is explained with the changes in the discipline, geography, sector and intellectual resources. Micro-economics are used to describe the micro-markets as stable point estimates in time. The transformation and transition states between the point estimates are best described using institutional economics.

This thesis contributes to the understanding that an economic sector can have more than one market structure. With the various structural demographics, a CEC can find itself in different micro-markets. The CEC may take on different strategic positions for each micro-market. This permits companies to determine what their competitive strategies and pricing positions are. With the division of the client base, firms can have multiple strategies and pricing positions. This accounts for the three types of engineering competitive strategies (isomorphs) in the competitive strategy dimension.

Furthermore, the conceptual framework was constructed using building blocks established by institutional economics. The business environmental factors acknowledge the rules, traditions, practices and customs that govern economic behaviours. The commercial services operations and principal–agent relationship dimensions of the conceptual framework are based on the premise that economic institutions are both abstract and physical representations. This is reinforced by the research. They are structured, legitimised, learned, mimicked and persist through internal institutions inside of the firm and external institutions outside of the firm. The economic behaviour is also a demonstration of power of the firms in the relationship.

The organisational structure model(s) used by the CECs determine how the strategy is executed. This research contributes to the understanding of the role of organisational structure in strategy execution and the institutionalism associated with the structure. Additionally, it contributes to the use of the principal–agent theory in deployment of strategies in firms. It demonstrates how institutions in service firms determine what competitive strategies are selected and deployed in the market.

The technology dimension demonstrates the constant flux for the CECs. The CECs must be adaptable to new technologies being developed for and deployed in the built environment. The built environment is also influenced by policy requirements that require new technologies to be implemented in the building artefacts. The research contributes to the theoretical underpinnings of technological influences on the competitive strategies.

Technology impacts on the liveability, value of the built environment artefact, and the cost of the construction.

Furthermore, design practices in the CECs were influenced by the adoption of digital design technology. The design practices impact on the commercial services operations of the CECs. The adoption of technological innovations was promoted by institutionalised learning. The peer and network associations provided the motivations for CECs to incorporate new design practice to the way they work.

The consulting engineering market experiences a constant flux because of the M&As happening in the market. The M&As cause disruptions in the market. The micro-markets can change structures as the numbers of competitors change. The competitive strategies for the CECs may have to change if the market where they operate faces M&A activities. The conceptual framework developed in this thesis provides a basis make those strategic decisions.

9.2.10 RO6: Summarise the conclusions and suggest future research

This chapter provides the conclusions from this research. The next section of this chapter discusses the limitations and is followed by the future research.

9.3 LIMITATIONS

This research is limited by its scope and research design. The research focused on the CECs located in the Greater Sydney Capital City Statistical Area (GSCCSA). The geographical boundaries of the GSCCSA are determined by the Australian Bureau of Statistics (2012) Greater Capital City Statistical Areas specifications and by the Australian Bureau of Statistics (2016) Australian Statistical Geography Standard, respectively. The research findings in terms of the economic theories that govern the competitive strategies were only applicable to NSW-operating CECs. The geographical limit was used to control the research scope. Each of the Capital City Statistical Areas in Australia has different economic conditions, which affect the business performance and competitive strategies required by the CECs. The research protocol can be applied to the other CCSAs in Australia. Future research can investigate if the conceptual framework is applicable to the other CCSAs.

Furthermore, the research was not able to investigate further into the impact of the M&As on the consulting engineering market. The M&As change the economic conditions of the market in terms of competitiveness and power of the firms. The interviewees identified this as a major change in the market. This was supported by the M&A data extracted from the M&A transactions databases as shown in Chapter 6. The scope of this PhD did not

include a detailed analysis of M&A activities in the consulting engineering market. However, it is acknowledged that further investigations are needed to understand the impact this has on the competitiveness of the consulting engineering market in New South Wales. This is expanded in the next section.

9.4 FUTURE RESEARCH

In conducting this PhD research, there were areas that were not pursued in order to control the scope. They are opportunities for future research. The research can go in different directions (themes): mergers and acquisitions, technology adoptions, and transformation of commercial services operations. These recommendations provide more ideas of where the research can be taken. These research areas apply different interdisciplinary areas – behavioural economics, change management, institutional economics, micro-economics, operations management, organisational design, systems thinking, and technology innovation management.

During the research, M&As (consolidations) were identified as major changes in the overall consulting engineering market (micro-markets based on structural demographics). The consolidations created new opportunities and new competitors in the consulting engineering market and by extension in the architecture and construction markets. The overall industry, inclusive of architecture, engineering and construction, can be considered the built environment markets. There is an international component related to the consolidation. The firms face competition from international firms and are considered prime candidates for mergers & acquisitions. This can also happen with Australian firms initiating the merger or acquisition of an international firm.

The future research questions centre around how the consolidations, technology innovations and the commercial services operations transformations impact on market competitiveness. Starting with the research into the consulting engineering market in New South Wales, future researchers can explore how the market changes with the three broad themes. How are the competitive strategies modified in respect to the three broad themes? Systems thinking (theory) will be a useful analytical technique. The market has different institutional elements. Some of the institutions are composed of systems e.g. CEC is an institution, which is made up of different parts. The system theory can add another layer to using the institutional economics techniques used in the research.

9.4.1 Mergers and acquisitions in the consulting engineering markets

During this research, the findings discuss how the consolidated companies create new engineering streams, get new clients and modify their strategies. New companies are

formed by consultants splitting from their merged/acquired firms or if there was downsizing as a result of the consolidation. These are a result of the consolidations happening during the review period of 2007–2017. These newly formed firms are micro-businesses (FTE < 5) or small business (FTE 5–19) (Swanepoel & Harrison 2005).

These new CECs must establish their commercial identities, although they have a head start since they have their professional reputations to acts as an entry point in the market. Their sizes impact on how competitive they are in the market. Therefore, several research questions about their competitiveness arise:

1. How do the newly formed CECs compete with established firms, who have merged or acquired another CEC(s)?
2. How is the intellectual capacity and knowledge incorporated into CECs post-merger or post-acquisition?
3. What is the market power of these micro-CECs in the face of their bigger competitors?

With the consolidations, the market reacts in different ways. One would consider that a merger or acquisition will reduce the number of competitors. However, in the consulting engineering market in NSW, the competition increased post-consolidation. Future research can investigate the competition in the market as a result of the M&A activities. From the conceptual framework, the structural demographics show the different combination of discipline, geographical and sectoral markets and intellectual resources. An additional research question can be investigated:

4. How do the consulting engineering market structures change after a merger or acquisition?
    a. What are the disruptions to the micro-markets?
    b. How does the CECs respond to the increased internationalisation of the mergers & acquisitions?

Mergers and acquisitions have been evaluated from anti-competition basis where pricing is a major factor, that is, micro-economics (Rosch 2014). Rosch (2014) advocates for the use of behavioural economics in M&A evaluations. Although, Kwoka & Moss (2012) argue against the behavioural approach in conducting M&A analysis. Gundlach & Moss (2018) share similar views as Rosch (2014) in advocating for a non-pricing consideration in the evaluation of M&As. The micro-economics branch advocates a rational profit maximiser, which decides about the M&As. However, this is not always the case. The use of heuristics/rules of thumbs/systematic biases aid in decision-making (Rosch 2014). It comes down to the principal–agent scenario – the CECs comprises of individuals who are

making decisions based on their personal perspectives. Even though a firm is making the decision, within the firm the decision comes down to an individual. Therefore, behavioural economics and institutional economics apply.

Behavioural economics and institutional economics provide further insights into why decision-makers make certain rational and irrational choices. Also, why certain market conditions permeate and impact on how the market operates. Additionally, institutional economics and behavioural economics have less rigidity to their analytics. There are solid foundations for the institutional economic interpretation of M&A activities (Aoki 2007; Dequech 2006, 2009; Duina 2011; Gagliardi 2008; Greif 1998; Kapp, Berger & Steppacher 2011; North 1989; Williamson 2000, 2005). Furthermore, the SDL framework helps to focus the analysis of the services side of the consulting engineering market consolidations (Åkesson et al. 2016; Baumann, Le Meunier-FitzHugh & Wilson 2017; Eggert et al. 2018; Ekman, Raggio & Thompson 2016; Vargo, Maglio & Akaka 2008). The research can contribute to a better understanding of competition and anti-competitive behaviour in a business-to-business service-oriented industry like consulting engineering.

Generally, M&A approvals are based on the micro-economic ideology of market power. Market power is derived from the ability to set prices. M&As reduce the number of competitors and increase the power of the remaining firms to set prices. However, in the B2B environment of CECs, market power does not only come from the power to set price. It comes from the principal–agent relationships with clients and the intellectual capacity of the CECs. The M&As do change the competitiveness in the market. Microeconomic theory is useful for the snapshot/point estimate of the market before and after an M&A. However, institutional economics provide a suitable base to analyse the dynamics of the markets as they undergo changes because of the M&A.

The Australian Anti-Competition and Consumer Commission (ACCC) is currently reviewing anti-competitive behaviour in the commercial construction industry (Australian Competition & Consumer Commission 2018). However, the proposed research looks at how M&A changes the competitiveness of the built environment market. The research will provide empirical evidence to anti-competition regulators on how to evaluate the proposed M&A in the consulting engineering market for anti-competitive practices.

The service-dominant perspective considers how services will be delivered post-consolidation. Additionally, it looks at what the market will gain or lose when these consolidations occur, given the frequency and size of the M&As create constant changes in the overall consulting engineering market. Another research question arises:

5. How do the clients respond to M&As in the consulting engineering market?

This impacts on the competitiveness of the new entity in the micro-markets. During the research, clients discussed how they usually follow an engineer across companies. If they are not happy with the service after the consolidation, they will move to another firm.

One of the motivators for M&As is getting access to new technologies and the knowledge of how to use them. The next section discusses future research investigating technology adoption in the consulting engineering market and by extension in the built environment market.

9.4.2 Adoption of technology innovations in the consulting engineering markets

This proposed research area investigates how the CECs introduce and commercialise new technology innovations in their micro-markets. With advancements in digital design and documentation, cloud computing and communications technologies, the delivery of consulting engineering services is being transformed. Further, the research investigates how CECs compete with respect to engineering technology and knowledge. Therefore, the potential research questions are:

1. How does engineering technology influence the economic activities of consulting engineering companies in New South Wales?
2. How do the consulting engineering companies adapt the technology innovations into their competitive strategies?
3. How do the consulting engineering micro-markets change with the inclusion of new technology innovations?

Hosseini et al. (2015) discuss the innovation diffusion model, which is a framework for the uptake of new technology innovation in firms. As illuminated as part of the conceptual framework, technology innovation impacts on the design practices (internal) and engineering design (external) of the CECs. Both Hosseini et al. (2015) and Sepasgozar, Loosemore & Davis (2016) argue that a specific innovation diffusion model does not exists for the firms operating in the built environment markets. They describe the innovation as having different forms (isomorphs from institutional economics). Hosseini et al. (2015) describe innovation as a spectrum from incremental to radical, while Sepasgozar, Loosemore & Davis (2016) describe it as parts of an economic system. Although, Singh & Holmström (2015) apply both the innovation diffusion model and needs hierarchy model to express how the motivational needs of the firms align with their adoption of technology innovation.

The principal–agent relationship between the CECs and their clients influences what technology is utilised. Asare, Brashear-Alejandro & Kang (2016) focus on the decisions by firms to adopt business-to-business technology and consider the relational factors that contribute to this decision. Asare, Brashear-Alejandro & Kang (2016) propose a Technology Adoption in Supply Chain (TASC) model, which accounts for the institutional nature of technology adoption. The TASC model evaluates the 'characteristics of technology, organisational factors, external factors and inter-firm relationships' (Asare, Brashear-Alejandro & Kang 2016, p. 4). The market responds in different ways to the introduction of new technology, especially if it provides a competitive advantage for the implementing company (Asare, Brashear-Alejandro & Kang 2016; Hosseini et al. 2015; Sepasgozar, Loosemore & Davis 2016; Singh & Holmström 2015).

The technology adoption extends to construction materials and technologies being proposed in the engineering designs by the CECs. The new materials and technology can be governed by government interventions and clients' requests (Arora et al. 2014; Ayinla & Adamu 2018; Rogers, Chong & Preece 2015). The new engineering construction materials may require new building design approaches. As discussed, the CECs can develop a new discipline and subsequently a new micro-market. They have an opportunity to be a monopoly before more competitors arrive in the market. Technology adoption is driven by the knowledge base of the CECs. The acceptance of this new technology is mediated by clients' acceptance and regulatory endorsement.

Rosch (2014) focuses on the questions about innovation effects on consolidations. This extends to the M&A of knowledge-based firms like CECs, where the consolidation joins the discipline opinion/market leaders from the different firms into one firm. These opinion/market leaders are considered as star consultants and are the industry experts in the engineering discipline(s). The presence of these opinion/market leaders in a firm impacts on the perception of a firm's competitive value (Arslanagic-Kalajdzic & Zabkar 2017; Baker 2011; Eggert et al. 2018; Salunke, Weerawardena & McColl-Kennedy 2018; Terho et al. 2017).

Another two research questions can be asked in terms of the technology adoption model:

4. How is the technology adoption model applied to the consulting engineering markets?
5. What modifications are needed to apply the technology adoption model to the consulting engineering markets?

The design practices of the CECs are influenced by the adoption of BIM, virtual communications and the creation of virtual design teams (Hosseini et al. 2015; Son, Lee

& Kim 2015). These innovations impact on the design practices, which are institutions in the firm. Therefore, institutional economics would contribute to this potential research as the socialised adoption of technology is unavoidable. The CECs work within a variety of micro-markets and react differently to the business environment factors. They adapt to technology in different ways based on the technology maturity and competitive pressures (Ayinla & Adamu 2018). Furthermore, technology adoption impacts the way the commercial services operations of the CECs are run. A future area of research can investigate how the commercial services operations of CECs are impacted by mergers and acquisitions and technology adoption. This is discussed below.

9.4.3 The transformation of commercial services operations (CSO) of CECs

Research can investigate how CECs are being transformed from organisational, project, and operational management perspectives. The commercial services operations (CSOs) are institutional manifestation that determine how the firm executes its commercial strategies. As explored in this research, one of the dimensions in the conceptual framework is the CSO. With the M&As (see Section 8.4.3) and technology innovation adoption (see Section 8.4.4), the CSOs are modified. The proposed research investigates the relative strengths of the different CSOs in the CECs.

The research questions for the potential research:

1. What are the different structures of commercial services operations found in the consulting engineering markets?
2. How are the commercial services operations modified after the mergers and acquisitions in the CECs?
3. How are the commercial services operations modified after adopting new design practices and engineering disciplines?
4. How do the commercial services operations of the CECs adapt following a multi-dimensional M&A?

The CSOs have different structures, which are equivalent to institutional structural models (see Section 3.3.4). Based on the structures, the CSO influences how power is distributed in the firm (Aoki 2007; Bouquet & Birkinshaw 2008; Clegg et al. 2011; Klein 1987). The CECs are competing in the market to earn supernormal profits. Power is used in different ways (Argyres & Mayer 2007; Clegg et al. 2011; McTaggart, Findlay & Parkin 2013; Perloff 2014; Sappington 1991):

a. To set prices in the market
b. To determine the company's strategy
c. To arrange and deploy intellectual resources in the company.

The research can investigate how the different structural models enable and support power, internally and externally. The competitive strategies are described at the individual firm level using micro-economics and at the market level using institutional economics (see Sections 8.2 and 8.3.7). In this research, organisational design, operations management, micro-economics and institutional economics are applied. They provide a strong framework to understand how the competitive strategies of the CECs are applied across their micro-markets. This research aligns with the conceptual framework developed in the current research.

Organisational design determines how the firms arrange their intellectual resources (Chen et al. 2018; Devaney 2014; Helfat & Karim 2014). It establishes the principal–agent relationship structures within the firms (Holmstrom & Milgrom 1991; Miller 2005). Once these structures are established, the firms start operating – operations management. Furthermore, the CSOs are being used by the firms to compete in the market. Based on micro-economic theories of market structures, the firms have power in the market. They have power relative to their competitors, collaborators and clients. These organisational designs create new institutions in the firms. The institutions can be analysed using the frameworks of political, economic and sociological perspectives advocated by Duina (2011), Kapp, Berger & Steppacher (2011) and Williamson (2000).

Following an M&A, the question arises about how the new consolidated firm would work because of the different organisational cultures being merged or acquired (Bligh 2006; Giessner 2011; Kwoka 2015). The various components of the consolidated entities must work together. How do the different entities, who have different organisational cultures, work together? The organisational cultures are also influenced by multinational mergers & acquisitions. This cultural fit impacts on the post-consolidation competitiveness of the firm. Bligh (2006) and Giessner (2011) indicate the fallacy of leadership journals, which push the narrative that culture is a top-down approach. They posit that culture is not only influenced by the leadership team, but it is also created by frontline employees. The M&A provides opportunities for organisational efficiency and to gain market share. The constituent firms with different organisational cultures are joining to work together. The collective identities of the different firms are threatened when they merge or acquire another.

With the M&A activities, the CECs must modify their CSOs. The firms are integrating different CSOs into a new firm. How does the new consolidated firm adapt to its new commercial reality? The CSOs for the different components can either (1) align to a common approach or (2) exist separately. The organisational culture is manifested

through the organisation design. The CSO determines how the new competitive strategy is carried out by the firms. With the organisational upheaval caused by the merging with or acquiring of another firm, there is some time before the different CSOs are aligned properly.

New technology pushes the market boundaries of the firms. They adjust how the CSOs are structured. The use of virtual communications means the clients can be served in different geographical locations to the CECs' physical location. How do CECs that are based in the same location as the client compete with CECs that use globally distributed virtual engineering teams. Do the multinational firms use virtual communications and cloud solutions to access design services in countries with lower wages to have a price advantage? Do the clients prefer their consultants to be physically based in the same country as them? The use of virtual technology impacts on the competitiveness of the firms.

When a firm adopts a new engineering discipline based on new technology, it must establish a micro-market around it. Furthermore, a CSO must be developed to deploy the discipline commercially. Is the new discipline being added in a monopoly, oligopoly or monopolistic competitive market structure? How does the discipline being added contribute to the power of the firm in the market? The engineering disciplines are the intellectual strengths of the CECs. The CSO enables the disciplines to be commercially viable.

The three research areas can be taken in different ways depending on the availability of and access to data by the research. Next, the summary of this chapter is made.

9.5 SUMMARY

CECs are active participants in the architecture, engineering and construction economic sectors in New South Wales, Australia. The sectors have experienced continuous investments from private and public sector entities since 2008. CECs compete to be selected for various built environment projects. These CECs have various competitive strategies, which are governed by economic theories. The relationship between the CECs and their client firms is a business-to-business one. The research investigates what economic theories are applicable to the competitive strategies used by consulting engineering companies in New South Wales in their business-to-business relationships. The research explores how the economic theories can explain the economic behaviours of the CECs in the marketplace.

This research questioned whether or not micro-economics theory held for the economic behaviours of the CECs. It questioned whether or not alternative theories like institutional economics can better explain their behaviours. Additionally, it questioned whether or not the competitive strategies used by the CECs were part of a common framework. These questions were answered using a positivist research paradigm applying a mixed methodology consisting of quantitative and qualitative data collection and analysis methods. The research design used a theoretical framework in terms of market, decision-makers, buyers, sellers and services. This framework was a blend of micro-economic, institutional economic, strategy, value and pricing theories. Primary data were collected via semi-structured interviews using the critical incident and laddering techniques with senior decision-makers in CECs and their client firms. Secondary data were collected from merger and acquisition databases and a literature review. The data were analysed using quantitative and qualitative content analysis, descriptive statistics and modelling.

The research findings were discussed in the data collection, data analysis and conceptual framework chapters in the dissertation. The research developed a multidimensional conceptual framework, which explains the competitive strategies used by the CECs. The framework incorporates micro-economic, institutional economic, strategy, value and pricing theories. The first part of the framework consists of one dimension, that is, competitive strategy. The competitive strategy can be divided into three types: commoditised engineering, value innovation (innovative) engineering and hybrid engineering, respectively. They influence the pricing behaviours of the CECs. The second part of the framework consists of four dimensions: discipline markets, geographical markets, sectoral markets and intellectual resources. The third part of the framework consists of three dimensions: commercial service operations, principal–agent relationships and technology.

The research was limited by the geographical region from where interview subjects were recruited, that is, New South Wales, Australia. The selected CECs operated both in the metropolitan capital (Sydney) and regional New South Wales areas. Each of the states and territories in Australia have different business environments, which affect how the CECs operate. Researching across the different states must account for the differences in the regulatory and customary environment. Expanding the research across countries would face the same challenges. This was not feasible in the time frame allocated for this PhD research. Additionally, the research was limited by ongoing consolidations in the consulting engineering market, which affected the competitiveness of the market. However, there was a secondary goal of creating a repeatable research design that could

be applied across different Australian states or different countries to investigate the same research questions.

The conceptual framework can be used by the CECs to understand their strategic positions in the market. With this framework, the CECs develop their market orientation based on the intellectual resources and strategic intent. They structure their operations to deliver the services and value based on the location in the built environment supply chain. Additionally, they use their knowledge of engineering technology to keep a strategic advantage. The research advocated for value-as-a-service and value-in-use as way of strategic positioning and pricing for CECs over the common value-in-exchange and cost recovery (commoditised) pricing. Furthermore, it pushes the CECs to consider their service orientation in a business-to-business orientation instead of taking a business-to-customer orientation in its strategies and pricing.

The conceptual framework is an original contribution. It introduces the multidimensionality of competitive strategies for CECs. It demonstrates that an economic sector does not have one market structure, but numerous structures based on multidimensional factors. The research established that micro-economics holds when the consulting engineering market is divided into micro-markets. The CECs apply different competitive strategies and pricing positions based on the micro-economic conditions. Institutional economics gives the behavioural insights into why the decision-makers act the way they do. This strand of economics fills the gap left by the neoclassical micro-economic idea of the 'invisible hand' to explain economic actions. The research takes the institutional economics strands to explain how the competitive strategies and firms are structured, legitimised, learned, persisted, and mimicked to remain relevant over time. Additionally, it expands the application of the value-in-use theory by applying it as value-as-a-service in the conceptual framework. The research is applicable to both academics and practitioners.

10 APPENDIX

10.1 SURVEY QUESTIONS

The table below shows the survey questions, response format, and alignment of the questions to the analytical framework (Figure 18 on page 74).

Table 10: Survey questions.

Question	Response Style	Pillar
Question 1 asked about the size of the company in terms of the full-time equivalent number of employees in NSW.	The answers were five discrete answers that provided a range of full-time equivalent numbers of employees.	CEC (Sellers)
Question 2 asked about the percentage distribution (total of 100%) of the CEC's clients based on project values in NSW.	The answers were five tick-box options, which provided for five multiple answers and free response boxes to indicate the percentages.	Clients (Buyers)
Question 3 asked about the different sectors where the CECs operate.	The answers were eleven tick-box options, which provided for multiple answers. There were ten choices and one free response to name any sector not covered.	Commercial Consultancy Services
Question 4 asked about the number of disciplines that the CECs offer as part of their services.	The answers were ten discrete answers that provided a range of discipline counts.	Commercial Consultancy Services
Question 5 asked about the role played in the organisation of the person, who was filling out the survey.	The answers were four tick-box options, which provided for multiple answers and a free response to indicate an alternative role not covered by the three other options.	Decision-makers
Question 6 asked how long the person worked in the consulting engineering industry.	The answers were ten discrete answers that provided a range of service years.	Decision-makers
Question 7 asked about the pricing methods used by the CECs in their tender responses for projects.	The answers were ten discrete options, which allowed the respondent to select on a five-point Likert	Market

Question	Response Style	Pillar
	scale of frequency for each option.	
Question 8	A free response to permit the respondent to provide details of other pricing methods they used if they selected the tenth option in Question 7.	**Market**
Question 9 asked if the company considered the complexity of the project design in order to determine the project price.	The respondent selected on a five-point Likert scale of frequency for this question.	**Decision-makers**
Question 10 asked if the pricing for a project varied based on the current workload of the company.	The respondent selected on a five-point Likert scale of frequency for this question.	**Decision-makers**
Question 11 asked if the pricing strategy remained the same even when the engineering speciality changed.	The respondent selected on a five-point Likert scale of frequency for this question.	**Decision-makers**
Question 12 asked if the pricing strategy for a project changed because of the client's procurement requirements.	The respondent selected on a five-point Likert scale of frequency for this question.	**Clients/Decision-makers**
Question 13 asked if the pricing strategy for a project changed because of the relationship with the client.	The respondent selected on a five-point Likert scale of frequency for this question.	**Clients/Decision-makers**
Question 14 asked about the advertising of its consulting engineering services.	The answers were eleven tick-box options, which provided for multiple answers and free response to indicate an alternative if it was not covered by the other options.	**Markets**
Question 15 asked if the CEC monitored the project's profitability during the lifetime of the project.	The answers were six discrete options but also included an option to write-in another.	**Markets**

10.2 Interview Questions

The interview questions were aligned to thematic pillars as shown in the tables below.

Table 11: Interview questions for CECs.

Questions	Pillar
Warm-up Questions	
What is your role at the company?	**Decision-makers**
How long have you worked at the company?	**Decision-makers**
In your [ ] years with the company, how has the company changed over time?	**Sellers**
Main Questions (with Subsidiary Questions)	
Can you describe for me your company's approach to its competitive strategy for its consulting engineering projects?	**Markets**
Can you describe for me your company's approach to pricing of its consulting engineering projects?	**Sellers**
Are you able to indicate who is involved in the pricing decisions on the consulting projects?	**Decision-makers**
Is there any reason why you price your consulting project(s) in the selected way?	**Markets**
Have these pricing approaches provided commercial profits for your company?	**Markets**
Can you explain how your client(s)' procurement practices impact on your competitive strategy for the company?	**Clients**
How do you factor in your competition in your pricing (competitive strategy) decisions?	**Market**
Extra Questions	
Does your specialisation impact on the way you price your services?	**Commercial Consultancy Services**
How did your firm handle the economic conditions the past three years (2014–2017)?	**Market/Sellers**

Table 12: Questions for architects, project managers and property developers.

Questions	Pillar
Warm-up Questions	
Can you explain your role at the company?	**Decision-makers**
How long have you worked at the company?	**Decision-makers**
In your [ ] years with the company, how has the company changed over time?	**Buyers**
How has the industry changed since you started working in the industry?	**Market**

Questions	Pillar
Main Questions	
Can you tell me how your company selects its engineering consultants?	**Decision-makers**
What roles are involved in the selection decisions?	**Decision-makers**
How does the specialisation of the engineering consultant firm influence your selection criteria?	**Sellers**
What is your procurement policy as it relates to specialised services like engineering consultants?	**Buyers**
Do you consider value-add as a factor in selecting a winning bid from the engineering consultants?	**Buyers/Decision-makers**
How do you interact with your engineering consultants?	**Buyers/Sellers**
Do you have preferred consultants that are your go-to firms for particular projects?	**Sellers**

10.3 SAMPLE INTERVIEW TRANSCRIPT

Name: CEC23 - Lima Tango India

Description: Date: 24 January 2018 | Place: Lima Tango India | Time: 13:02 - 13:24 | Interview: CEC 23 | Interviewee: Victor Xylophone | Interviewer: DM

Created:	25/01/2018 11:44:37
Created By:	DM
Modified:	28/01/2018 19:18:31
Modified By:	DM
Embedded in project?	Yes
Format:	MP3
Duration:	22:10.2
Size:	2 MB
Transcript Entries:	45

	Timespan	Content
1	0:00.0 - 0:04.5	DM: Good afternoon
2	0:04.4 - 0:43.4	DM: We are recording data collection interview CEC23 on 24 January 2018 at location LIMA TANGO INDIA. The time is 13:02. I am with interview participant VICTOR XYLOPHONE at his office. We will get a brief overview of the research. The research focuses on the economic theories that govern the competitive strategies of consulting engineering companies in New South Wales. In order to establish these theories, we have to interview the companies that operate in the market space. This can contribute to a greater understanding of the consulting engineering market in New South Wales. What is your role at the company?
3	0:43.4 - 0:48.6	VX: The managing director of the Australian office.
4	0:48.5 - 0:51.0	DM: How large is your Australian office?
5	0:50.9 - 4:41.9	VX: Two full-time employees and three part-time. DM: Two full-time employees and three part-time employees. The part-time persons work 50% per week? VX: They are called in on as needed basis. DM: So, they are more like casual staff? VX: Yes. DM: Casual staff. So, you have two full-time equivalents? But you are also a subsidiary of a bigger international firm? VX: A larger company. Yes. DM: How large is the company? VX: It has 80 employees. DM: In any other regions as well? VX: No, just Australia and the US. DM: How long have your worked at the company? VX: Seven years now. DM: In these seven years with the company, how has the company changed over time?

VX: When I originally started with the company, it was a privately held company. It is still privately held, but privately-held by private-equity now. At the point, when I started, it was an office in New York and Boston. Now, we have offices in Washington and California. Washington state that is. And now in Australia.

DM: Initially, the owners had it and it was sold to private equity. There was a change in ownership, basically. That was the big change for that company?

VX: Yeah.

DM: Perfect. I am moving into some of the main questions here. Alright, can you describe for me what is your company's approach to its competitive strategies with consulting engineering projects?

VX: It is a difficult to describe. The office here in Australia is a little different to the US.

DM: Okay.

VX: The US business is 130 years old. The competitive strategy is the strength and depth of the history of their relationships within the market. Here, we have been since 2013. So, we cannot rely on those relationships, locally. And what we had to do is develop relationships. Develop our own strategies. Develop our own opportunities and build from there.

DM: You were based in the US before...

VX: Moved out to here in 2013.

DM: Are you Australian?

VX: I am Australian.

DM: You were the person sent to establish the Australian office.

VX: I moved to work to New York not to be working with Lima Tango India but with another firm over there. I came to work for Lima Tango India, whilst I was in New York. And the opportunity came up in about 2012 to open up this office and I took in 2013.

DM: Okay.

VX: I returned to Australia.

			DM: You returned to Australia to set up. What will be your strategy now that you are a new firm? In the marketplace, are there even competitors for what you do? VX: There are engineers who do the work we do. The business has three strong streams of consulting. Failure analysis investigations from advanced analyses, perspectives and knowledge and experience.
6	4:38.6 5:02.5	-	VK: And there is a materials-based component to that. And there is technician and investigation on site evaluation basis. Those three elements in the Australian marketplace can be found, individually. But they are not found in the one consulting firm in its own right.
7	5:02.4 5:09.6	-	DM: Then you clientele will be railway, and heavy industry? Any heavy industry sectors?
8	5:09.6 5:47.3	-	VK: Can be. Given this office, if we are speaking about this office particular, we do to get revenues going, we basically did anything that was in the realm of the firm. We could provide support. My background is structural engineering. We did structural work. The other permanent employee, he is a mechanical engineer. We did mechanical work. We also do some corrosion evaluation. We do investigations of failures and other design work as well.
9	5:47.3 5:57.2	-	DM: In the Australian market, you are not necessarily doing all of what you did in the US company? You are doing more generalist work to basically establish.
10	5:57.2 6:10.9	-	VK: We are trying to establish a revenue base and a business. The long-term intent is to replicate the US-based business, where you have those three core specialties in the one place.
11	6:10.8 6:16.3	-	DM: That is the field inspection, materials lab-based, and technical?
12	6:16.3 6:40.2	-	VK: Yeah. Like NDT - Non-destruction testing. DM: You guys can also do corrosion testing? Right? VK: Yeah. DM: Metallurgy as well? VK: Yeah, metallurgy. Also doing real structure measurements such as strain gauges and accelerometers, displacement loads and all that sort of stuff, we have done as well.
13	6:40.1	-	DM: You generally intend to focus on infrastructure that has

	6:48.3		already been built or laid down. And then just be preventive?
14	6:48.2 7:00.9	-	VK: What we found is both with our experience in investigative failures in existing structures helps. It is a great advantage for people, who are designing new structures.
15	7:00.9 7:08.2	-	DM: So, then you could even be hired by other engineering firms to basically look at their… VK: We are hired by engineering consulting firms.
16	7:08.1 7:49.0	-	DM: …to look at their structures to make sure that there are not failures. VK: Where they are not comfortable with. I guess we have the knowledge and expertise in. We come in and help them evaluate those designs. DM: So, a peer review process, basically? VK: Not an entirely peer review process. Sometimes, we do an entire peer review process where we will come in as an independent peer reviewer and do an entire review. In most cases, we will come in as a speciality peer reviewer. We will only review the details that falls into our speciality there.
17	7:49.0 8:02.4	-	DM: That would be the failure analysis? VK: It would be all related: corrosion, fatigue, fracture mechanics, details from experience with it.
18	8:02.4 8:45.4	-	DM: Okay, again I am trying to get a sense of the strategy in terms of where you are. You have this niche area that working in. And you are just using other work to get people acquainted to what you guys are doing. And you then do what is that speciality peer review to provide that support for other engineering firms, who may need that work as well too. They may not necessarily have that speciality. From all that, it leads to up to asking about your pricing as well. I am not asking specifically what you specifically charge but it is more like are you are to describe for me your company's approach to how it prices its consulting engineering projects?
19	8:45.4 9:42.2	-	VK: Yeah. Our approach is to price based on our experience on similar projects -estimated hours. We have experience in the last couple of years. We have been involved in competitive bid arrangements where technically we were very much in the lead but we lost out on price. And part of that could be considered that our pricing arrangement is not considered to be aimed at being the lowest bidder but just being reflective of the effort we would put in to attend to the required scope.

20	9:42.2 - 10:00.2	DM: In a competitive bid, they would assume all of the engineers have similar skills sets. Then they are basically looking at price. But you are saying from a strategic perspective, based on your experience, you guys put a lot more effort into the work. And that kind of reflected the price you put in.
21	10:00.2 - 10:47.5	VK: Yeah. In the last couple of bids that we put in, there were components of material-related investigations, corrosion-related investigations, on-site testing and evaluation, that we all do. We do all-in-one. Our competitors did only one of those streams and where bringing other people to address the other streams. From a technical perspective, dealing with one house and one set of overheads, we were a lead bidder from a technical perspective. When it came down to a price, we priced it based on what our hours were going to be to attend to a scope that was in front of us. We subsequently do not under bid ourselves and try to make money after that. There are some people like that.
22	10:47.5 - 11:05.0	DM: It is a competitive market, even if it is a rather niche area that you are looking at. Can you indicate who is involved in those pricing decisions for those consulting engineering projects?
23	11:05.0 - 11:50.0	DM: It is just only you who do it? VK: Ah yeah. I do 99% of it. DM: Okay. Because you are in Australia, you are responsible for all of the Australia sales? VK: Yeah. DM: It does not necessarily go to head office up in the US? VK: No. DM: Okay. I think you mentioned not trying to under bid yourself. Is there any way you would price your consulting projects in the selected way? You said you do experience in similar projects and estimated hours. So, this experience and estimated hours are taken from a US perspective? Or are you doing it from an Australian perspective? VK: Originally, it was from a US perspective. But as time goes on, it is more Australia-based.
24	11:50.0 - 12:03.4	VK: As we pick-up projects, we understand the nuances within

		the Australian market that require different attention, different details.
25	12:03.4 - 12:08.3	DM: Even within the State as well. Do you operate in New South Wales only or across the Australia? VX: Across Australia.
26	12:08.3 - 12:23.8	DM: Just trying it back to the US here. With the experience in the similar projects and the estimated hours. That is what you use in the US to do your costing as well? Or were there any different methods as well?
27	12:23.8 - 13:03.6	VX: I understand that to be same in the US. We have a costing sheet - an estimation sheet - at the start of the year. It is modified for the Australia rates. In the US, the project is broken down into phases. Each phase is estimated hours and employee type involved and hourly rate added to that. And any other costs that have to be brought in. It is all added up and broken down for the client.
28	13:03.6 - 13:19.7	DM: Even with these two pricing methods, which is a modified pricing for the Australian context. Would these pricing approaches provide commercial profits for the company? Have they been... VX: Yeah.
29	13:19.7 - 13:35.8	DM: Coming a bit into procurement practices. Can you explain how your company's procurement practices impact on the competitive strategies for the company?
30	13:35.7 - 15:45.5	VX: The approach that we do take, we bid based on what it was suggested to be in the scope involved. We do not try and second guess the customer what they are after. Sometimes, that bites us. DM: Because sometimes, the customer does not always know what they want. VX: Sometimes, the customers ask me a question when we know that is not really the answer, but it is not the question that they should be asking. Trying to get them to ask that right question at that point, to quote is a very difficult task. In that process of educating them, we are kind of doing work for them as well. DM: Yes. That is right. They can easily go back and ask somebody else to do it. It is trying to get them ask you the right questions so you can actually quote them of doing the work itself. Do you work with both public-sector and private-sector

		clients? VX: Yes. DM: I guess with public-sector clients; it is very prescriptive on what they want? VX: Yes. DM: Do you want to give them answers that they could easily give them to somebody. It is intellectual work that you are doing already. And it is the same for private sector as well too. But let us talk a bit about your consulting engineering clients that you have. They would at least understand what they want. VX: Hopefully. Yes. They do. Then again, the same things apply. Those consulting engineers in some instances are further consultants to public entities - public authorities. Again, that same loop happens where we educate up the chain as well. We were involved in a project a couple of years ago where we educated people up the chain. The scope of the project what we finally did was different from what we were asked to price at the start.
31	15:45.5 - 15:56.6	DM: Looking back at the project, did the price you charged initially, was it worth the amount of work you ended up doing?
32	15:56.6 - 16:20.2	VK: For that particular project, I did very lightly because it was something it was something that I wanted to win. I did not specifically under bid. I certainly made it attractive enough to do.
33	16:20.1 - 16:34.4	DM: With your speciality, in terms of procurement, is it competitive tenders? Do you have to actually have to be on a qualified list? Or this is more like sometimes? Or is it single source as well?
34	16:34.4 - 16:54.1	VK: It depends. You will only be asked to bid on something if you are on a qualified list. It is going more that way for public-type work. Other instances, they might just go on a general tender with people they know who can do the work.
35	16:54.1 - 17:53.3	DM: Both private and public-sector clients? VK: Only public-sector clients do be part of a particular list. DM: In terms of your private sector clients, they just call you up and say: Hey, there is a job that I want you to send me a bid for. Here is the scope.

		VK: Yeah. DM: You will also know whether or not if you are competing. Would your private client let you know if there is someone else? VK: Generally, yes. Would that change the way we bid it? The main response to that would be generally no because we feel that we will be diluting the value of the expertise and knowledge that we will be bringing to the table if we continue to do that.
36	17:53.2 - 18:04.1	DM: Do you factor competition in your pricing? You generally do not factor in competition when you do your bid?
37	18:04.0 - 18:18.8	VK: Generally, not. We factor based on ourselves as a sole bidder whether we are selected or not.
38	18:18.8 - 18:34.0	DM: Because of the area that you are talking about, a lot of it is technical expertise is required for this. It is sort of a niche area of consulting engineering. You are able to position yourself of not being the cheapest part. It is a high quality.
39	18:34.0 - 18:39.7	VK: High quality, high expertise.
40	18:39.7 - 19:05.9	DM: Coming down to the last two questions, do we have time for that? VK: Yeah. DM: We talk about your specialisation. How does your specialisation impact on the way you price your services compared to any other type of engineering?
41	19:05.9 - 19:23.8	VK: I guess I would say is the type of work we do. There is a smaller amount of it in the marketplace. There is a high premium in our fees. That can be expected.
42	19:23.8 - 19:54.4	DM: It is a smaller market. This is generally the same even across in the US as well, in this particular area of engineering? VK: Ah yeah. I was talking about if you are looking at mechanical engineering space versus the structural engineering space versus the aeronautical space. The little bits and pieces that we do is considered very small.
43	19:54.2 - 20:06.5	DM: You said you came in 2013, right? VK: Yeah. DM: How did your firm handle the economic conditions in the past three years (2014 - 2017)?

44	20:06.4 - 20:28.3	VK: We went through a growth phase from a revenue standpoint. We went from a revenue of zero to what we are now, which is profitable. DM: And you say that you worked across the Australia continent. Would you have been affected by the different economic conditions in each of the states?
45	20:28.3 - 22:10.2	VK: No, not really. Sydney was chosen because it was seen as hub for a lot of heads of businesses. That is why we chose Sydney. We have not really been that badly affected. it is really had to comment on how we were affected because we started from zero in 2013. DM: You would have been adapted to the economic situation at that time? VK: Yeah. DM: Some of the work that you do, it is some on-going, repeatable, on retainer work to review structures that they have on site? Or is it more of a one of projects with clients? VK: The majority is one of. On occasions, we will get some repeat for maybe two or three years where we have to go back and do repeat inspections. DM: You guys would augment say railways companies? They would have an inspection team, but you guys will augment their services? VH: Yeah. DM: So, it mainly more augmentation of inspection team? VK: Yeah. DM: Alright. I think that is it, actually. Thank you.

10.4 NVivo Codebook

Table 13: NVivo Codebook

Name	Description	Sources	References
Clients (buyer agents)	The client organisations who are the procurer, user and beneficiary of the consulting engineering services. The client	32	342

Name	Description	Sources	References
	organisations are public-sector and private-sector.		
Changes in the contract delivery	The commercial (contract) delivery have changed for construction projects. The rise of the design & construct (D&C) contract in addition to the full design contract. The D&C contract may have differences in percentage of design work done by the engineering consultancy before it is handed over to the contractor.	10	37
Client's procurement policy	The policy that governs how the client procure products and services. This applies to private and public-sector companies.	29	108
Changes in procurement policy	The client changes its procurement policy.	3	3
Global procurement practices in a local context	International clients have global procurement policies, which are adapted to local conditions.	1	1
Public-sector procurement policy	How do the public-sector entities procure products and services? What are the governing rules and guidelines?	15	31
Managing specialised services	How does the client manage specialised services?	17	197
Having an engineering background	The client's procurement team may have an engineering background. The team consists of engineers but they do not perform the engineering services for their client. They hire other engineers to do the engineering consultancy.	4	17
Non-engineering background of staff	The staff does not have engineering background. They may have a background in	3	3

Name	Description	Sources	References
	architecture, business, law and/or procurement.		
Procure specialist services	Core business of the project management business unit.	4	5
Retaining and managing engineering services	How do they make the decisions on hiring the consultant engineering services?	13	168
Commercial consultancy services	The services that are being offered by the engineering consultancy firms to be paid for by the client organisations. It also covers the project management consultancies on offer by the property developers, architects and project management firms.	35	437
Commercial property development	The client owns, builds and operates commercial properties.	4	18
Private infrastructure development	The company owns, manages and operates physical infrastructure as a private entity. A public sector good that is managed by private sector concerns. Public-private partnerships and early contractor involvement.	2	9
Property Tenancy	How do the property owners get clients?	3	11
Anchor tenants	The chief tenant that brings other tenants to the property.	2	3
Need for space	The clients need space.	1	1
Engineering Consultancy Services	How do the client's select the engineering consultants? How do engineering consultants perform their services?	32	299
Cost drivers	The cost of their services to the client.	2	3
Dispute resolution	Resolving disputes between the engineering	5	6

Name	Description	Sources	References
	consultants and their clients.		
Providing services	Providing engineering consultant services for clients.	9	18
Specialist engineering advice (Intellectual)	Engineering consultancy is an intellectual exercise. It is about the knowledge and training of the consultant.	23	143
Having a smarter team	Does the engineering firm have the intellectual capacity to do the job?	12	34
Value-add or Co-creating value	The engineers are providing a unique experience. They are working with the client to create value.	18	77
Project management	How the projects are managed?	18	67
Detailed scope management	Breaking down the scope in a detailed way by the bid response / project management team.	4	10
Challenging the scope	Challenging the scope defined by the client.	1	2
International collaboration (Offshoring)	How much offshoring is done? Sending work to overseas technical centres.	3	8
Resource planning	How are resources assigned for clients' projects?	3	7
Technology - Digital Transformation & Technology Accommodation	Introduction of technology in the built environment space | Accommodating the new technology | Digitally transformation	15	53
Design & Documentation	Digital delivery of designs and documentation. The CAD tools.	10	30
Digital Delivery	Digital delivery of designs and documentation.	3	4
Financial Modelling	Using the technology to model financial data.	1	1

Name	Description	Sources	References
Project Management software	Using project management software.	1	3
Understanding the technology	Understanding BIM | In with digital transformation	2	3
Engineering consultants (service provider agents)	The engineering consulting firms who providing the consulting engineering services to the clients. These clients are both public and private sector clients	32	651
Changing the competitive strategy	Changes the strategy from commoditised engineering to innovation engineering.	14	69
Innovation	Innovation in the engineering consultant's approach to the client's problem or a problem the client did not know s/he had.	8	15
Different ideas & perspectives	The different ways the engineering consultant approaches a client's problem.	5	7
Finding a solution to an unknown problem	Finding a solution to an unknown problem.	3	3
Repositioning the company	Changes in the strategy of the firm.	5	9
Specialising in new areas	New specialisations or disciplines.	8	18
Commoditising engineering	Engineering is treated as a retail product operation instead of a services operation. Shopping around for the problem solution.	17	56
Transactional relationship	Hiring consultants based on their rates. It does not matter about their technical skills set. The engineering firms bid mainly on price as the relationship is based a transaction.	7	17

Name	Description	Sources	References
Competition among the firms	The firms compete with each other.	23	94
Consolidation in the industry	There are mergers & acquisitions of firms in the built environment space.	22	90
Acqui-hiring	Firm A is bought over by Firm B for their intellectual resources.	5	12
Large firm vs small firm	The firms are being divided by size. The firms can either grow larger or they can become smaller. The larger firms are growing through mergers, acquisitions or organic growth. While the smaller firms are split off from bigger firms or are newly established firms.	19	63
Specialist boutique firm vs Multi-discipline firm	Boutique firms have a smaller number of disciplines and a multi-discipline firm has a larger number of disciplines.	18	52
New ownership	The company has new owners.	2	2
Having market relevance	Does the engineering firm have relevance in the market?	24	94
Bid vs Non-bid	Do the engineering firm bid or you pass it up?	8	18
Invited to bid	Client invite you to bid.	1	1
Project risks	The risk of doing a project.	22	57
Professional relationships (Local collaborations)	The professional relationships between the consultants within a company and with other consultants in other companies. Collaboration with local competitors.	10	37
Professional experiences (Star consultant)	The experiences of the team and the presence of a recognisable engineering consultant. The star consultant helps the company win work with the client.	12	25

Name	Description	Sources	References
Relationship with the client	Do the engineering consultants have a previous relationship with the clients? How do they maintain the relationship to get future jobs with the client?	30	211
Preferred consultant	The clients have a preference for their services over other engineering consultants.	17	52
Relationship with the architectural clients		4	46
Leading the business	The person leads a business unit or the company.	34	451
Decision makers	Who makes the decisions on pricing?	20	51
Driving different outcomes	Economic goals for the business units and the company.	3	5
Focusing on sustainability	Sustainability of the design: environment, economics.	6	15
Global commercial operations	The company is a multinational firm, that operates in different countries in addition to Australia.	18	105
Bringing expertise from outside of the region	The acquisitions mean the companies are able to bring new talent into the country.	4	7
Operates in Africa	Operates in African country including the Near Eastern countries that are in North Africa.	2	3
Operates in Asia	Operates in the countries in the Asia region including the Middle Eastern countries.	7	12
Operates in Europe	Operates in countries in the European region.	6	13
Operates in North America and the Caribbean	Operates in countries who belong to the North America and the Caribbean regions.	4	5

Name	Description	Sources	References
Operates in Oceania	Operates in Australia, New Zealand and the countries in the Pacific.	11	22
Operates in South America	Operates in countries in the South American region.	0	0
Transforming into a global operation	By acquisition of other company or human resource increases.	2	2
Local commercial operations	How does the firm operate in Australia?	31	197
Changing ethos after acquisition	How does the company change after it has been acquired?	4	8
Growing the local firm	The local firm is growing in size by hiring, mergers, acquisitions or geographically.	24	68
Owning the company	Having shareholdings in the company	1	4
Market	The market that explains the relationships between the clients and service providers. The general economic conditions (including regulatory frameworks) that governs how the market operates	34	389
Market economics	What are the economics associated with engineering consultancy companies and the industry? What are the economics of the built environment sectors?	34	389
Decline in the Mining and Resources sector	Changes in mining and resources extraction across Australia.	8	20
Great Financial Crisis (GFC)	How did the company survive the GFC?	7	10
Growth in the Built Environment sector	Growth in the built environment sectors across Australia.	9	14
Growth in the Energy & Renewables sector	It is an emerging sector in Australia.	1	1

Name	Description	Sources	References
Growth in the Transport & Infrastructure sector	Boom in the Transport & Infrastructure sector in Australia.	3	5
Losing project work	Losing project work due to the GFC or competition.	5	5
Mature market in New South Wales	Mature market with the government clients operating the same way.	1	1
Payment Schedules	How do the clients pay their consultants?	2	4
Pricing strategy	Winning strategy | Pricing done project by project	28	263
Gut feeling	Intuition of the pricing team	8	17
Pricing the bid	How does the engineering firm price the bid?	25	142
Excel spreadsheets	Technology involvement	1	1
Margin	The profit margin	6	11
Negotiations	Haggling and not haggling	11	20
Nudge factors	Factors that influence the bid.	6	10
Price	Final bid price	11	26
Published Rates	Internal rates for the cost of the assigned resources.	5	6
Resource histograms	How are the resources are distributed?	3	4
Profit analysis	Reporting on projects from various bids - doing profit analysis.	17	35

10.5 Merger & Acquisition Raw Data

Table 14: Spread of horizontal and vertical M&A activities based on AEC disciplines (2007–2017).

Year / Disc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
H	**16**	**23**	**21**	**14**	**31**	**36**	**21**	**20**	**13**	**19**	**19**	**233**
A-A					1		2		3	1	2	9
A-AE							1					1

Year Disc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
AE-A										1		1
AE-AE										2		2
AEC-A								1				1
AEC-E									1			1
AE-E					5	4	3	1		2		15
AE-EC							1					1
C-C	8	10	6	6	6	8	3	2	1		8	58
C-EC								1				1
E-AE			1		2							3
EC-AE								1				1
EC-E	1		1		3		3	4	1		1	14
EC-EC				1	1	1	1	2	1			7
E-E	7	12	13	7	11	22	7	6	4	8	4	101
E-EC					1	1					2	4
L-L										1		1
PD-PD		1			1			1	2	3	1	9
PS-PS								1		1	1	3
V	**8**	**9**	**3**	**9**	**5**	**7**	**6**	**6**	**5**	**10**	**9**	**77**
AEC-PS								1				1
AE-L							1					1
AE-PS							1					1
A-PS										1		1
C-E					1		1					2
C-PD										1		1
E-A						1						1
E-C	2	4	2	3	1		1	1	1	2	2	19
EC-A							1		1			2
EC-PM									1			1
E-E	1											1
E-L								2				2
E-PD									1			1
E-PM		1		1							1	3
E-PS				2						1		3
I-C	4	3	1	2		4	1			4	6	25

Year Disc	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
I-E		1		1	1	1		1		1		6
PD-C	1				2	1			1			5
PD-E								1				1
Total	**24**	**32**	**24**	**23**	**36**	**43**	**27**	**26**	**18**	**29**	**28**	**310**

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