

**DIVERSIFICATION AND DYNAMIC CAPABILITIES WITHIN
CONSTRUCTION BUSINESS MODELS AND THEIR IMPACT ON
FIRM PERFORMANCE**

by

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*Thesis presented for the
Degree of
Doctor of Philosophy (PhD) in
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PREFACE

This dissertation is submitted to the Department of Construction Economics and Management in the Faculty Engineering and the Built Environment, University of Cape Town, towards the fulfilment of the requirements for the Degree of Doctor of Philosophy (PhD) in Construction Management.

DECLARATION

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LIST OF ACCRONYMS AND ABBREVIATIONS

BM	Business Models
CBM	Construction Business Model
CBM's	Construction Business Models
CE	Civil Engineering (contractor)
cidb	Construction Industry Development Board
cidb ROC	Construction Industry Development Board Register of Contractors
EB	Electrical – Building (contractor)
EP	Electrical – Infrastructure (contractor)
FYE	Financial Year Ending
GB	General Building (contractor)
ME	Mechanical Engineering (contractor)
PESTELE	Political Economical Social Technological Environmental Legal Ethical
PLS	Partial Least Squares
PLS-SEM	Partial Least Squares – Structural Equation Modelling
PPPs	Public-Private Partnerships
RBV	Resource-Based View
RO	Research Objectives

CHAPTER ONE

1 INTRODUCTION

This thesis studies the diversification and dynamic capabilities within construction business models and their impact on firm performance. This chapter begins by introducing the topic matter of the thesis and offering definitions of the important vocabulary that will be used throughout the rest of the paper. Immediately following this, an explanation of the background of the thesis will be provided. This explanation will cover subjects such as the thesis context, theoretical point of origin, the problem statement, research questions, the aim, the objectives, and the hypothesis. In the first part of this section, an overview of the research techniques is presented. This is followed by a discussion of the limitations of the study, the significance of the thesis, and its contribution to the overall body of knowledge. An outline of the dissertation is provided in the following section, which is the second part of this section. This thesis is comprised of eight numbered chapters, with this introductory chapter acting as Chapter One for the purpose of organisation and reference.

The presentation of the systematic literature review comes in the second chapter, and the subsequent presentation of the theoretical underpinnings and conceptual model comes in the third chapter. The research technique and intellectual frameworks that were utilized in the creation of this thesis are dissected in further detail in the fourth chapter. These frameworks cover anything from different philosophies of research to different approaches of data science. In Chapter Five, both the presentation of the data and the analysis are broken down and discussed. In the sixth chapter, we go over the findings of the research, and in the seventh chapter, we go over the different ways in which the business model is implemented in the construction industry. A synopsis of the most significant facts, conclusions, and proposals is offered in the eighth and final chapter of the thesis.

1.1 Background to the thesis

The current business environment is characterised by unprecedented levels of change, driven by rapid technological advancements, evolving consumer preferences, pandemics and intensified global competition. Within this context, businesses are continually striving to adapt and innovate to sustain competitiveness, enhance performance or merely sustain operations and retain a portion of market shares. Central to this undertaking lies the investigation of a wide range of business models, which serve as indicators of diverse strategies for generating revenue, creating value, and allocating resources. This doctoral study investigates relationships in construction business models, diversification and business performance, towards the development of a business model framework for construction organisations.

This study is inspired by the researcher's Master of Philosophy (MPhil) research, which served as the impetus for this PhD research. The MPhil focused on the implementation of Building Information Modeling (BIM) in the South African construction industry. One of the key findings of the study indicated that there is a relatively low degree of adoption of BIM as a technique for the delivery of projects in South Africa. The practitioners, businesses, and general industry have all acknowledged a need to comprehend the business value of BIM, as well as its innovative technologically driven eco-system, and the manner in which BIM will disrupt current business methods. Without understanding the business case of any innovation, businesses are hesitant to disrupt their business models.

1.1.1 Business models

A business model, in its most basic form is a unified unit of analysis shown in graphical form (Magretta, 2002; Demil and Lecocq, 2010; Osterwalder and Pigneur, 2010). According to (Casadesus-Masanell and Ricart, 2010), a business model is made up of a collection of choices (policies, assets, and governance), as well as a collection of consequences arising from those decisions (flexible or rigid). These options and their repercussions are depicted on a business model canvas (Osterwalder & Pigneur, 2010), which organises parts of a business model into three interconnected dimensions: value creation, value delivery, and value capture. The business model canvas is used to present the choices and their results. Components of the value

creation proposition (customer segment) include communication channels, important customers, and key products and/or services. The delivery of value constitutes the second dimension, with its constituent aspects including key resources, key activities, and key partners. The third (performance) dimension is value capture, and in most cases, revenue cost models are prioritized within this domain (Magretta, 2002; Morris *et al.*, 2005; Demil and Lecocq, 2010; Osterwalder and Pigneur, 2010; Morris *et al.*, 2013). The methodology proposed by Demil and Lecocq (2010) will be utilized in this thesis, who contend that business models is characterized and applied in two different contexts: as static models and as transformational models.

According to the static approach, the word "model" is the most significant word in the definition and function of business models, and therefore, the consistency between the depiction of essential components is the most crucial factor. According to this point of view, a business model is the definitive blueprint that enables description and classification of the various operations of a firm that contribute to the generation of value. At the stage of business planning, the static view is used to evaluate if the business strategy has been successfully implemented by determining whether or not the business model is used to determine whether or not the strategy has been fulfilled (Demil and Lecocq, 2010). According to Magretta (2002), the most important thing for organisations is to have a static business model. Business models are helpful representational tools for organisational alignment, meaning that they allow employees to connect with one another and have a shared idea of the nature and type of value the company aims to create.

Business models help the workforce perceive individual tasks within the greater framework of what the firm is attempting to do and modify personal behaviour accordingly. Additionally, business models assist individuals realize how their positions fit into the larger context of what the organisation is trying to do. When put to use in this manner, a solid business model becomes a potent instrument for enhancing both execution and, consequently, performance (Magretta, 2002). Managers found business models to be the recipes for their businesses, according to a study conducted by Baden-Fuller and Morgan (2010). The managers also identified the fundamental component of business models as models that are both practical and have a dynamic aspect.

According to Demil and Lecocq (2010), the transformation view believes a business model to be a tool that is used to address change either within an organisation or within the business model itself. The transformative perspective depicts the business processes during the business execution phase (the period in which the business model is being implemented), and it is during this phase that an assessment of the alignment between the business model and the business processes is made. According to Demil and Lecocq (2010) explanation of the transformative view of business, companies frequently experiment with, adapt, refine, and re-invent their business models. Amit and Zott (2014) also present a more dynamic account of business model design. The authors stress that it is not only static, but rather needs to occur on an ongoing basis, integrated in routines, due to the fact that critical elements in the environment of the focal firm continually shifting and changing. Amit and Zott's account of business model design is likewise more dynamic. Adopting either the static or the transformational point of view, the performance of business models can therefore be evaluated in two different contexts: first, on the performance of the business model itself, and second, on the influence of its performance on the organisation's bottom line. Both of these aspects are within the purview of this research.

The study categorisation classification, comparison, evaluation, and measurement of business model performance has been greatly aided by research on business model archetypes, ontologies, taxonomies, and performance. This research has been conducted mostly in the information communication technology and systems domain. According to Shafer et al.'s research from 2005, business models "facilitate the analysis, testing, and validation of the cause-and-effect relationships that flow from the strategic choices that have been made." The same idea of business models as recipes, together with the exemplars of real cases that are linked with each type of business model, also enables us to comprehend why the discussion about business models is so crucial in the day-to-day operations of organisations (Baden-Fuller and Morgan, 2010).

When presenting their respective business models, managers need to make sure they are using a language that is understood by everyone. This is a prerequisite for the business model architecture. This ontology is provided by the MIT business model archetypes that were produced by (Weill et al., 2005). These MIT business model archetypes detail sixteen Business Model Archetypes that is used to classify business models across a variety of industries and specialties. According to Weill et al. (2005), the categorisation matrix determines the nature

of the rights that are being sold as well as the nature of the assets that are associated with the rights that are being sold.

When it comes to determining the level of vertical integration present in a company's process of value creation and delivery, business models are the tool of choice. According to Osterwalder et al. (2005), business models are therefore essential instruments for figuring out the value configuration logic of the various project delivery systems. The purpose of this thesis is to investigate the prevalent business models utilized by construction organisations for the purpose of delivering construction projects and to evaluate whether or not business models have an effect on the performance of construction organisations. The following is an overview of the theoretical underpinnings of the thesis, which are elaborated upon in greater depth in Chapter Three of the thesis: the resource-based view of the firm, which is utilized when looking at business models from a static perspective, and the dynamic capabilities theory, which is applied when looking at business models from a transformational perspective. According to the resource-based view, the services that are produced by the resources are a product of the way in which those resources are used, in conjunction with varying amounts and kinds of other resources. This approach also maintains that in order for a company's strategy to be successful over the long term, it must be ingrained in the company's existing resources and skills. In Teece, Pisano, and Shuen's (1997) dynamic capability theory, "the firm's ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments" is referred to as "the firm's ability to address rapidly changing environments" (Teece, Pisano, and Shuen, 1997).

This idea has been used to explain why companies operating in the same industry is so different from one another. According to Eisenhardt and Martin (2000) and Teece et al. (1997), the dynamic capabilities viewpoint focuses on hard-to-replicate qualities that allow the organisation to change by molding and adapting to the environment. This viewpoint claims to explain the roots of a company's success through time. This viewpoint was created to describe the factors that contributed to a company's long-term success. Business models are discussed and examined less frequently in the field of construction (Pekuri et al., 2013), despite the fact that they are extensively utilized and have shown to be beneficial in practice for creating, comparing, and analyzing an organisation's value generation logic (Pekuri et al., 2013).

There has not been a lot of research done on how value generation and value capture are affected by the utilization of cutting-edge, modern construction techniques and fresh materials. The authors Nailor and Buttriss (2020) reference the work of Helkkula *et al.* (2012) in which they argue that there is a disregard for the temporal aspect of value, specifically in relation to the concept of 'experience'. The significance of interaction in value generation, wherein action can occur in multiple directions, is often overlooked in the majority of business model studies.

1.1.2 Construction businesses and the industry

Construction organisations are described as project-based firms, with peculiar characteristics such as the one-of-a-kind nature of projects, site production and dynamic project delivery systems comprising of temporary multi-organisations (Koskela, 1999). In addition, the industry within which construction organisations operate is characterised by heterogeneity (Fellows and Liu, 2012; Mokhlesian and Holmén, 2012; Matinheikki *et al.*, 2017), with products and services ranging from the creation of buildings, infrastructure, and all kinds of built assets for different purposes, to the services of consulting and contracting. There are now a variety of project delivery methods as a result of the change in how construction businesses and operations are run (Thompson *et al.*, 1998; Ball, 2014). Different project delivery methods have emerged as a result of changes in how construction enterprises and activities are conducted (Thompson *et al.*, 1998; Ball, 2014). Breiby and Wanberg (2011) provide a synthesis of business model innovation definitions, by reviewing the focus and criteria which determine innovative business models. The scholars found resonance in previous research by Lindgardt and Reeves (2010), Johnson (2010), Osterwalder & Pigneur (2010) that for a business model to be innovative, it should be new to the firm, through a process of conceiving new business models, or fundamentally changing existing business models. Santos (2010), differs by viewing only those business models which are new to the market, as innovations.

This thesis will use both views, namely models new to the firm, and models new to the market, and will delineate between the two views. The term “organisational innovation” is used to refer to business models which are new to the firm, but which exist within the market; while the term “disruptive innovation” is used to refer to business models that are new to the market.

The building industry has been forced to adapt in order to better deal with the effects of a number of external factors. These factors include worries about the price, the quality, and the

on-time delivery of building supplies (Mtya, 2019). In the context of South Africa, the Construction Industry Indicators (CIIs) show that customer dissatisfaction with constructors has steadily increased (cidb, 2015). Client dissatisfaction in the South African construction industry is attributed to contractual disputes, poor-quality products and incompetence of constructors due to their insufficient capacity and capability to complete construction work, according to Hanson, Mbachu and Nkando (2003). In addition to increasing competition locally and globally, the construction industry has also been impacted by technological advances, leading to changes in how people do business (Mtya, 2019). Various project delivery systems have developed as a result of the evolution of construction business and activities (Thompson et al., 1998; Ball, 2014).

High levels of complexity, fragmentation, and the existence of special combinations of business relationships and procedures are characteristics of the industry. A variety of project phases, including feasibility analysis, design, construction, and maintenance, are included in the execution of construction projects by numerous firms. Harvey (2003), Dave and Koskela (2009), Fellows and Liu, and others claim (2012), The underperformance of construction businesses in the South African construction sector, according to Mbachu and Nkado (2006) as well as Enshassi, Mohamed and Abushaban (2009), is ascribed to a lack of capacity and capability to successfully build infrastructure of high quality. The low barriers to entry in the construction industry allows many entrepreneurs to venture into construction businesses (Bajari et al., 2009) and often based on the individuals' technical experience rather than business management expertise (Windapo and Cattell, 2013). On the contrary, the ICT industry is a leading innovative sector, with increased productivity over the last decades, through innovative business models (Ikediashi and Ogwueleka, 2016; Leviäkangas et al., 2017), hence this study on construction business models. Some peculiar challenges for the construction sector include the high volatile markets, local benchmarks rather than global standards and restricted business practices to geographical presence, where ICT businesses operate virtually.

1.2 Research question

What is the relationship between business model diversification and business performance?

1.2.1 Construction business models

Some firms implement multiple business models simultaneously. Within businesses, the different business models employed is assessed against the value derived; across organisations, similar business models is assessed for performance. In aiding these comparative assessments, frameworks are borrowed from existing literature and these include the business model change analysis by Linder and Cantrell (2000a). Linder and Cantrell (2000b) use business model performance categorisation, where the outcome determines the degree to which the core business logic changes. Where there is no change to the business model, it is termed to have been realised (as the primary function is to implement the planned business model). Where there is minimal change in the core logic, the business model is termed “renewed”; when there is moderate change, the business model is termed “extended” and where there is high degree of change in the core logic, the business model is termed a “journey model”, which is a continuously transforming business model with a rapidly changing core business logic.

Construction enterprises are typically characterized as capital-intensive organisations that require significant resources. The present study aims to build upon the dynamic-capability theory, as proposed by (Teece *et al.*, 1997; Proeller *et al.*, 2014) which pertains to an organisation's capacity to adapt its internal and external competencies in response to swiftly evolving environments. This theory has been employed to elucidate the variations in performance among firms operating within the same industry. The focus of this thesis will be on the application of this theory within the context of the construction industry. Dynamic capability theory is used to explain the extent to which construction firms reconfigure core competencies in reaction to changes, demands and other pressures in their environment. The first step is, however, having a clear, concise and coherent classification of construction business models, with the key elements identified, for construction organisations. The application of the business model canvas has not been use and it would be a beneficial exercise for construction business managers to identify the rights and nature of their core business. It is crucial to this thesis to identify, understand, communicate and map the business model elements, as the priority process before observing and comparing performance (Weill *et al.*, 2005).

The Covid-19 crisis has forced many practices to rethink how they deliver services. With low margins, low cashflows, survival from Covid-19 proved difficult for most construction companies. The Covid-19 pandemic has brought attention to the need for the construction industry to reassess and challenge existing norms. This includes addressing issues such as low productivity, limited predictability, adversarial pricing models, financial vulnerability, insufficient collaboration, and inadequate investment in research and development (R&D) and innovation (Love and Holt, 2000; Farmer, 2016; Li et al., 2019; Casadesus-Masanell and Ricart, 2010). In their seminal work, Osterwalder et al. (2005) delineate a comprehensive framework consisting of nine fundamental components that constitute a business model. The initial aspect to consider is the value proposition, which encompasses a comprehensive assessment of the business's assortment of products and/or services. Second is the target customer element, which describes the customer segments to which the business is offering value. Then follow, in order, customer handling and distribution channels, and customer interfaces and relationships. The fifth element is value configuration, which describes the arrangement of activities and resources. Sixth is capability and the set of core competencies, seventh, partner networks, cost structures are eighth, and last is the revenue model. Some authors further classified the value capture patterns within business models and identified the following patterns: unbundling, long tail, multi-sided platform, freemium, bait and hook and open ('free').

Emergent business models within the construction industry include Computer Integrated Construction methods, Sustainable and Green building methods, as well as the transition of some construction organisations from main constructors to consulting constructors; however, there is no literature on the impact of these business models' transformation, nor of their impact on existing business models and whether these emerging business models fundamentally change the delivery of construction projects or result in new revenue streams and new customers. To assess this, this researcher used Johnson (2018) framework of assessing what he calls the "white space" (possible area of innovation within a firm); and the idea that the innovation space has opposite characteristics to those of the existing core business, characterised by high assumptions, low knowledge, and therefore high risks (ibid.).

According to existing literature, it has been asserted that a business model that is sufficiently varied to cater to the specific needs of different clients and possesses a high level of replication

difficulty can potentially confer a competitive advantage (Morris et al., 2005; Teece, 2010). According to Magretta (2002), in situations when organisations provide comparable products and services to identical customer bases while engaging in similar operational activities, it is unlikely for any company to achieve sustained success. According to Magretta (2002), in the short term, clients will experience advantages as a result of head-to-head rivalry, which leads to a decrease in prices to a level that renders returns insufficient. It is not known whether this is the exact phenomenon in the construction industry. What is evident is the continued poor performance of construction firms, low profit margins, the rising number of firms applying for business rescue and the continued failure and liquidation of construction firms (Ali et al.; Mahamid, 2012; Holt, 2013; Oyewobi *et al.*, 2020). In a world with unprecedented and fast-paced changes, organisations are evolving into new forms (Moore, 2007; Sims, 2019), and experiencing sustainability challenges with increasing dynamic and global competition (Mahmood et al., 2021; Nestle, 2021). Despite the numerous pressures, the construction industry has not noticeably changed the methods by which it delivers construction products and services (Peralta Abadia *et al.*, 2020).

This thesis will use the business model framework to analyse and determine whether there are any significant changes in value proposition logic in construction firms. Where there is no significant change, the business model is termed to have been realised (realisation model). When the rate of change is significant, the business models is termed to have been renewed, extended, or innovated (a new form of value creation logic). One of the primary difficulties associated with the process of developing business models is in the limited number of managers who possess a comprehensive understanding of their respective organisations' existing business models, hence hindering their ability to effectively enhance or modify them in a timely manner (Johnson et al., 2008; Linder and Cantrell, 2000). The success of organisations heavily relies on the presence of a well-designed business model, which provides significant practical benefits (Magretta, 2002). Various authors, including Kaplan et al. (2004), Tapscott et al. (2000), Timmers (1998), and Slywotzky et al. (1997), have explored the reasons why certain firms outperform others, utilizing the business model as a framework for comparative analysis (Achtenhagen *et al.*, 2013).

According to Teece (2010), investigations looking at the reasoning behind how businesses create value might use the business model concept. The business model concept first emerged

with ICT and e-commerce in the construction sector and has since grown in popularity across a number of disciplines (Lambert and Davidson, 2013; Lambert, 2015), as well as in construction research (Abuzeinab *et al.* (2016), Pan and Goodier (2012). The discipline of construction research has recently incorporated the business model concept into the study of sustainability and green transitions. Zhao and Pan (2015) proposed the utilization of the business model approach as a means to enhance the widespread adoption of zero carbon buildings. In a study conducted by Walravens (2015), many business models were put up for the implementation of a smart city. These models were mostly centered around the concepts of value networks and public value. Furthermore, Selberherr (2015) proposed a conceptual framework for sustainable building business models, wherein the construction sector is perceived as a collaborative network.

1.2.2 Construction business performance

The construction industry continues to be characterised by poor performance for a multitude of reasons. The industry is further characterised by dynamic and complex environments (Raiden, Dainty and Neale, 2006; Loosemore *et al.*, 2003; Wild, 2002; and Druker *et al.*, 1996). This research examines the business model strategies of construction firms in relation to, but excluding, the construction industry level strategies (as part of the environment in which the firm operates), to further understand the nature of value drivers and value creation complexities. This thesis aims to establish whether business model configurations significantly impact the performance of construction organisations. This section offers a background on the construction industry, the status quo in terms of challenges in the performance of construction organisations, and the state of research in this field, in relation to the thesis context. Using the business model approach, construction challenges and the state of research are discussed, using the concepts of value creation, value delivery and value capture.

In their study, Kujala *et al.* (2011) conducted an analysis to determine the many elements that exert an influence on the selection of a business model for the provision of solutions inside project-based organisations. In the realm of construction, the notion of consumers presents an additional hurdle, given that the entity responsible for developing a facility is frequently distinct from its eventual users. Thus, it is more difficult for construction managers to grasp the idea of creating customer value, especially, differentiated value, where companies conduct activities differently than competitors, rather than offering something different (Porter, 1996).

In 2020, Industry 4.0 and the Covid-19 pandemic became the disruptors that are still shaping many industries and resulting in innovative ways of creating, delivering, and capturing value. The business model approach is thus proposed for exploration, to find out the value creation logic of construction firms and the business model configurations that lead to optimal performance. Hence this research investigates which business model elements significantly impact the main constructor's business performance, and whether business models is used to predict future levels of construction business performance.

1.3 Problem statement

The problem statement to be addressed in this thesis is stated as follows:

In the construction industry, service providers (constructors, used interchangeably as contractors) are usually chosen through competitive bidding and tendering procedures that require standardised offerings (Dubois and Gadde, 2002), resulting in companies offering equal value relative to each other and thus, low cost and operational flexibility (business becomes the key competing factor). Coupled with this, construction businesses are faced with digital and virtual construction disruptors and need to strategise how best to respond to market pressures and at what value. Business models as management tools are the starting point in evaluating the fulfilment of a firm's strategic objectives, to evaluate the alignment of business processes to the core logic of value delivery configurations, and to evaluate the performance of firms in relation to business models implemented. However, there is limited research in the context of the construction industry, more so in the region of Africa.

According to Linder (2000) and Johnson et al. (2010), only a small percentage of managers have a full understanding of the business models that are already in use by their companies, which hinders their ability to effectively improve and develop those models. The business model approach offers a holistic view of the measurement of organisational performance. Previous studies on performance of construction organisations have neglected the functional areas of management, as well as external factors such as local market conditions, industry recipe, and the client's role, all acting as project initiators. Whilst sustainable competitive advantage (through *resources, capabilities and market conditions*) is covered within strategic management research (for example in the work of Amit and Shoemaker, 1993; Barney 1991,

1997; Peteraf, 1993), there remains gaps on the ways in which *dynamic capabilities in the business model context* affect the establishment of diverse levels of construction business performance both within industries and among individual companies. Therefore this research towards understating why particular business models are more successful than others (Baden-Fuller and Morgan, 2010)

1.4 Research aim

This thesis evaluates the relationship between business model diversification and business performance, and the impact of business models on business performance.

1.5 Research Objectives (RO):

- I. Critically analyse the predominant business models used within organisations;
- II. Determine the key value logic within construction organisations;
- III. Establish the levels of organisational performance of construction businesses;
- IV. Assess the performance of business models in construction organisations;
- V. Establish whether there are significant relationships between the business model elements and business performance;
- VI. Develop a business model framework for construction organisations.

1.6 Research hypotheses

The research hypothesised that the level of diversity within construction business models has a significant impact on the construction organisation performance. This hypothesis has three components or sub-hypotheses:

- There is a significant relationship between the business model diversification and organisation performance (Objective V)
- There is a significant relationship between dynamic capabilities and organisation performance (Objective IV & V)

- The relationship between the business models of a firm and its organisation performance is moderated by its dynamic capabilities (V & VI).

1.7 Preliminary research plan

Construction management research is characterised as multidisciplinary design science (Voordijk, 2011), where sciences and humanities, amongst other disciplines, are combined and industry solutions are proposed (Van Aken, 2004). The basic goal of design science is to generate information that is applied by professionals working within a given discipline to the development of effective solutions for problems that are encountered in those fields. The planned research activities in this thesis included an extensive literature review, the design and development of a research method, the development of a research tool, obtaining ethics clearance, data collection, data analysis and presentation of findings. This research aims to identify the predominant business models in the construction industry, at sector level, using an established classification system obtained through literature. The elements of value creation are client relationships, client segments and distribution channels within the construction business models. In the context of this thesis, distribution channels are contextually deduced to indicate procurement methods. These make up the revenue streams of business models. The elements of value delivery are key activities, key resources and key partners, which make up the cost models within the business models. The elements within value capture are cost models and revenue streams.

1.7.1 Research philosophy and approach

The research was based on pragmatism which combines positivist and interpretivist views. It used both inductive and deductive reasoning in producing the knowledge. As a result, a mixed-methods research strategy was used to collect and analyze data using both quantitative and qualitative methods (Ahuja *et al.*, 2010). Due to the ability to collect different types of data for one study utilizing a mixed approach of quantitative and qualitative paradigms, the likelihood of adopting only one methodological design was lowered (Wu, 2009).

The research approach entails the plan the researcher maps out to undertake research. Known research strategies include experiment; survey; case study; ethnography; grounded theory; action research and archival research (Saunders et al. 2009). This thesis adopted a sequential mixed method research approach, where the survey strategy was adopted for the initial part of the research. Case studies were then identified and selected from the collected responses, and a detailed study of the cases was conducted to achieve the thesis objectives.

1.7.2 Research method

The following research methods were employed in order to achieve the thesis objectives:

- a) A comprehensive literature review using NVivo and EndNote20
- b) The development of a research tool – including the pre-testing of the questionnaire and consultations with a few experts in both academia and industry. This method aimed to offer insights on the validity and reliability of the data to be collected, and alignment with the research objectives
- c) A survey questionnaire was distributed to randomly selected construction companies listed on the cidb register of contractors, in grades 7 – 9. This was used to identify the business models employed by construction companies in South Africa. The survey included the collection of construction company characteristics, resources, and strategic choices amongst others – in order to identify, classify and categorise the various business models within companies.
- d) Survey data was analysed, and case studies selected as per designed criteria. The case study selection criteria involved the selection of established constructors who employ a minimum of two business models within their organisations, operating within South Africa, and listed in the grade 9 of the cidb register of contractors.
- e) Case studies were conducted based on the selected companies, which included:
 - Face-to-face interviews (semi-structured)
 - Surveys (to collect in-depth structure data from the value chain within the selected construction companies)
 - Company records (strategic, operational and performance records)
 - Observations (strategic meetings, business process meetings, performance meetings)

- Third party data – industry reports, publications, stock exchange information pertaining to the selected companies.

1.7.3 Method of data analysis

The data was analysed using descriptive and inferential statistics, such as classification techniques and regression analysis to build empirically based construction business model classifications, configurations and their related performance measures (Thomsen, 2019). For classification, the tool used was the decision tree as it allowed for the analysis of the key variables that impacted the result category. The software used was the “R” application, which is programming language for statistical computing. The same application was used to perform regression analysis from the detailed data sets obtained from the case studies. For the qualitative data analysis, the NVivo application was used. NVivo is a qualitative data analysis software.

1.8 Limitations of the study

The major limitation of the thesis was on the quality of the responses obtained, considering that some of the participants might be reluctant to divulge company secrets. The findings of the preliminary literature review, revealed that the majority of the literature discussed business models from a static perspective, focusing on archetypes, ontologies, and taxonomies. Limited research has been conducted and is available on business models as transformative models and as such, limits the availability of techniques to evaluate the performance of business models during the value delivery phase. Another limitation with the value delivery phase is the availability and access to detailed and true financial reports (not summaries), as organisations are reluctant to divulge sensitive, detailed operational costs data. Lack of financial reports detailed at business model level, as classified within the context of enquiry, contribute to the quality of observations and conclusions drawn within the study constructs.

1.9 Significance of the thesis

Effective construction business management is critical to the success of a construction organisation, as it impacts all aspects of the business, from project planning and execution to financial management and customer satisfaction. The theory of construction business management seeks to understand the principles, strategies, and practices that contribute to the success of construction organisations. In order to understand why firms tend to favor standard models and why some of them perform better, the thesis examines generic business models within the construction industry as well as the introduction of new business models and the diversity of business model configurations. Practically speaking, the findings will show how closely related different elements of a firm's business model are, where there are combinations rather than features of single components, and whether these combinations have an impact on firm performance.

This study adds value to knowledge, through a focused and detailed approach on the levels of diversity within construction business models and their impact on business performance. The common business models within construction contractor businesses management services, project management, and property development are discussed. Key resources and partners for these businesses studied. The study discusses the use of business models as a strategic management tool, drawing on existing literature. The themes that emerge from the study are analysed in highlighting the use of business models for evaluation and optimization. The study contributes by reporting the predominant construction business models, categorizing them based on project delivery methods, procurement strategies, risk management, and innovation. The advantages and disadvantages of different business models are discussed, highlighting the importance of considering the specific business, project, and stakeholder goals. It highlights that while a company's business model provide insights into its past performance and future potential, it is just one factor among many that influence performance.

Other factors, such as the state of the economy, competition, regulations, and the availability of skilled labour, as described in the literature, play a significant role. Finally, the business model and performance framework is developed for construction organisations, as a key contribution to knowledge drawn from the study, which will help construction companies make informed decisions and develop strategies to navigate complex and changing business environments.

1.10 Contribution to knowledge and practice

The study adds to the discussions on how business models affect how well construction companies operate and how well construction companies are managed in terms of how well business models is utilized to forecast the performance of organisations. In the field of construction business management, there is a dearth of literature by both field (construction management) and region (Africa). By creating a construction business model framework for the best performance, this research helps to advance the application of business models as a construction management tool. Clear descriptions of the constructs used and analyzed are a must for advancement in the discipline (Casadesus-Masanell and Ricart, 2010).

The presentation of business model configurations and an integrated framework for the construction industry can assist direct the search for innovative strategies to compete with high returns on investment. The outline of the thesis is detailed in Table 1:

Table 1: Outline of the thesis

Chapters	Content
Chapter 1	<i>Introduction</i>
Chapter 2	<i>Literature review</i>
Chapter 3	<i>Theoretical and conceptual framework</i>
Chapter 4	<i>Research methodology</i>
Chapter 5	<i>Data presentation and analysis</i>
Chapter 6	<i>Discussion of findings</i>
Chapter 7	<i>Conclusions and recommendations</i>

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature on business models, construction business management and construction business model literature. The chapter is given structure through a thorough scoping of relevant and related systematic literature. A thorough search of pertinent literature from a range of sources, including academic journals, conference proceedings, books, and reports, is used to conduct the systematic literature review. The aim of the review is to identify, evaluate and synthesize existing research on construction business models, in order to provide insights into the current state of knowledge in this area. Furthermore, the literature reviewed includes the research methods used within the field of business models, construction business management and construction business model research.

2.2 Business model literature

To further introduce this chapter and the scope of application of the business model literature as a body of knowledge, a study by Foss and Saebi (2017) adds value in shaping this literature review process. In the study of the evolution of business model literature, Foss and Saebi (2017) identified three streams of literature (Zott *et al.*, 2011; Lambert and Davidson, 2013), the first as enterprise classification, secondly as an antecedent of heterogeneity in firm performance and lastly, business models as unit of innovation . This study's objectives are aligned with the business model streams of literature, as shown in Table 2, with the applicable references covering the various streams of literature. The references referred to are in relation to the contribution on the stream of literature. This research thus aims to further contributing to this body of knowledge by evaluating the relationship between business model diversification and business performance, and the impact of business models on business performance.

Table 2: Business model literature and research objectives

Research objectives	Stream of business model literature	References
I. Critically analyse the predominant business models used within organisations; II. Determine the key value logic within construction organisations	Enterprise classification	(Magretta, 2002; Zott <i>et al.</i> , 2011)
III. Establish the levels of organisational performance of construction businesses IV. Assess the performance of business models in construction organisations V. Establish whether there are significant relationships between the business model elements and business performance	Antecedent of heterogeneity in firm performance	(Winter and Szulanski, 2001; Weill <i>et al.</i> , 2005; Zott and Amit, 2007; Doz and Kosonen, 2010)
VI. Develop a business model framework for construction organisations	Business models as unit of innovation	(Magretta, 2002; Doganova and Eyquem-Renault, 2009; Chesbrough, 2010; Lambert and Davidson, 2013; Spieth <i>et al.</i> , 2016; Foss and Saebi, 2017; Ranta <i>et al.</i> , 2021)

Business model literature is presented and discussed throughout this chapter, including the holistic overview of the key terminologies that inform the study. The industry in which construction businesses operate within is discussed next. To add to this alignment, Figure 1 presents a word cloud with the common themes collected from business model literature and the construction industry. These themes include construction business models, innovation, research elements.



Figure 1: Key terminologies from related literature

2.3 Overview of the construction industry

The construction industry is one of the most significant sectors of the economy, as it contributes to the development of infrastructure, housing, and public services. However, the construction industry also faces many challenges and uncertainties in its business environment, such as market fluctuations, regulatory changes, socio-political issues, technological innovations, environmental concerns, and competition. These environmental factors have a significant impact on the performance of construction firms, which is measured by various indicators such as profitability, productivity, quality, customer satisfaction, innovation, and sustainability.

The literature on the construction business environment and performance is classified into three levels: global, regional (African), and national (South African). Each level has its own characteristics and issues that affect the construction industry. The following sections will review some of the existing studies on each level and highlight their main findings and implications.

At the global level, the construction industry is influenced by various factors such as globalization, urbanization, industrialization, digitalization, climate change, and a pandemic. These factors create both opportunities and challenges for construction firms operating in different markets and regions. Some of the studies that have examined the global construction

business environment and performance are described below. Ofori (2015) provides a comprehensive overview of the global construction industry and its trends, challenges, and prospects. The scholar discusses the drivers and impacts of globalization on the construction industry, such as market integration, technology transfer, knowledge diffusion, labour mobility, and environmental sustainability. Ofori (2015) also identifies some of the key issues and opportunities for the construction industry in different regions of the world, such as Asia-Pacific, Europe, North America, Latin America, Africa, and Middle East. According Ofori (2015) the construction industry needs to adopt a strategic approach to cope with the changing global environment and enhance its competitiveness and performance.

Tan et al. (2017) investigates the business model types of 72 international construction contractors based on their relationships with subcontractors. The authors use cluster analysis to classify the contractors into four types: adversarial, competitive, collaborative, and partnering. Examination of performance differences among the four types is conducted using financial and non-financial indicators. They find that the partnering type has the highest performance, followed by the collaborative, competitive, and adversarial types. They suggest that the construction industry should adopt more collaborative and partnering business models to improve its performance and sustainability in the global market. Building Material Data Structure proposed and demonstrated by Guven *et al.* (2022). In the recent study, Guven et al. (2022) introduce and validate a modified building material data structure derived from UniFormat and MasterFormat, two widely utilised construction classification systems in North America. The authors provide a comprehensive dataset pertaining to fine-grained materials utilised in 70 buildings located in North America. This dataset encompasses various aspects including the type of materials employed, their respective quantities, associated costs, embodied energy, carbon footprint, and potential for recycling. Additionally, they conduct comparisons of material data among various building types, regions, and construction methods. The authors contend that the utilisation of building material data structures enables the examination and enhancement of building materials and their ecological consequences on a worldwide level (Guven *et al.*, 2022).

At the regional level, the construction industry in Africa is influenced by various factors such as economic growth, population increase, infrastructure development, urbanization, poverty reduction, and social stability. These factors create both opportunities and challenges for

construction firms to operate in different countries and sub-regions. Some of the studies that have examined the African construction business environment and performance include: Oyewobi et al. (2016) investigate the relationship between environmental factors, organisational factors and performance of construction firms in Nigeria. They use a questionnaire survey and partial least squares analysis to collect and analyse data from 120 construction firms. They identify six exogenous environmental factors (economic, political/legal, socio-cultural, technological) and three endogenous organisational factors (structure, culture, strategy) that affect the performance of construction firms. They also measure the performance of construction firms by two dimensions: financial and non-financial. They find that environmental factors have a direct positive effect on organisational factors, which in turn have a direct positive effect on performance.

They recommend that construction companies modify the organisational components of their businesses so that they are compatible with the environmental factors in order to improve their performance. Aigbavboa et al. (2020) define and study the construction organisational environments and their aspects that have an impact on the performance of contracting organisations in South Africa. This research was conducted in South Africa. Aigbavboa et al. (2020) use a questionnaire survey and structural equation modelling to collect and analyse data from 72 construction organisations registered with the South African cidb. Aigbavboa et al. (2020) identify 16 dimensions of the construction organisational environment, such as market conditions, regulatory environment, socio-political environment, technological environment, economic environment, natural environment, competitive environment, organisational culture, organisational structure, organisational strategy, organisational resources, organisational processes, organisational leadership, organisational learning, organisational innovation, and organisational performance.

Aigbavboa et al. (2020) identify some of the challenges that main contractors face when working with inexperienced subcontractors, such as poor quality of work, lack of skills and experience, lack of communication and coordination, delays and disruptions, cost overruns and disputes. He also suggests some measures for improvement, such as training and mentoring, prequalification and selection, contract administration and supervision, performance evaluation and feedback.

One of the studies that has examined the South African construction business environment and performance, is by (Oyewobi *et al.*, 2016; Windapo, 2016)). The authors examines the factors affecting the performance of emerging contractors in South Africa. Windapo (2016) identifies five factors affecting the performance of emerging contractors: contractor characteristics, project characteristics, client characteristics, external environment characteristics, and internal environment characteristics. Windapo, (2016) also measures the performance of emerging contractors by four indicators: profitability, growth rate, client satisfaction, and repeat business.

2.4 Construction business environments: PESTELE view

The construction business holds a crucial position in a nation's economy and bears the duty of establishing, delineating, and upholding the physical infrastructure (cidb, 2004; Cain, 2003; Morton, 2002; Ganesan, 2000; Ofori, 1988). The management of construction enterprises in a sector that holds a significant role in the socio-economic advancement of the country (Kajimo-Shakantu, 2007) is susceptible to many obstacles. (Bala *et al.*, 2009; Kale and Karaman, 2011; Bondinuba, 2012; Tayeh *et al.*, 2019). In a study by (Pekuri *et al.*, 2013), construction business managers often struggle to articulate their organisations' business models and value creation reasoning, citing a deficiency in analysis and comprehension of value creation and operational requirements within the construction industry. This is one of the aspects of the persistent client dissatisfaction with the construction industry.

On reviewing literature on the macro-environment in which construction businesses operate, the Political, Economic, Social, Technological, Environmental, Legal and Ethical (PESTELE) framework is used for context and scoping. The PESTELE analysis is a framework that helps reviewers and role-players to understand the external macro-environmental factors affecting a business. The following is a PESTELE analysis of construction business models. The construction industry is a complex and dynamic business environment that is influenced by various internal and external factors. The PESTELE framework as a tool, will be used to examine the political, economic, social, technological, environmental, legal, and ethical factors that affect the performance of construction business models, in the later chapters of this thesis, as visually illustrated in Figure 2 below.

2.4.1 Political factors

The political lens refers to the regulations and policies related to construction and building codes, labour laws, and environmental standards vary across countries and regions, affecting the ease of doing business. Government investments in infrastructure projects and public-private partnerships (PPPs) provide opportunities for construction companies.

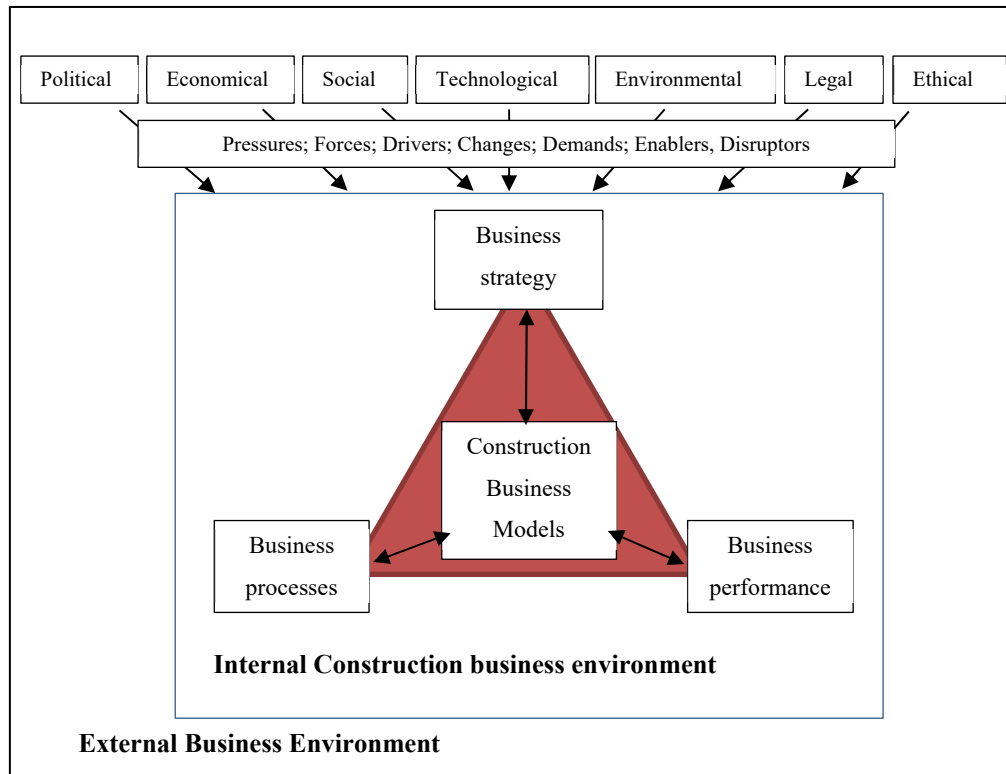


Figure 2: External and Internal construction business environment

Political stability and predictability play a significant role in investment decisions, particularly in large-scale infrastructure projects.

2.4.2 Economic factors

The economic layer covers the state of the economy and economic growth rate, which have a direct impact on the demand for construction services. Interest rates, inflation, and currency exchange rates affect the cost of construction materials and labour. The availability of financing and investment capital impact the growth and competitiveness of construction companies. The social aspects cover demographic trends, such as population growth, migration, and urbanization, which drive demand for construction services and new infrastructure. Consumer preferences, attitudes, and spending patterns affect the demand for specific types of

construction projects, such as single-family homes or commercial buildings. The availability and skills of the labour force are crucial factors for construction companies.

2.4.3 Technological factors

The technological dimension includes aspects such as advances in technology, for example, 3D printing, drones, and prefabrication, which increase efficiency, reduce costs, and improve quality in construction projects. The adoption and integration of new technologies also create new opportunities for construction companies, such as smart building solutions. The pace of technological change and innovation impact the competitiveness of construction companies.

2.4.4 Environmental factors

Environmental factors include regulations and sustainability considerations, such as energy efficiency, water conservation, and waste management, which play a significant role in construction projects. Climate change and extreme weather events have a significant impact on the construction industry, particularly in terms of increased costs and disruptions to supply chains.

The construction industry's carbon footprint and contribution to environmental degradation affect its reputation and public support. According to the findings of Aigbavboa et al. (2020), there is a notable degree of variability in environmental complexity, suggesting that the complexity of the construction industry's operating environment has a significant role in shaping the performance outcomes of construction businesses. It is recommended that construction companies obtain market and environmental data and employ effective processing methods to mitigate uncertainty in their strategic decision-making processes Aigbavboa et al. (2020).

2.4.5 Legal factors

The legal layer comprises of factors such as contractual arrangements and intellectual property rights, which play a significant role in the construction industry, particularly in terms of project delivery and risk management. Liability and dispute resolution mechanisms impact the financial performance and stability of construction companies. Changes to labour laws and employment regulations affect the availability and cost of labour for construction companies. Construction business models are impacted by a wide range of political, economic, social,

technological, environmental, and legal factors, and companies must carefully consider these factors in their planning and decision-making.

2.4.6 Ethical factors

The last layer covers ethical considerations, such as bribery, corruption, and fraud, which have a significant impact on the reputation and success of construction companies. Labour rights and working conditions, as well as the treatment of suppliers and sub-constructors, are also important ethical considerations for construction companies. The environmental impact of construction projects and the responsible use of natural resources are also critical ethical considerations.

2.5 Business model components, constructs and variables

Table 3 details a summary from scholars who investigated various components, constructs, and variables that contribute to the formulation, design, and evaluation of effective business models. This literature review provides an overview of key contributions from different authors in understanding the intricate elements that shape business models. Business Model Components: The "Business Model Canvas," introduced by Osterwalder and Pigneur (2010), has garnered significant popularity and acceptance in the field. The "Business Model Canvas" delineates nine crucial constituents that collectively constitute the underpinning of a company's model.

The aforementioned elements encompass essential collaborators, pivotal operations, unique offerings, interactions with customers, targeted client groups, vital resources, distribution methods, cost allocation, and sources of revenue. Key partners encompass companies that play a vital role in the achievement of the business's objectives. The Business Model Canvas offers a visual framework that may be utilized for the examination and development of business models.

Table 3: Business model constructs

Field	Author	Constructs/Archetypes/Typologies	Summary of source
general (constructs literature)	(Kopp and Orlovskiy, 2020)	Products or services, target market, expenses, pricing, costs, revenue streams, partnerships	A description of what a business model is and how it helps companies make money. It also provides some examples of different types of business models.
construction (constructs literature)	(Lepinoy et al., 2022)	Value proposition, target market, revenue streams, cost structure, key resources, key activities, key partnerships, customer relationships, channels	A blog post that discusses how to achieve business model innovation in construction by understanding the environment, connecting with the UN SDGs, and using the Autodesk IOF. It also provides some examples of construction business models in Industry 4.0.
construction	(Alinaitwe, 2020)	Value proposition, value creation and delivery, value capture, value network, value communication	A research paper that proposes a conceptual framework for developing sustainable business models for construction firms in Uganda. It also identifies the key drivers and barriers for sustainability in the construction industry.
construction	(Das et al., 2021)	Value proposition, value creation and delivery, value capture, value network, dynamic capabilities	A research paper that develops a construction business model transformation canvas to map the transformation of construction enterprises in Industry 4.0. It also identifies the key elements and relationships of the canvas.
general (constructs literature)	(Kesting, 2020))	Value proposition, value creation and delivery, value capture, strategic choices, dynamic capabilities	A conceptual paper that proposes a dynamic business model framework that integrates strategic choices and dynamic capabilities. It also provides a typology of business model innovation patterns.
general	(Peric et al., 2017)	Value proposition, value creation, value delivery, value capture, strategy, sustainability	A review of the most common themes used in defining business model elements and their relationship with strategy and sustainability.
general	(Bhattacharjee, 2012)	Concepts, constructs, variables, measurement scales, reliability, validity	A chapter on how to define and measure concepts and constructs in social science research. It also explains the difference between variables and constructs.
general	(Teece, 2010; Teece and Linden, 2017; Teece, 2018)	Value proposition, target market segment, revenue generation and margins, value chain structure, position in value network, competitive strategy, complementary assets, sustainability of advantage, imitation deterrence	A seminal paper that defines a business model as the design or architecture of the value creation, delivery, and capture mechanisms employed by the firm. It also discusses the role of business models in innovation and competitive advantage.

2.5.1 Value Proposition:

Johnson, Christensen, and Kagermann (2008) emphasized the significance of a clear value proposition within a business model. They argued that successful business models are centred around unique value propositions that address specific customer needs and challenges.

2.5.2 Revenue Models:

Chesbrough and Rosenbloom (2002) explored the concept of "open innovation" and its impact on business models. They highlighted the importance of revenue models that capitalize on licensing, partnerships, and collaboration with external entities to generate income beyond traditional sales.

2.5.3 Customer Segmentation:

Ries (2011) introduced the concept of the "lean startup" and emphasized the role of customer segmentation in shaping business models. He argued that understanding distinct customer segments and tailoring value propositions to their needs is crucial for sustainable business growth. All the papers use the value proposition as a core construct of the business model, which describes what value the firm offers to its customers and how it differentiates itself from competitors. The papers also use similar constructs for value creation and delivery, such as key resources, key activities, key partnerships, channels, and customer relationships. Teece (2010) discussed the dynamic capabilities required for business model innovation. He highlighted the importance of continuously adapting business models to changing market conditions, technological advancements, and competitive landscapes.

2.5.4 Metrics and Performance Indicators:

Zott and Amit (2010) introduced the concept of "business model design and innovation metrics." They proposed a framework for evaluating business models based on metrics related to novelty, lock-in, complementarities, and efficiency.

2.5.5 Patterns

Gawer and Cusumano (2002) examined platform-based business models. They explored how companies create and govern platforms that encourage external contributors to develop complementary products or services, leading to ecosystem growth. Hart (1995) contributed to

the discourse on sustainable business models by highlighting the concept of the "triple bottom line." He emphasized the integration of economic, social, and environmental dimensions in business models to create long-term value for multiple stakeholders. Afuah and Tucci (2001) discussed the role of technology in shaping business models. They explored how digital technologies enable companies to create innovative value propositions and deliver them through efficient digital channels. Casadesus-Masanell and Ricart (2011) emphasized the influence of external context on business models. They discussed the importance of aligning a company's business model with the broader industry environment and competitive dynamics.

These constructs describe how the firm creates and delivers value to its customers and stakeholders. The papers differ in how they define value capture, which describes how the firm generates revenue and profit from its value proposition. Some papers use revenue streams and cost structure as the main constructs, while others use value network and competitive strategy. These constructs reflect different perspectives on how the firm captures value from its customers and partners. The papers also differ in how they incorporate dynamic capabilities, which describe how the firm adapts and innovates its business model over time. Some papers use dynamic capabilities as a separate construct, while others integrate it with other constructs such as value network or strategic choices. These constructs reflect different perspectives on how the firm responds to changes in the environment and market. On the dynamic nature of value, according to the theoretical framework proposed by Alexius Meinong (1853–1920), the concept of value is comprised of four essential components. These components include a value subject, who serves as the experiencer of the value; a value feeling, which is either positive or negative and is directed towards a value object; the emergence of the value feeling as a consequence of the value entertained by the subject; and finally, a judgement pertaining to the realization or existence of the value object. This framework has been referenced by Rescher (1982) and subsequently cited by Shen and Liu (2003), Achtenhagen et al. (2013), and Nailer and Buttriss (2020).

The stakeholders are referred to as entities that are involved in a project or that influence or be affected by the project; and the project is implemented by the central organisation in meeting its objectives (Freeman, 1984; Olander, 2007), in (Oppong et al., 2017). Client satisfaction has been a challenge in construction organisations for years (Ahmed and Kangari, 1995; Kärnä et al., 2004; Durdyev et al., 2018; Nguyen, 2019). Meeting customers' performance demands is

critical to the survival of construction companies (Oyewobi et al., 2013). Customer satisfaction allows construction companies to differentiate themselves stand out from their competitors and create sustainable advantages (Kärnä et al., 2004). Currently, there are no sufficiently developed tools in construction companies that are specifically aimed at improving customer satisfaction (Nguyen, 2019). Companies that have a high level of customer satisfaction achieve, also enjoy superior economic returns (Nguyen, 2019). Firms which achieve high customer satisfaction also enjoy superior economic returns (Anderson et al. 1994, in (Kärnä et al., 2004). In the construction industry, aspects of quality assurance and timely delivery of projects have a strong influence on overall customer satisfaction(Kärnä et al., 2004).

2.5.6 Value for key partners and stakeholders

The use of a stakeholder perspective on business measurement is crucial for the attainment of successful business plans, as it enables the achievement of optimal business performance. It is anticipated that in the forthcoming years, the establishment of steadfast and all-encompassing stakeholder connections will emerge as a pivotal factor influencing the commercial feasibility and triumph of businesses. Therefore, it is imperative for construction organisations to adopt a forward-thinking approach in their strategic decision-making process and prioritize the interests of their stakeholders, both from an economic and ethical standpoint. The authors, Love and Holt (2000), propose the adoption of a holistic stakeholder perspective approach to company performance. This strategy aims to monitor and evaluate the organisation in a manner that is socially acceptable, thereby establishing the basis for optimizing stakeholder value.

2.5.7 Business models (configurations) and strategy

The concept of business models is widely prevalent and yet difficult to comprehend, which contributes to its potential significance for future management study (Baden-Fuller and Morgan, 2010). Previous studies have reached a consensus in addressing the issue of terminological ambiguity between business models and business strategy. These studies propose that the business model serves as an intermediary layer between business strategy and business processes, as depicted in Figure 3 (Wheelwright and Hayes, 1985; Osterwalder et al., 2005). In contrast, a business model is regarded as an embodiment of a company's implemented strategy. In certain competitive scenarios, both concepts are employed

concurrently, although they may exhibit disparities "in instances where a strategically sound approach relies heavily on significant contingencies" (Casadesus-Masanell & Ricart, 2010).

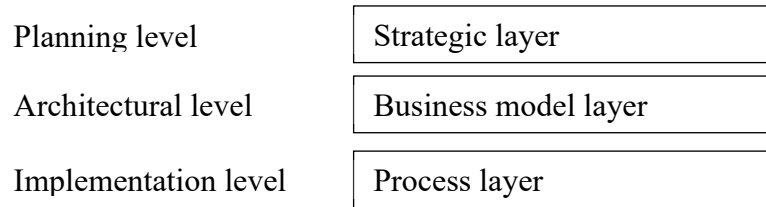


Figure 3: Business model and business processes, adapted from Osterwalder, (2004).

The current body of strategy literature posits that a corporation is conceptualized as a collection of resources and capabilities, ultimately manifested through the business model notion (Amit and Zott, 2001). A business model encompasses a series of decisions pertaining to policies, assets, and governance, which subsequently lead to a range of outcomes categorized as either flexible or rigid.

The notions of strategy and business model are interconnected yet distinct (Casadesus-Masanell and Ricart, 2010). A strategy refers to a flexible and conditional course of action that determines the choice of business model to be employed. The possible strategic actions of the corporation encompass a range of alternatives, including policies, assets, and governance structures, which serve as the fundamental components of business models. Therefore, the concept of strategy involves the deliberate development and modification of business models in response to unforeseen circumstances, resulting in the creation of various configurations of business models that enable the firm to achieve its objectives. Business models serve as manifestations of the implemented strategy. Similarly, tactics, referred to as dynamic capabilities, operate at a more granular level and encompass specific action plans that are constrained by the firm's economic model, as discussed by Casadesus-Masanell and Ricart (2010). The distinction between strategy and business model becomes apparent when a firm's course of action necessitates adjustments to the business model, such as changes in policies, assets, or governance, in response to specific events. According to Casadesus-Masanell and Ricart (2010), when such circumstances arise, there is a misalignment between strategy and business model, irrespective of the magnitude of the changes made to the business model.

According to Markides and Charitou (2004), it is proposed that it is feasible to operate two business models concurrently, while ensuring sufficient integration to leverage maximum synergies. Markides (2013) presents an additional viewpoint about the management of diverse business models, asserting that the notion of a firm successfully operating many business models concurrently lacks a solid theoretical basis. Markides (year) suggests the incorporation of concepts derived from the ambidexterity literature to tackle the challenge of simultaneously managing many business models. The author identifies three key domains that offer potential avenues for achieving this objective. The concept of spatial separation, which involves the segregation of two activities that appear to be incompatible, prompts an inquiry into the methods through which synergy might be harnessed between these two opposing activities.

Temporal separation is a viable approach to achieve this objective, wherein a company engage in two operations that may appear to be contradictory, but not concurrently (such as engaging in exploration or exploitation activities). The concept of contextual ambidexterity may be effective when a business is able to provide a suitable environment that fosters and facilitates each employee's ability to strike a suitable equilibrium between competing demands on their time and attention (Markides, 2013). Casadesus-Masanell and Ricart (2010) provided an elucidation on the coexistence of various business models within a single organisation. Their findings align with those of other scholars, indicating that the selection and design of a business model are influenced by strategic considerations.

2.5.8 Business model innovation and evolution

Reaction of firms to external pressures such as those stipulated in the PESTELE framework, contribute to the transformation of business models. Demil and Lecoq (2010) explain that firms experiment, change, refine and re-invent their business models and refers to this transformation process as the dynamic consistency of business models. The extent to which firms reconfigure core competencies in reaction to changes, demands and other pressures in their environment, introduces the concept of business model innovation. The trajectory of an organisation is the consequence of how purposeful actions made by that organisation interact with new trends and occurrences. While the developing changes are unanticipated and somewhat outside of managers' control, the voluntary modifications to the BM are the consequence of a single decision or a series of actions connected to one or more key components.

These changes might result from the environment, unintended consequences of intentional actions, or even the mechanics of how the BM operates itself. These changes could produce ripple effects or diminishing returns, which could then result in the establishment of beneficial or harmful cycles. Managers also have to deal with negative emerging change, which eventually could lead to vicious circles detrimental to their BM (Demil and Lecocq, 2010). Breiby and Wanberg (2011) synthesised business model innovation definitions and found that, according to Lindgardt and Reeves (2010), Johnson (2010), Osterwalder and Pigneur (2010), for a business model to be innovative, it must be new to the firm, through a process of conceiving new business models or fundamentally changing existing business models. Santos (2010) however, views business model innovation as a business model new to the market.

This thesis will use both views and to delineate between the two views, the term “organisational innovation” is used to refer to new business models within the firm, but which already exist within the market; and the term “market innovation” is used to refer to business models that are new in the market. The survival and success of innovations lead to business model evolution, where (in the case of organisational innovation), the firm sustains the changes to one or more components in its business model (intra-firm BM evolution). Market innovation also lead to BM evolution at industry level, where all firms adopt a similar way of doing business.

2.6 Overview of construction business models

The framework presented in Figure 4 is used to define and refine the scope of this thesis and the bounds of the literature which was reviewed. Construction Business Models are studied through three business layers; that is, the strategic layer, at the basis of which initial business conditions are established and managerial choices are made; the business process layer, where the resource system is activated; and the performance layer, where business performance is captured.

At the strategic layer, the business models are studied at both industry level and within firms. This layer is proposed to represent the value creation dimension of business models. The construction business models within firms are studied, categorised and classified, followed by

the business process layer. In the business process layer, the resources within construction business are studied and this layer represents the value delivery dimension of business models. The study limitation, illustrated by the dotted lines within the framework, acknowledges that resources within firms are not static and that firms reconfigure resources to adapt to pressures experienced within and during the business operations. The business performance layer represents the value capture, with business model and firm performance as the key constructs.

In conducting a thorough literature review, the thesis starts off with the technical focus, by reviewing literature relating to the topic and focus of the thesis. This is done through a Systematic Literature Review similar to that of Rosa et al. (2019) on Circular Business Models. The next chapter reviews literature in relation to the theoretical underpinnings and the theory development from related and relevant scholarly work. The conceptual model is presented and key findings and framings from literature are utilised to inform the research methodology.

The primary source of literature search is the University of Cape Town's library, with access to over 220 200 e-books, 90 000 e-journal titles, 173 high quality electronic databases and over 1.2 million print volumes within the library system (UCT fact sheet, 2022). The search engine to access literature was Google Scholar, linked to the University's licensed access and credible academic quality literature, but due to limitations with semantic structuring of results, the Semantic Scholar was then used as the primary search engine. Figure 4 illustrates the iterative process implemented during the search, filter and organisation of relevant and related literature, using the necessary key words, phrases, industry, discipline-specific journals and bodies of literature, to obtain the literature reviewed and used within this thesis. Each search and systematic presentation of literature obtained, is presented across this chapter under the relevant sections, where the criteria for selection of literature are inserted and further discussed.

Figure 4 further demonstrates the repetition of the process, through an appraisal and improvement of search terms used, further informed and guided by the result of each previous search. Figure 6 illustrated the literature as packaged within the EndNote literature management tool. References and files from various search engines and journals are imported into EndNote and smart groups are created from all collected literature using key terms, phrases, words and discipline. Various iterations of search and packaging, within available sources is conducted

and the literature reviewed. The concept of value is discussed first, within literature, as this has been a key term in explaining business models elements, grouped into value creation, value delivery and value capture.

Figure 6 shows the key terminologies extracted using the NVivo application, where a collection of academic literature imported from the EndNote library is analysed and an in- depth review is conducted, using coding and exploration techniques within the NVivo software. From the key literature collected using the method detailed in Figure 6, smart groups are created within the EndNote library, using filtering techniques to identify studies relating to business models and construction business models. Innovation, business, construction model, research and elements are some of the terms emergent in the refined literature. The terms are coded into themes to conduct a further critical analysis of literature and the contributing scholars.

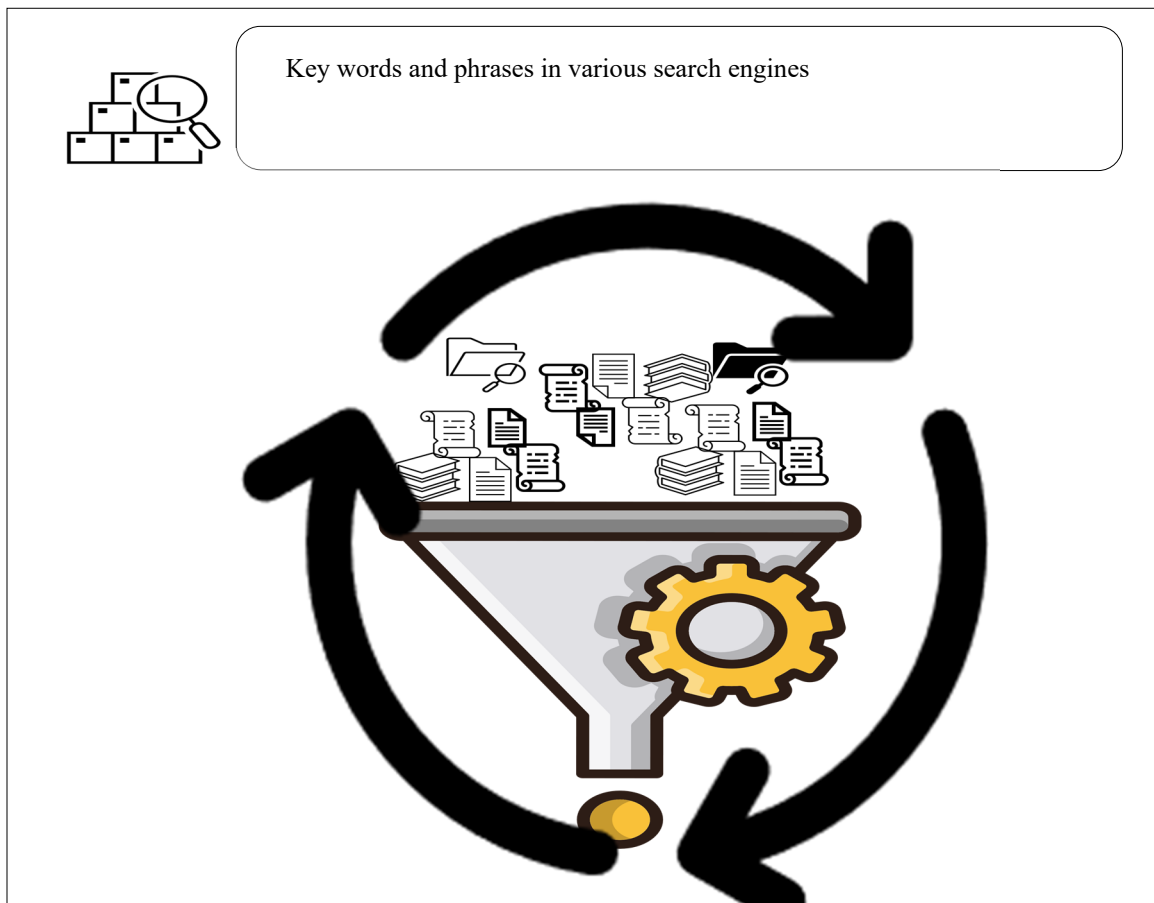
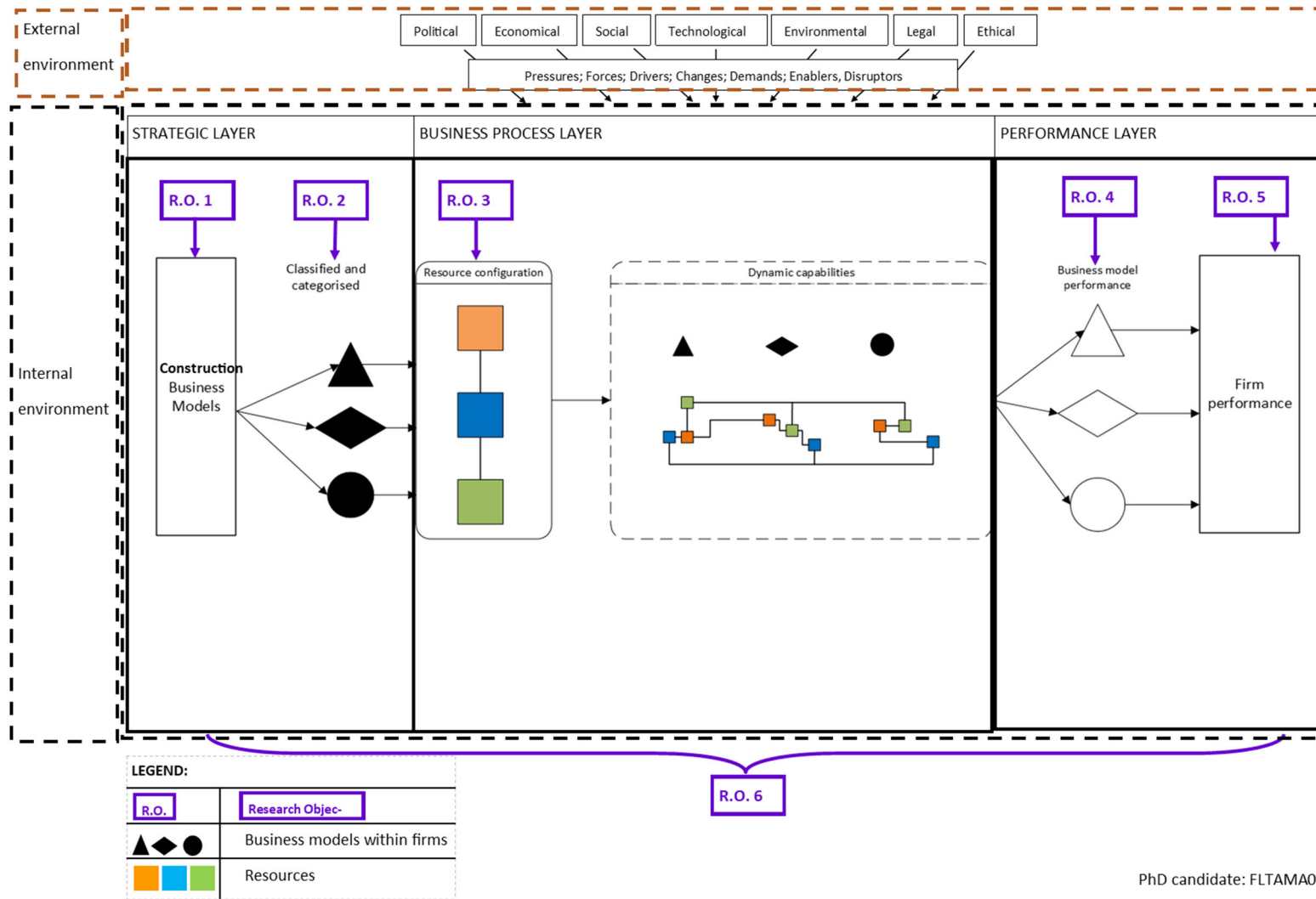


Figure 4: Conducting a systematic literature review. (Own source)



PhD candidate: FLTAMA002

Figure 5: Visual framework of the thesis and PESTELE

2.7 Business models used within organisations

The existing business model of a firm is a crucial component in the process of lean transformation. Business models serve as a tool for comprehending, analyzing, and enhancing the overall operations of a company (Pekuri, 2015). In the realm of construction research, a study conducted by Pekuri (2015) revealed that business managers within the construction industry face challenges in articulating their business models. Höök and Stehn (2014) provide evidence for this finding by asserting that the construction industry lacks sufficient awareness of business models and the inadvertent implications that arise from strategic decisions. Moreover, a limited understanding of business models and the significance of maintaining a well-balanced portfolio of business models potentially diminish managerial efficacy and impede overall performance (Höök and Stehn 2014).

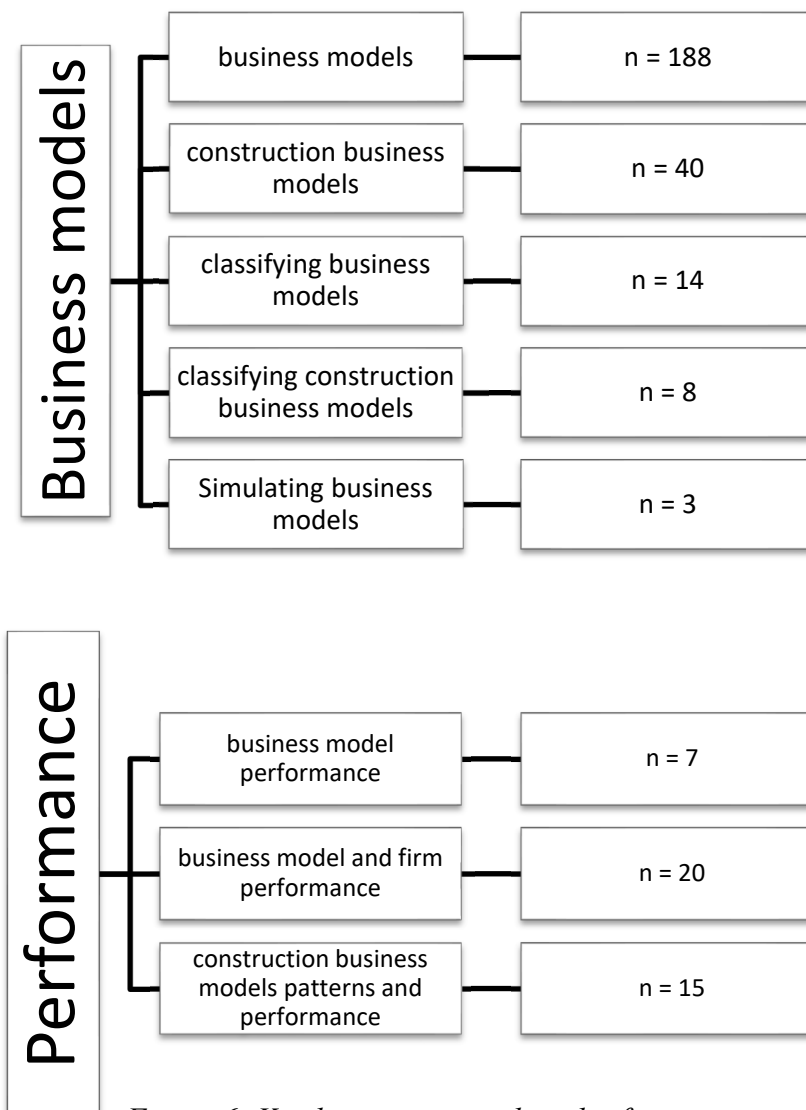


Figure 6: Key literature search and refining terms

2.8 Key value logic within construction organisations

General building and civil engineering are two distinct sectors within the construction industry, each exhibiting distinct characteristics and business disparities. There exist several notable distinctions between these two categories of construction enterprises. The scope of work for general building constructors primarily encompasses smaller-scale projects that are predominantly focused on interior spaces, including renovations, additions, and remodels for residential and commercial purposes. In contrast, civil engineering constructors primarily direct their attention towards the implementation of extensive infrastructure undertakings, encompassing areas such as transportation networks, architectural structures, aviation facilities, as well as water and waste management systems. In the field of construction, general building constructors typically possess a wider array of skills, albeit potentially lacking the same degree of specialised expertise found in civil engineers. In contrast, civil engineers possess specialised knowledge and skills in various domains, including geotechnical engineering, materials science, and construction management.

The size and complexity of projects can vary depending on the field of engineering. In general, building projects tend to be smaller and less complex compared to civil engineering projects. Civil engineering projects frequently encompass extensive infrastructure development and necessitate a considerable degree of technical proficiency and adeptness in project management. In the construction industry, it is common for general building contractors to operate under a lump sum agreement, whereby they receive a predetermined fixed payment for a defined scope of work. In the field of civil engineering, constructors frequently engage in projects on a cost-plus basis, wherein they are remunerated for the real expenses incurred, along with an additional percentage fee to cover overhead costs and generate profit. The regulatory environment for civil engineering projects is typically characterised by more stringent regulations compared to those governing general building projects. Civil engineering contractors are required to comply with regulations pertaining to the environmental impact, safety, and sustainability aspects of their projects. In summary, it can be asserted that general building and civil engineering constructors hold significant roles within the construction industry, albeit catering to distinct markets and operating under distinct business models, skill sets, and regulatory frameworks.

The primary resources essential for a construction main contractor encompass Capital: Sufficient financial resources play a crucial role in enabling a construction primary contractor to support operational activities, make strategic investments in equipment and technology, and effectively manage cash flow. The availability of appropriate equipment and technology is crucial for a construction contractor to successfully and proficiently execute projects. Skilled The presence of skilled and experienced workers is imperative for a construction primary contractor to successfully execute projects at a superior level of quality and effectively cater to customer requirements. Suppliers and subcontractors play a crucial role in the construction industry, particularly for main contractors. It is imperative for main contractors to establish a robust network of dependable suppliers and subcontractors to ensure the timely availability of materials and services as required.

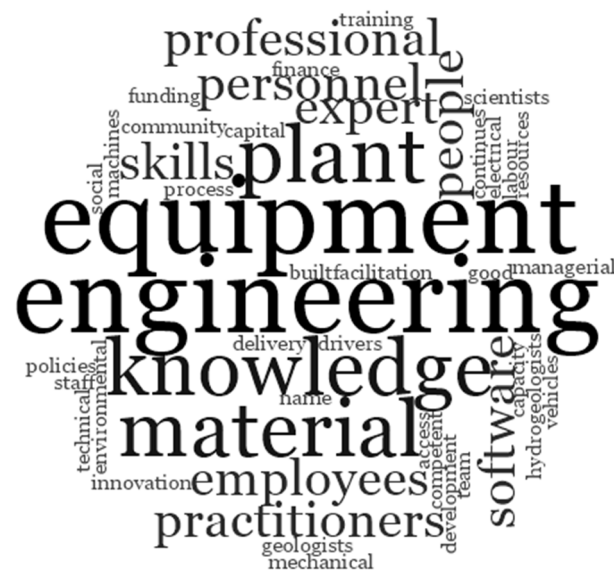


Figure 7: Key resources

Contracts and legal services are essential for a construction main constructor to establish and manage relationships with customers, suppliers, and subcontractors. Project management services are critical for the main constructor to plan, schedule, and manage projects effectively. Marketing and sales resources are important for a construction main constructor to build and maintain a strong customer base and generate new business opportunities. By effectively managing these key resources, a construction main constructor improve its efficiency, quality, and competitiveness, leading to improved performance and success in the construction

industry. The key resources for a general building constructor and a civil engineering constructor vary significantly depending on the size and scope of the business, as well as the specific projects they undertake. However, some common key resources for these two types of construction businesses are performance of business models, and performance measures in construction organisations.

2.9 Performance of business models

In a study conducted by Malone et al. (2006), the focus was on examining the significance of business models and their potential differential performance across various patterns. According to Malone et al. (2006), it has been determined that business models play a significant role in several observations. The second finding derived from the study indicates that certain business models exhibit superior performance compared to others, although it is important to note that no single model demonstrates superiority across all performance indicators (Malone et al., 2006). The reason for the continued dominance of certain business models lies in their intricate interdependencies, which are typically not apparent to rival enterprises and pose challenges for replication (Malone et al., 2006, citing Levinthal, 1997). The study conducted by Lenox et al. (2006) demonstrates that interdependencies play a crucial role in not only elucidating the permanence of industry profitability but also accounting for its volatility. Examining the level of interdependency within each business model serves as an additional avenue for elucidating performance. One additional factor identified by Malone et al. (2006) as a potential determinant of differential success in business models is the level of capital intensity necessary for business operations.

The balanced scorecard is a well-established statistic utilized for evaluating the effectiveness of business models (Stalder, 2018). The balanced scorecard is widely recognized as a comprehensive business model at the firm level. It simplifies the evaluation of a corporation by focusing on four primary dimensions: financial performance, customer satisfaction, internal procedures, and learning and growth. The balanced scorecard is considered as a precursor to contemporary business model frameworks like the Canvas (Osterwalder, 2004). Therefore, the four primary The balanced scorecard framework will be used as one of the primary sources in

this research when measuring performance, along with any other measurement frame deemed necessary (Stalder, 2018)(Osterwalder, 2004).

2.9.1 Financial performance metrics

Financial metrics are commonly used to assess the performance of business models. These metrics include return on investment (ROI), return on assets (ROA), return on equity (ROE), and profit margins. Research by Teece (2010) emphasizes the importance of aligning financial metrics with the specific characteristics of the business model to provide accurate performance insights.

2.9.2 Innovation and adaptation

The ability of a business model to innovate and adapt is crucial for sustained success. Zott and Amit (2010) argue that dynamic capabilities, such as the capacity to explore new opportunities and exploit existing resources, are critical for enhancing business model performance over time.

2.9.3 Customer-centric evaluation

Customer satisfaction and loyalty play a pivotal role in business model success. Studies by Frow et al. (2016) highlight the significance of customer-centric metrics, such as Net Promoter Score (NPS) and customer lifetime value (CLV), in assessing the effectiveness of business models in meeting customer needs and expectations.

2.9.4 Industry and Contextual Influences

The performance of a business model is also contingent upon industry dynamics and external factors. Chesbrough (2006) suggests that open innovation models may perform differently based on the industry context, with technology-intensive industries benefiting more from collaborative business models.

2.9.5 Longevity and Sustainability

Long-term performance is a critical consideration for business models. Osterwalder and Pigneur (2010) propose the concept of a "business model canvas" that visualizes key components of a business model, facilitating strategic planning and adaptation to ensure long-term sustainability.

2.9.6 Digital Transformation and Disruption

The advent of digital technologies has significantly impacted business model performance. Research by Hagi and Altman (2016) explores how digital platforms and ecosystems enhance business model scalability and extend reach, leading to improved overall performance.

2.9.7 Environmental and Social Performance

In recent years, there has been a growing emphasis on environmental and social aspects of business model performance. Hart and Milstein (2003) introduced the concept of the "sustainability business model" that integrates economic, social, and environmental dimensions to drive performance and societal value.

The performance of business models is a multifaceted topic that encompasses financial metrics, innovation capabilities, customer-centricity, contextual influences, sustainability, and the impact of digital transformation. While various studies have shed light on these dimensions, there is still room for further research to develop comprehensive frameworks for evaluating and enhancing business model performance in an ever-evolving business landscape.

2.10 Performance measures in construction organisations

The measurement of performance is of utmost importance in order to ascertain the achievement of company objectives. According to the findings of Lingle and Schiemann (1996), organisations that engage in performance measurement tend to exhibit superior performance compared to those that do not engage in such practices. The evaluation of business models in this thesis will be conducted based on the important success elements specific to construction organisations. The critical success factors in construction organisations have been recognized in the literature as important stakeholders and business partners (Love and Holt, 2000), clients, staff (Love and Holt, 2000), project (key products and services), and business processes (Mbugua et al., 1999; Deng and Smyth, 2013). The contemporary landscape of competition faced by organisations places significant emphasis on the importance of strategic thinking and the careful evaluation of corporate strategy, systems, and business processes. In this context, performance measures should accurately capture the overall and comprehensive perspective of the business, rather than focusing just on narrow and specific metrics.

According to Ashton (1997), as referenced by Mbugua et al. (1999), there exists a favorable association between the intangible components of stakeholder performance and the financial outcomes of a corporation. A firm's Performance Measurement (BPM) system encompasses a comprehensive set of financial and non-financial measures that are purposefully developed to provide management with crucial insights into the current state of the firm and its future prospects (measure.net, 1999). The measuring of business performance is a crucial instrument in strategic management that serves to strengthen the competitiveness of firms.

According to a study conducted by Robinson et al. (2005), there is variation in the measures of performance utilized by construction organisations, as different facets of business success are assessed. Profit and turnover are commonly recognized as the primary financial indicators. Nevertheless, there is a growing significance placed on alternative indicators, namely non-financial ones. The study also demonstrated that the size of organisations plays a determining role in the selection of measures utilized. Compared to their smaller rivals, larger firms favor the use of market-related metrics. Since larger corporations are more likely to be publicly listed than smaller ones, market share is primarily important for larger organisations. The popularity of mergers and joint ventures among large construction businesses is attributed to the utilization of measurement methodologies that are related to market share (Robinson et al., 2005). Finally, the analysis unveiled a prevailing perception of corporate social responsibility. Major corporations have initiated proactive measures and endeavors aimed at environmental conservation and community development.

2.11 Business model frameworks

Research frameworks such as the one shown in Figure 8, assist in structuring the entire research process. The research framework assists in defining, refining, expanding or modifying empirical findings. Frameworks also add value to the scoping, ensure coherence in key variables, and establish a logical flow from research questions to hypotheses and conclusions. Frameworks provide a roadmap for conducting systematic and focused investigations. Researchers like Miles and Huberman (1994) advocate for a flexible approach to framework development that accommodates emergent themes and insights from the data (George and Bock, 2011).

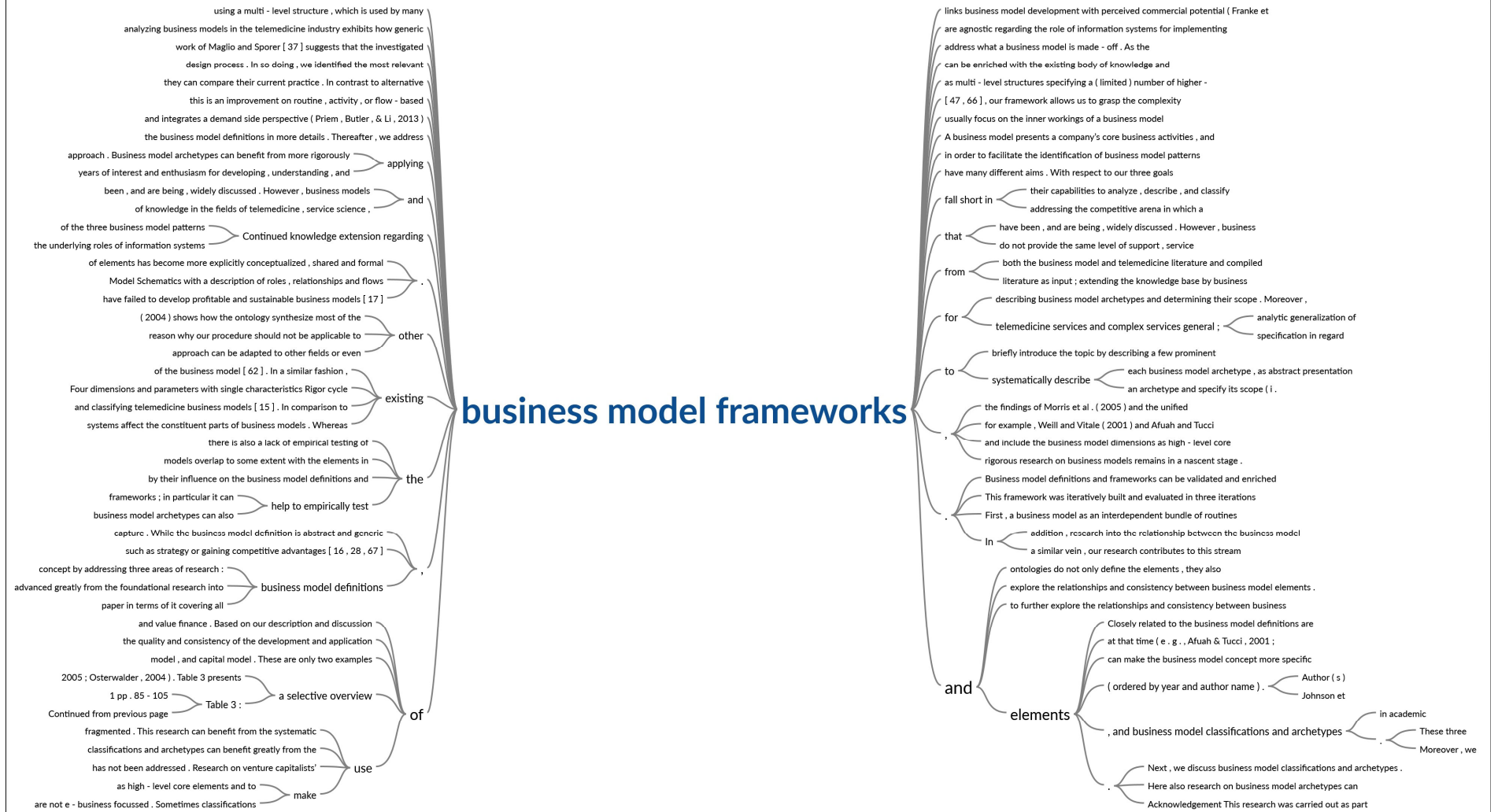


Figure 8: Business model framework - word tree

Companies discover areas where they need to make changes to better match with their aims by analyzing and mapping their present business model. Frameworks promote new thinking by giving people a formal mechanism to question and reevaluate established business concepts. This could result in the creation of fresh, better methods for giving customers value. By looking at a business model through a framework, businesses are able to spot potential risks and weaknesses. This promotes preventative risk management and guarantees that the business is better equipped to adjust to shifting market conditions. Decisions on resource allocation are aided by business model frameworks. By comprehending the core parts of their business strategy, organisations are able to improve their ability to allocate resources more efficiently to the areas that have the most significant impact on their success.

A strong business model can give an organisation a competitive edge. Frameworks give businesses the ability to assess their business model in comparison to rivals, pinpoint distinctive value propositions, and look for ways to stand out. Business model innovation has caused several prosperous startups and established businesses to disrupt their respective industries. Frameworks offer a methodical technique to investigate and test various business model ideas. Having a distinct and well-defined company model helps inspire trust in potential investors and business partners when seeking investment or partnerships. Frameworks assist businesses in making a structured and convincing presentation of their business strategy. Business model frameworks make it simpler for organisations to adjust to changes in the business environment, such as technical improvements, changes in consumer behavior, or regulatory changes. Businesses rapidly determine how changes will affect their current model and make the necessary corrections. Frameworks help businesses find chances to scale their operations, whether through diversification, geographic expansion, or other strategies.

Business model frameworks are crucial as an organised method for comprehending, deciphering, and creating business models. Within an organisation, business model frameworks provide a common language and structure for discussing and conveying business concepts and strategies. This transparency ensures that all parties involved in the firm, such as partners, employees, and investors, have a common grasp of its core concepts. Frameworks aid in the strategic alignment of a company's business operations with its strategic goals.

2.12 Chapter summary

This chapter reviewed literature on business models, construction business management and construction business models. Scoping of relevant and related systematic literature was conducted through a comprehensive search and collection of relevant literature from a variety of sources, including academic journals, conference proceedings, books, and reports. The chapter identified, evaluated and synthesized existing research on construction business models, that provided insights into the current state of knowledge in this area. Furthermore, the literature reviewed includes the research methods used within the field of business models, construction business management and construction business model research, to further frame the following chapters. The theoretical and conceptual framework is discussed in the next chapter.

CHAPTER THREE

3 THEORETICAL AND CONCEPTUAL FRAMEWORK

The theoretical point of departure in this thesis is that of differential performance and related theories, namely, the resource-based view of the firm, the dynamic capability theory and contingency theory. All these theories are here focused in the context of construction business management theory and practice. Business models are the foundation of any organisation and play a critical role in determining its success. Business model research assesses the process of the design, development, and implementation of business models, with the aim of improving their performance. This literature report will provide an overview of the theoretical underpinning of business model research, including the key theories and concepts that form the basis of this field of study. The theoretical underpinning of business model research draws from a range of disciplines, including economics, management, marketing, and strategy. Some of the key theories and concepts that form the basis of this field of study are described below.

3.1 Theoretical perspective on strategic management

Anvur (2008) defines "theory" as a scientific framework utilized to elucidate empirical observations pertaining to the natural environment or a scientific phenomenon, with the aim of enhancing comprehension and forecasting the future behavior of the phenomenon in question. The topic of organisational effectiveness has been a focal point in the field of strategy research for numerous years, with scholars employing various theories and methodologies to explore this subject (Hoskisson, Hitt, Wan & Yiu, 1999; Parnell, 2013). Numerous perspectives presented in the discourse delve into the factors contributing to the diversity observed in organisational performance. These viewpoints, whether explicit or implicit, shed light on the decision-making processes employed by organisations in formulating their strategies. Consequently, they converge on the fundamental inquiry of how an organisation surpasses its counterparts within the industry and attains a durable competitive edge. (Bea and Haas, 2005;

Porter, 1991) have been cited in the text. Hoskisson et al. (1999) observed that the evolution of theoretical frameworks within the realm of strategic management has been remarkable, characterized by a pendulum-like oscillation between the examination of internal strengths and weaknesses of organisations, and the analysis of external opportunities and threats.

3.2 The resource-based view of the firm

According to Grant (1991), resources refer to the inputs utilized in the production process, whereas capabilities pertain to the abilities necessary for a collection of resources to effectively carry out a certain activity or task. Early studies in the field of strategic management, such as Chandler's *Strategy and Structure* (1962) and Ansoff's *Business Strategy* (1965), centered their attention on the strategic congruence between organisational structure and strategy, drawing upon the principles of contingency theory. In recent times, scholars have directed their focus towards the resource-based approach (RBV) as a means of understanding an organisation's performance and capacities. This approach, as proposed by Wernerfelt (1984), Rumelt (1984), and Barney (1986), emphasizes the examination of internal strengths and weaknesses inside the organisation to elucidate the underlying dynamics. During the period spanning the 1980s and 1990s, the resource-based view (RBV) of the company gained significant traction as a prominent theoretical framework for explaining variations in firm performance. The Resource-Based View (RBV) posits that the performance of a firm is primarily influenced by its resources, capabilities, and competences, rather than its size or market position. This perspective places emphasis on the notion that organisations have the potential to attain varying levels of performance by effectively utilizing their distinct resources and skills. The aforementioned perspective was employed within the context of the construction sector, leading researchers to ascertain that the distinctive resources and capabilities possessed by construction enterprises, including their adeptness in project management, their capacity to devise novel solutions, and their access to specialized equipment, have the potential to significantly impact their comparative performance.

The Resource-Based View (RBV) framework provides a comprehensive explanation for the varying performance levels among enterprises operating within the same industry. This idea posits that enterprises within the same industry exhibit varying levels of performance due to inherent differences in the resources they possess, even when operating under equilibrium

conditions. This notion is supported by several scholars, including Amit and Schoemaker (1993), Barney (1986), Dierickx and Cool (1989), Penrose (1959), Peteraf (1993), and Wernerfelt (1984). The Resource-Based View (RBV) framework posits that a firm is characterized by a distinct combination of tangible and intangible resources that hold the qualities of being valuable, rare, inimitable, and not substitutable (VRIN). This unique resource configuration enables the firm to achieve a competitive advantage and superior performance. Therefore, the intangible resources, namely those that possess the VRIN characteristics, enable firms to cultivate unique core capabilities that are difficult to replicate. This distinctiveness empowers firms to outperform competitors through the implementation of novel approaches. According to Chew et al. (2008), organisational resources is categorised into three main types: financial resources, human resources, and physical resources.

In summary, the RBV, Porter's five forces framework, the value proposition, the business model canvas and lean startup (also useful in established organisations) all contribute to a successful business model. Understanding these theories and concepts is critical to the design, development, and implementation of successful business models. The resource-based view of the firm is a theory that argues that the success of a company is determined by its ability to create and exploit valuable resources. In the context of business model research, this theory suggests that the design and development of a business model is focused on the creation and exploitation of valuable resources (Zahara and Bogner, 2000; Miller et al., 2009).

3.3 Dynamic capabilities

According to the academic literature on strategy, the choice and organisation of the firm's operations results in a competitive advantage at the firm level (Porter, 1985, 1996). Furthermore, according to the research of (Casadesus-Masanell and Ricart, 2010), a company's resources (Wernerfelt, 1984; Barney, 1986, 1991; Peteraf, 1993) and expertise (Spender, 1996; Nonaka and Takeuchi, 1998) also be ascribed to its competitive advantage (2010). The ability of an organisation to integrate, build, and reconfigure internal and external capabilities to respond to a quickly changing environment is referred to as dynamic capability (Teece et al., 1997). This idea was used to explain why businesses in the same industry differ from one another. The dynamic capabilities perspective focuses on the difficult-to-replicate capabilities

that enable the organisation to change as it molds and adapts to its environment in an effort to explain the factors that contribute to an organisation's success over time (Teece et al., 1997; Eisenhardt & Martino) (2000). Organisational and managerial processes that support the identification and utilization of commercial, technological, and business opportunities as well as the reorganisation of organisational structures and resources as the organisation expands are the foundational elements of dynamic capabilities. Market trends are shifting (Teece, 2007:1330). Given the evolutionary nature of dynamic opportunities, this perspective is well-suited for analysing the strategic actions required to adapt firm models over time. The term "this" in this context pertains to the adaptable capabilities that enable a company to reconfigure, alter, and enhance its business models with the aim of creating long-term value in a sustainable manner. Teece (2007) posits that crucial skills are influenced by strategic and organisational activities, as shown by the findings of Eisenhardt and Martin (2000).

According to the scholarly literature, the establishment of a competitive advantage at the organisational level is attributed to the careful selection and arrangement of a firm's activities (Porter, 1985, 1996). Additionally, competitive advantage is derived from the firm's resources (Wernerfelt, 1984; Barney, 1986, 1991; Peteraf, 1993) and the knowledge associated with these resources (Spender, 1996; Nonaka & Takeuchi, 1998), as cited in (Casadesus-Masanell & Ricart, 2010).

3.4 Construction management literature

Construction management literature refer to the body of knowledge and principles that guide the planning, coordination, and control of construction businesses and projects (Windapo, 2013). This includes both the technical aspects of construction, such as building design and construction methods, as well as the management aspects, such as project planning, scheduling, cost management, risk management and business management. Construction management plays a critical role in the overall success of a construction project and the business that it supports (Seymour *et al.*, 1997; Radosavljevic and Bennett, 2012; Olanipekun and Bo, 2017). As the central coordinating point for all project-related activities, construction management is responsible for overseeing the planning, design, procurement, and construction phases of a project. This includes managing the project schedule, budget, and quality standards, as well as coordinating the efforts of the project team and stakeholders.

Within the realm of project management, construction management assumes the responsibility of guaranteeing the timely completion, adherence to budgetary constraints, and customer satisfaction of the project. A comprehensive comprehension of the project's scope, objectives, and limits, coupled with the capacity to predict and effectively handle any risks, is vital. The field of construction management is of utmost importance in guaranteeing that the project is carried out in accordance with the most stringent standards of quality and safety. In terms of business management, construction management is responsible for ensuring that the project is executed in a manner that supports the overall goals and objectives of the organisation. This includes managing the project budget and controlling project costs, as well as identifying and managing potential risks that could impact the organisation's bottom line (Seymour *et al.*, 1997; Olanipekun and Bo, 2017). Construction management also plays a key role in ensuring that the project is executed in a manner that supports the organisation's sustainability goals, such as reducing its environmental footprint and promoting social responsibility (Runeson, 1997; Sheng and Sheng, 2018). Overall, construction management is at the centre of both project and business management, playing a critical role in ensuring that the project is completed on time, within budget, and to the satisfaction of all stakeholders, while also supporting the overall goals and objectives of the organisation (Radosavljevic and Bennett, 2012; Windapo, 2013; Sheng and Sheng, 2018).

The literature on strategy presents various theories that complement each other. These theories suggest that competitive advantage at the firm level is attributed to the selection and arrangement of activities (Porter, 1985, 1996), the availability of resources (Wernerfelt, 1984; Barney, 1986, 1991; Peteraf, 1993), and the accumulation of knowledge (Spender, 1996; Nonaka and Takeuchi, 1998) as cited by Asadesus-Masanell and Ricart (2010).

3.5 Theory of differential performance

The theoretical point of departure in this thesis is that of differential performance and related theories, namely, the resource-based view of the firm, the dynamic capability theory and contingency theory under the lens of and into relation to construction business management theories and practices. Differential performance refers to the variation in the level of success

or competitiveness of businesses operating within the same industry (Zott, 2003; Tokarczyk *et al.*, 2007). The theory of differential performance seeks to understand why some businesses outperform others and what factors contribute to this variation in performance. Over the years, the theory of differential performance has evolved and developed, and has become a fundamental aspect of business strategy and management (Heimeriks *et al.*, 2007; Oyewobi, 2014). The application of differential performance theory to the construction industry has a rich history in the literature of construction business management. Early studies focused on the impact of market position, size, and economies of scale, while more recent studies have emphasized the importance of a business's resources, capabilities, dynamic capabilities, and organisational structure in achieving differential performance.

Early theories of differential performance focused on a business's size and market position as the primary drivers of performance. Researchers in the late 18th and early 19th centuries, such as British economist Alfred Marshall (1890), believed that larger businesses were better positioned to achieve economies of scale, which would give them a competitive advantage over smaller businesses (Williams, 1978; De Vroey, 2004). This theory has been applied to the construction industry, and researchers have found that construction businesses that are able to quickly adapt to changes in the market and the regulatory environment are more likely to achieve differential performance.

The external environment in which businesses operate have a significant impact on their performance. For example, changes in the economy, technological advancements, and government regulations create opportunities or challenges for businesses. Businesses that are able to effectively respond to changes in the external environment are more likely to achieve differential performance. Construction businesses that are able to respond effectively to changes in the external environment, such as by adopting new technologies or complying with new regulations, are more likely to achieve differential performance. Internal factors, such as organisational culture, leadership, and strategy, also influence the differential performance of businesses in the same industry. Organisations that have a strong culture of innovation and continuous improvement are often more successful in adapting to changes in the external environment and outperforming their competitors. Effective leadership, clear strategies, and well-structured organisational systems and processes also contribute to differential performance in the construction industry (Oyewobi, 2014).

The structure of the industry in which businesses operate influence differential performance. For example, industries with high levels of competition, high barriers to entry, and strong market leaders are more challenging for businesses seeking to achieve differential performance. On the other hand, industries with low levels of competition, low barriers to entry, and high levels of innovation may provide greater opportunities for businesses to achieve differential performance. The literature on strategy presents various theories that complement each other. These theories suggest that competitive advantage at the firm level is attributed to the selection and arrangement of activities (Porter, 1985, 1996), the availability of resources (Wernerfelt, 1984; Barney, 1986, 1991; Peteraf, 1993), and the accumulation of knowledge (Spender, 1996; Nonaka and Takeuchi, 1998) as cited by Asadesus-Masanell and Ricart (2010).

3.5.1 Contingency theory

Contingency theory is another important aspect of the theory of differential performance, which suggests that the relationship between organisational structure and performance is contingent on the environment in which the organisation operates (Deng and Smyth, 2013; Wadongo and Abdel-Kader, 2014). This theory emphasizes that businesses need to adapt their organisational structure and management practices to the specific environmental conditions they face in order to achieve differential performance. This theory has been applied to the construction industry, and researchers have found that construction businesses that are able to align their organisational structure with the specific environmental conditions they face are more likely to achieve differential performance (Deng and Smyth, 2013). The history of the theory of differential performance highlights the evolution of our understanding of the drivers of business performance. Early theories focused on size and market position, while more recent theories emphasize the importance of a business's resources, capabilities, and dynamic capabilities in achieving differential performance. Today, the theory of differential performance remains an important aspect of business strategy and management and continues to shape our understanding of why some businesses outperform others.

3.5.2 Five Forces framework

Michael Porter's Five Forces framework is a theory that analyses the competitive environment of an industry and the impact of various forces on the performance of companies within that industry. In the context of business model research, this theory is used to analyse the competitive environment of an industry and to design business models that are competitive in that environment (Bruijl, 2018).

The value proposition literature defines the unique value that a company's offers to its customers. In the context of business model research, this concept is critical to the design and development of business models as it defines the value that a company aims to create and deliver to its customers. The business model canvas is a widely utilized instrument employed for the purpose of conceptualizing, designing, and refining business models. The framework presented offers a systematic approach to examining and delineating the fundamental elements of a business model. These elements encompass client segmentation, value proposition, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure (Dälken, 2014). The theory of differential performance suggests that businesses operating within the same industry exhibit varying levels of success and competitiveness based on their ability to effectively respond to changes in the external environment and leverage their internal resources and capabilities. The concept of differential performance highlights the importance of strategic management and the effective utilization of organisational resources for businesses seeking to achieve a competitive advantage and outperform their competitors. The theory of differential performance applied to construction businesses by considering the various factors that contribute to differential performance, construction businesses make informed decisions that support their success and competitiveness in the industry.

3.6 Conceptual framework

The conceptual framework of the thesis is underpinned by the two primary theories, the resource-based view of the firm, and the dynamic capabilities theory. These both arise from the Strategic and Business Management domains. The framework of the thesis is designed following the three key components of business models, namely value creation, value delivery

and value capture. These components are also depicted in line with the strategic, business processes and performance layers of organisations.

At the strategic level, the business models are categorised as per features identified from the participating companies. From these classifications, organisations implementing two or more business models, operating within South Africa and matching the other criteria of the case study, were selected for further study. Within these firms, the identified business models were observed, recaptured, and observed through implementation. The key research factors in this process are the evaluation of the alignment of business models to the organisational strategy, by means of gathering data, and also the evaluation of the alignment of business models and business processes. In the implementation phase, the configuration and reconfiguration of resources (dynamic capabilities) and business model performance were captured. Lastly, the performance of the business models was analysed, assessed and correlations were tested among the identified critical success key factors. This process shows the alignment of the research objectives to the framework of the thesis.

3.6.1 Towards a contribution to business model body of literature

The notion of business models encompasses a collection of theoretical frameworks and concepts that serve to elucidate the manner in which a firm generates, delivers, and acquires value. Business models serve as a conceptual framework that elucidates the operational and value creation mechanisms of a firm, while also delineating the interconnections between the company, its customers, partners, and stakeholders. The theory of business models encompasses various approaches, with the value proposition framework being prominently employed within this domain. The framework in question provides a definition of a business model as the value proposition presented by a corporation to its clients, which subsequently generates revenue streams. The Business Model Canvas, created by Alexander Osterwalder and Yves Pigneur, is a widely recognized framework for comprehending business models. The framework presented above offers a graphical depiction of a business model, elucidating the fundamental elements of the enterprise, including customer groups, value propositions, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure. The theory of business models incorporates other additional concepts,

including value chain analysis, the resource-based view of the organisation, and network effects. These notions contribute to a more holistic comprehension of how an organisation generates and delivers value, and is utilized to create more intricate business models (Hedman and Kalling, 2003; Ritter and Lettl, 2018).

The theory of business models is an important field of study that provides a framework for understanding how companies create, deliver, and capture value (Hedman and Kalling, 2003). By understanding the theory of business models, companies are able to improve their ability to create value and compete effectively in the market. Developing new theories and models is a critical aspect of research. New theories and models help to expand our understanding of a particular phenomenon and provide a framework for analysing and solving complex problems in the field of business management. In this report, we will outline the steps involved in contributing towards the development of new theories on business models. The first critical step in theory development is conducting a thorough literature review of the existing theories and studies in the field of (construction) business models (this study). This aids in the understanding of the current state of knowledge and identify any gaps in the literature that are addressed by this research. Data collected is analysed and used to test the proposed hypothesis, using appropriate data analysis tools and techniques. The findings are discussed, and the contribution of this research is presented, with the supporting tests conducted and validation techniques employed.

3.6.1.1 Value chain analysis

The utilization of value chain analysis serves as a methodological tool employed to comprehend the fundamental operations undertaken by an organisation in order to generate and provide value to its clientele. Value chain analysis is a valuable tool in the construction industry for identifying the essential activities that contribute to value creation in the building process and for enhancing the efficiency of construction project delivery. This literature review presents a comprehensive examination of the utilization of value chain analysis within the construction sector and its influence on the efficacy of construction business models. The application of value chain analysis enables the identification of the essential activities encompassed in the construction process, encompassing design, procurement, construction, and maintenance. The aforementioned activities is further dissected into sub-activities, namely

design development, material procurement, and site management, in order to gain a more comprehensive comprehension of the origins of value within the construction process.

By identifying the key activities involved in the construction process, construction companies use value chain analysis to optimize their operations and improve their competitiveness. For example, companies use value chain analysis to identify areas for cost reduction, improve the efficiency of their operations, and enhance the quality of their work. Value chain analysis have a significant impact on the performance of construction business models. By improving the efficiency of their operations, construction companies are able to reduce their costs and increase their profitability. Furthermore, by enhancing the quality of their work, construction companies are able to improve their reputation and attract more business.

3.6.1.2 Value network analysis

Value network analysis is a methodology employed to comprehend the intricate relationships between an organisation and its stakeholders within the context of generating value. Value network analysis is a valuable tool within the construction industry for the identification of crucial partners and stakeholders engaged in the building process, as well as for the enhancement of construction project delivery.

This literature review aims to present a comprehensive examination of the utilization of value network analysis within the construction sector, and its influence on the efficacy of construction business models. Value network analysis is a useful tool in the construction business for identifying the primary partners and stakeholders engaged in the building process. These include architects, engineers, constructors, suppliers, and customers. The examination of these stakeholders is conducted in order to gain a deeper understanding of their involvement in the process of value creation and their influence on the overall performance of the building project. Construction organisations are able enhance their operational efficiency and competitive advantage by employing value network analysis, which involves the identification of crucial partners and stakeholders engaged in the construction process. For instance, organisations have the capacity to utilize it as a means of identifying potential opportunities for collaboration, optimizing operational efficiency, and augmenting the overall quality of their work.

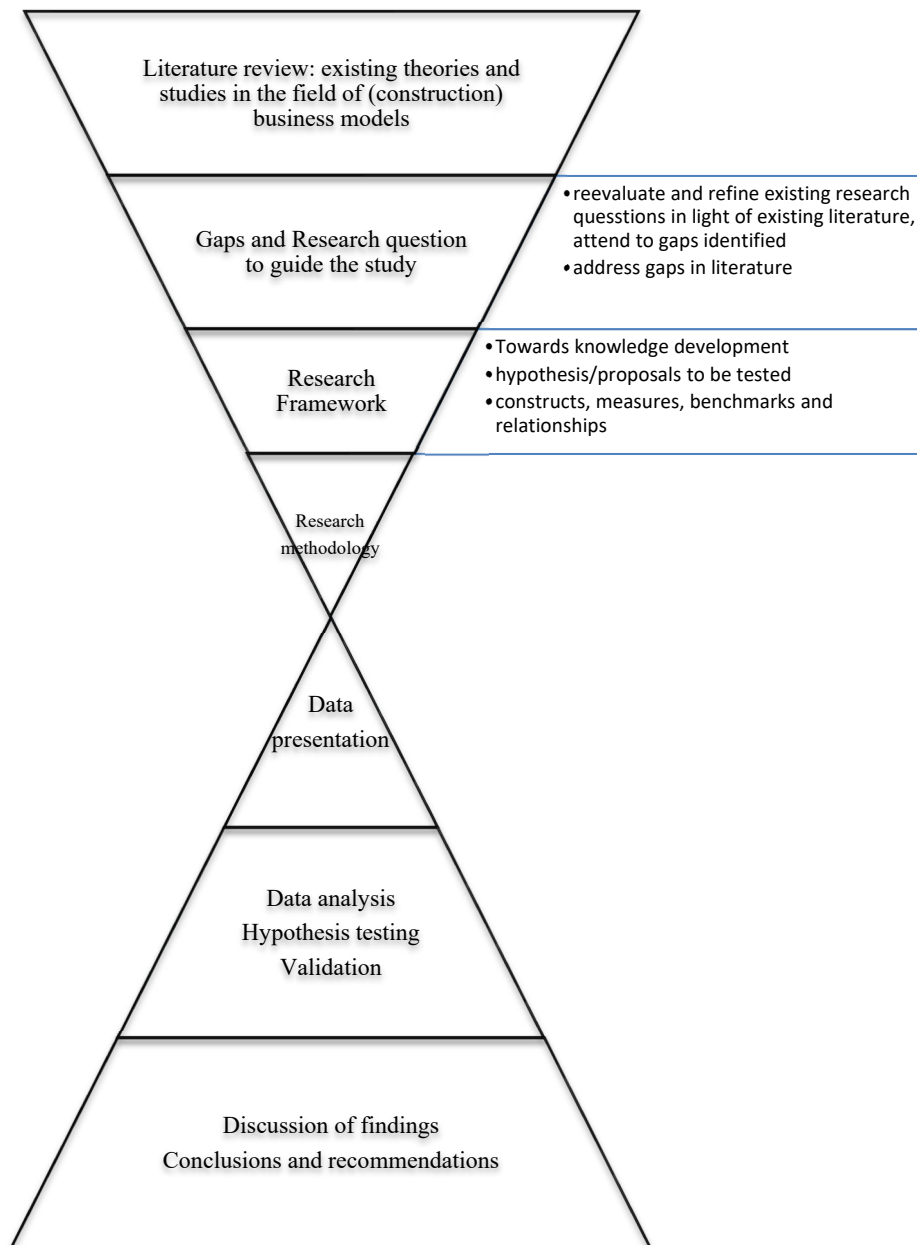


Figure 9: Knowledge creation and contribution process

Value network analysis have a significant impact on the performance of construction business models. By improving the efficiency of their operations through collaboration with key partners and stakeholders, construction companies reduce their costs and increase their profitability. Furthermore, by enhancing the quality of their work, construction companies are able to improve their reputation and attract more business. Additionally, value network analysis help construction companies to differentiate themselves from their competitors. By identifying areas

for collaboration with key partners and stakeholders, companies create unique value propositions that set them apart from their competitors.

3.6.1.3 Value integration

Integration is a strategy that companies use to expand their operations and increase their competitiveness. In the construction industry, integration is achieved through both vertical and horizontal integration. This literature review provides an overview of the application of vertical and horizontal integration in construction business models, and its impact on the performance of these models.

Vertical integration in construction business models refers to the integration of operations that are involved in different stages of the value chain. For example, a construction company may integrate its design, procurement, and construction activities to improve the efficiency of its operations and reduce its costs. Horizontal integration in construction business models refers to the integration of operations that are involved in the same stage of the value chain. For example, a construction company may integrate its construction activities with those of other construction companies to improve the efficiency of its operations and reduce its costs.

The performance of construction business models is significantly influenced by both vertical and horizontal integration. The integration of activities inside construction organisations has the potential to yield several benefits, including cost reduction, operational efficiency improvement, and enhancement of work quality. Moreover, the implementation of integration strategies serve as a means for construction enterprises to establish a unique market position and enhance their competitive advantage vis-à-vis rival firms. The implementation of integration serves as a crucial approach for the expansion of construction businesses' operations and the enhancement of their competitive advantage. The implementation of both vertical and horizontal integration within construction business models yield substantial effects on performance, including cost reduction, efficiency improvement, quality enhancement, and differentiation from competitors. Therefore, the integration of various components should be thoroughly evaluated as a strategic approach to enhance the efficiency and effectiveness of construction business models.

3.6.2 Conceptual model

The conceptual framework of the thesis is underpinned by the primary theories, the resource-based view of the firm, the dynamic capabilities theory and the theory of differential performance. These both arise from the Strategic and Business Management domains. Figure 10 illustrates the conceptual framework of the thesis using the three key components of business models, namely value creation, value delivery and value capture. These components are also depicted in line with the strategic, business processes and performance layers of organisations.

At the strategic level, the business models are categorised as per features identified from the participating companies. From these classifications, organisations implementing two or more business models, operating within South Africa and matching the other criteria of the case study, were selected for further study. Within these firms, the identified business models were observed, recaptured, and observed through implementation. The key research factors in this process were the evaluation of the alignment of business models to the organisational strategy, by means of gathering data, and also the evaluation of the alignment of business models and business processes. In the implementation phase, the configuration and reconfiguration of resources (dynamic capabilities) and business model performance were captured. Lastly, the performance of the business models is analysed, assessed and correlations are tested among the identified critical success key factors.

The South African construction market is a complex and dynamic one that has been impacted by various economic, political, and regulatory factors. Some of the key trends and insights in the South African construction market include slow growth in recent years due to a challenging economic environment, political uncertainty, and high levels of debt. There is a growing focus on infrastructural development in South Africa, including investments in transportation, energy, and water infrastructure, which provides opportunities for construction companies.

The South African construction industry is subject to increased regulation, including safety regulations and environmental regulations, which impact the cost and feasibility of construction projects.

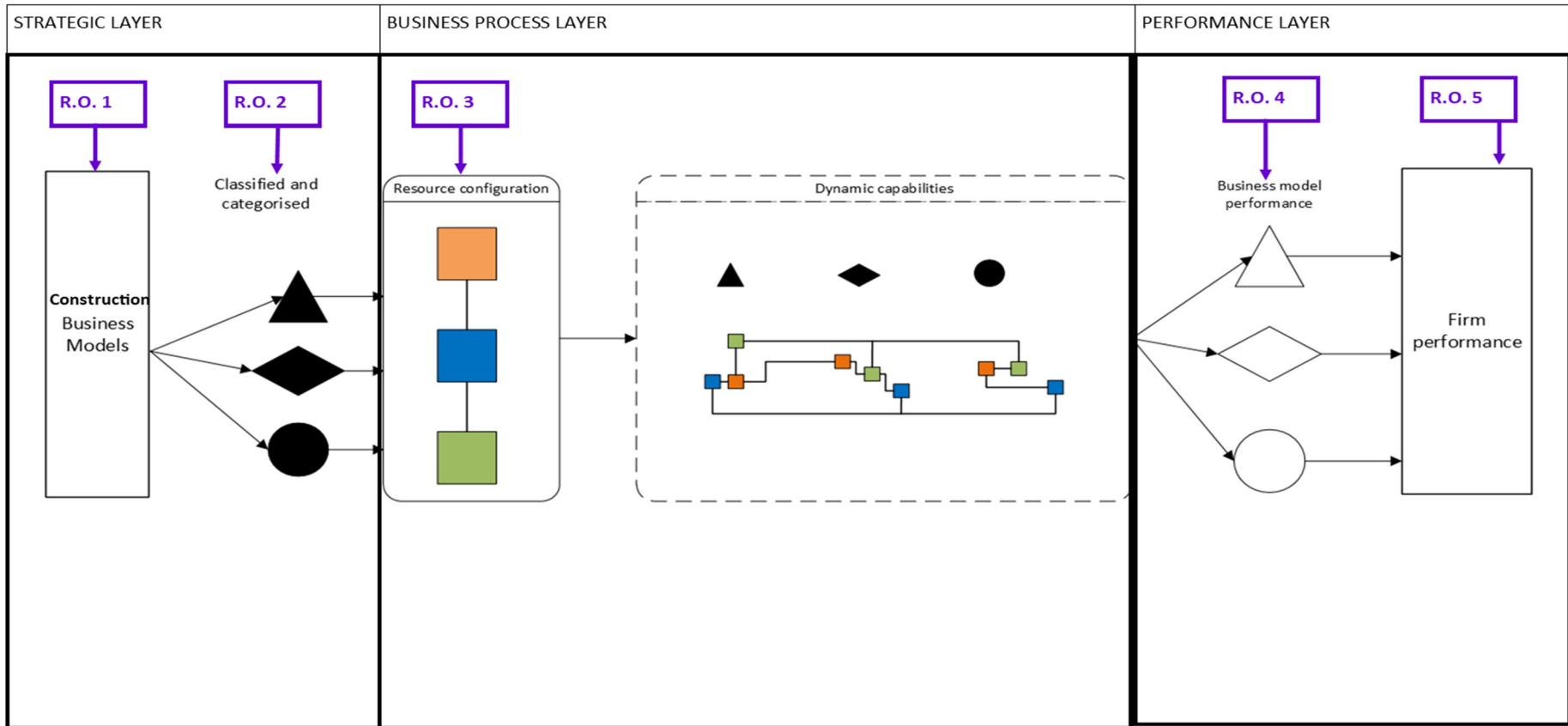
Other factors which affect productivity are competition, because the South African construction market is highly competitive, with a large number of local and international companies vying for market share; and the skills shortage of skilled labour in the South African construction industry, which impact the availability and cost of labour, as well as the quality of workmanship. A third factor is technological advancement, because the construction industry in South Africa is beginning to adopt new technologies, such as building information modelling (BIM) and construction robotics, to improve efficiency and quality, though this is still at a low level of adoption.

To deal with these factors, companies which are developing business model configurations for optimal business performance in the construction industry, have taken the following step; first, construction market analysis. Third, this research considers the determination of key resources that construction business need to deliver projects, such as capital, equipment, and labour, and develop a strategy for allocating these resources efficiently and effectively. Finally, this study considers the implementation of effective business processes. In order for businesses to develop and implement effective business processes to manage projects, such as project planning, scheduling, budgeting, and risk management, these processes must be standardized and automated where possible, to improve efficiency and effectiveness.

Establishment of a management structure is essential to provide adequate control and oversight over the business, while also allowing for flexibility and agility in response to changing market conditions. Businesses should continuously monitor and improve, by regularly monitoring the performance of their business model and making changes as needed, to optimize performance and respond to changing market conditions.

3.6.3 Business model, resources and performance

The resources and capabilities that an organisation has amassed and the efficiency with which these special resources and capabilities are used, determine its capacity to operate better over time (Phua, 2006). The effort to achieve a competitive advantage and continual development in organisational performance is said to depend upon the organisational structure and strategy (Pertusa-Ortega et al., 2010). According to (Menor et al., 2007), an organisation cannot follow a predetermined plan to achieve high performance, and organisational performance is mostly a matter of comparison. The trinity of strategy, organisational structure, and performance has been investigated in previous management and organisational analysis research.



LEGEND:

R.O.	Research Objective
▲ ◆ ●	Business models within firms
■ ■ ■	Resources

R.O. 6

PhD candidate: FLTAMA002

Figure 10: Research conceptual framework and alignment to objectives

The user's text is too short to be rewritten in an academic manner. According to Chandler (1962) and Rumelt (2003), there is a suggestion that the performance of an organisation is contingent upon its corporate strategies and structure. The examination of the essential connection between strategy, structure, and performance has been investigated by Porter (1980) and Parnell (2013) in order to get a deeper comprehension of the contingency approach and the decision-making process involved in the allocation and control of resources when configuring strategy and structure. Nevertheless, Chandler (1962) and Rumelt (1974) claimed that a limited analysis of the stochastic elements pertaining to strategy, structure, and outcome would merely unveil a fraction of the fundamental overarching correlation. Numerous researchers, including Pitts (1980) and Hammond (1990), have posited that the organisational structure plays a pivotal role in shaping strategic decision-making by management.

Consequently, they have underscored the notion that structure delineates strategy, serving as the fundamental underpinning for strategic decision-making. In their seminal work, Hill et al. (1992) provided a comprehensive analysis of the significance of these interactions within the context of a development strategy. The authors highlighted a notable gap in existing literature on diversification, wherein the crucial aspect of incorporating the interplay between strategy and performance has been largely disregarded in research endeavors. The researchers reached the determination that the findings of these investigations are deemed inadequate or unreliable in the absence of accounting for the impact of organisational features in the realm of strategic studies.

The correlation between organisational strategy, characteristics, and performance is a well-established topic in the field of strategic management. Additionally, the interplay between structure and strategy and its influence on organisational performance has been extensively explored in the seminal work of Chandler (1962). The veracity of this categorisation has been substantiated by other scholars, including Hamilton and Shergill (1992), Suzuki (1980), and Rumelt (1974), who posited that alterations in organisational strategy would result in idiosyncrasies in the organisational structure, thereby enabling the formulation of strategy in a suitable manner and facilitating the attainment of superior outcomes.

Critics have raised concerns regarding the assertion that the influence of strategy on outcomes is contingent upon organisational features. The available literature demonstrates that the

organisational structure of a company has a significant influence on its strategic decisions, which subsequently affects its overall performance. This is because the chosen strategy directly impacts the costs and revenues of the organisation. Several studies have supported this notion, including those by Ebben and Johnson (2005), Edelman et al. (2005), Ericson (2006), Pertusa-Ortega et al. (2010), and Spanos and Lyukas (2001). Furthermore, previous research has demonstrated a significant association between leadership style and decision-making style with organisational performance (Albaum et al., 1996; Russ et al., 1995). In the realm of construction research, it has been observed that the performance of a project or project organisation is influenced by various management or leadership styles (Giritli & Oraz, 2004; Lansley, 1994; Limsila & Ogunlana, 2008; Naum, 2001; Nicholas 1990). The approach proposed by Pertusa-Ortega et al. (2010), known as the structure-strategy-performance-fallback approach, is well-suited for the analysis of corporate strategy. According to Pertusa-Ortega et al. (2010), firms engaged in the development of a business strategy do not necessarily have to alter their structure. Instead, they leverage internal coordinating mechanisms as a valuable resource in order to attain a competitive advantage.

Lansley (1987) proposed a framework within the construction industry that aligns with the contingent approach to organisational performance. The author's findings suggest that a crucial aspect of this approach is the organisation's capacity to assess its structure and adapt to its changing environment. Failure to do so potentially diminishes the competitiveness of the business brand. The speaker underscored that the contingent approach does not posit the environment as a sole predictor of structure, but rather acknowledges the relevance of some environmental components. Shirazzi et al. (1996) conducted a study on organisational structures within the construction industry, with a specific emphasis on the impact of environmental variables on the structural composition of design organisations.

These investigations have provided confirmation that specific organisational traits are more appropriate for particular environmental conditions (e.g., 1996). Previous studies conducted by Chew et al. (2008) and Phua (2006) in the domain of dynamic resource and capacity building have revealed a significant correlation between organisational resources and capacity, and their impact on performance outcomes. According to Phua (2006), the attainment of greatness by an organisation is contingent upon its capacity to effectively leverage its distinct and valuable resources and competencies. Competitive strategies facilitate the optimum utilization of an

organisation's resources and the attainment of optimal performance in the long run (Barney, 2011; Junonnen, 1998). Nevertheless, it has been discovered by scholars that varying environmental conditions necessitate the implementation of diverse strategies.

Consequently, if an organisation lacks the necessary resources and capabilities to function, it will refrain from employing unsuitable tactics (Cadle et al., 2010; Kabadayi et al., 2007; Prescott, 1986). Chapter Four examines the correlation between these constructs and performance.

3.7 Chapter summary

In this chapter, the theoretical perspective is presented and discussed, where a theory is described as the scientific way of explaining empirical observations about the natural environment or a scientific phenomenon in order to better understand it and predict the future behavior of the phenomenon under consideration. Business model research is the outcome of the design, development, and implementation of business models with the aim of improving their performance. This chapter presented an overview of the theoretical underpinning of business model research, including the key theories and concepts that form the basis of this field of study. The theoretical underpinning of business model research draws from a range of disciplines, including economics, management, marketing, and strategy. Some of the key theories and concepts that form the basis of this field of study include differential performance and related theories, namely, the resource-based view of the firm, the dynamic capability theory and contingency theory under the lens of, and in relation to construction business management theories and practices. The conceptual framework, underpinned by the study aim and objectives, and designed to aid in answering the research questions, is also presented and discussed. In accordance with the three essential elements of business models—value creation, value delivery, and value capture—the framework of the thesis is constructed. Organizational performance, business processes, and strategic levels are also reflected in the representation of these elements.

CHAPTER FOUR

4 RESEARCH METHODOLOGY

Research methods within the construction management discipline have been contested by a number of scholars due to the interdisciplinary nature of the field, leading to debates about choice of research method (Runeson, 1997; Seymour et al., 1997; Wing et al., 1998; Rooke and Kagioglou, 2007). This chapter details the research methodology employed in this research, with justifications and support from relevant, related literature in the field of both construction management and business models studies.

4.1 Research philosophy and paradigm

The research is based on pragmatism which combines positivist and interpretivist views.. It uses both inductive and deductive reasoning in producing knowledge. Therefore, a mixed method research approach was adopted, using both quantitative and qualitative means in data collection and analysis (Ahuja, Yang and Shankar, 2010). The pragmatic methodology combines positivist and interpretivist viewpoints. While recognising the significance of subjective comprehension and interpretation, this philosophical position values objective, quantifiable data (positivism) (interpretivism). By considering and incorporating both perspectives, the study strives to provide a thorough comprehension of the construction business models being researched. This research adheres to a pragmatic standpoint by utilising a combination of inductive and deductive reasoning. By means of inductive reasoning, generalisations are deduced from particular observations, enabling the investigation of recurring patterns and themes in qualitative data obtained from comprehensive case studies. Deductive reasoning, conversely, operates by applying general principles or theories to particular instances or situations; this is relevant when conducting quantitative analysis using the pre-existing construction database.

A mixed-method research approach was considered the most suitable due to the complex and multifaceted nature of the research problem. This strategy collects and analyses data utilising both quantitative and qualitative techniques. Quantitative techniques are employed to measure and examine empirical data extracted from the pre-existing construction database. This process yields statistically significant findings regarding patterns, associations, and connections between variables. On the other hand, qualitative research approaches, including comprehensive case studies, provide a more profound comprehension of the contextual subtleties, subjective viewpoints, and inherent complexities of construction business models. The utilisation of a mixed-methods approach in this research aims to triangulate findings, thereby augmenting the validity and resilience of the results. By employing an integrative approach, the research problem can be examined in a more comprehensive manner, encompassing the entire scope and complexity of the phenomenon being investigated. The research endeavours to produce nuanced insights and make a scholarly contribution to the field of construction business models by integrating positivist and interpretivist perspectives, as well as utilising inductive and deductive reasoning.

4.2 Research approach

The thesis may encounter limitations or personal biases when only one methodological methodology is used, but when quantitative and qualitative paradigms are combined, more data is collected in a single study, reducing these issues (Wu, 2009). The research approach entails the plan the researcher maps out to undertake the study. Known research strategies include the experiment; the survey; the case study; ethnography; grounded theory; action research and archival research (Saunders et al. 2009). This thesis adopts a sequential mixed method where the survey strategy is adopted for the initial part of the research and case studies are then identified and selected from the collected responses and a detailed study of the cases is conducted to achieve the thesis objectives. Sequential mixed methods research is a research design that combines both quantitative and qualitative methods in a specific order. In a sequential mixed methods study where the survey is followed by a case study, researchers first collect quantitative data through a survey, which provides a broad overview of the thesis population and generates initial findings. This data is then used to inform a more in-depth qualitative study, such as case studies, which allows for a deeper understanding of the specific

experiences and perspectives of individual participants. Using a survey in the first phase of the thesis allows researchers to gather large amounts of data from a representative sample of the population. This data is used to identify patterns, trends, and relationships, and to generate initial hypotheses about the thesis population. In the second phase, the case study method is used to gather rich, in-depth data from a smaller number of participants. This allows researchers to examine the phenomenon of interest in its natural context, and to explore the experiences and perspectives of individual participants in more detail (Malhotra, 2017)..

4.3 Research design

In business model research, a sequential mixed methods design is useful for gaining a comprehensive understanding of the topic. Here are some examples of how a sequential mixed methods approach could be applied to business model research:

1. Survey phase: Researchers conduct a survey to gather quantitative data on business model characteristics, such as revenue streams, key partners, and value proposition, from a large and representative sample of companies in the industry. This data allows researchers to identify patterns and trends in business model design and performance across the industry.
2. Case study phase: Researchers conduct in-depth case studies of a smaller number of companies to gather qualitative data on the specific experiences, challenges, and strategies associated with business model innovation and implementation. The case studies provide a more detailed understanding of the factors that influence business model design and performance, and how these factors vary across different companies and industries.
3. Combination phase: Researchers integrate the findings from the survey and case study phases, using the quantitative data to provide a broad overview of the industry, and the qualitative data to provide a more detailed understanding of the specific experiences and strategies of individual companies.

This type of sequential mixed method design allows researchers to gain a comprehensive understanding of business model design and performance in a specific industry, by providing a broad overview of the industry through quantitative data and a more in-depth understanding of specific companies through qualitative data. This provide a deeper understanding of the

factors that influence business model design and performance, and how these factors vary across different companies and industries.

In research on construction business models, a sequential mixed methods design is useful for gaining a comprehensive understanding of the topic. Here are some examples of how a sequential mixed methods approach could be applied to construction business model research:

In the survey phase: Researchers conduct a survey to gather quantitative data on construction business model characteristics, such as project delivery methods, risk management strategies, and innovation practices, from a large and representative sample of construction companies. This data allows researchers to identify patterns and trends in construction business model design and performance across the industry.

In the case study phase: Researchers conduct in-depth case studies of a smaller number of construction companies to gather qualitative data on the specific experiences, challenges, and strategies associated with business model innovation and implementation. The case studies provide a more detailed understanding of the factors that influence business model design and performance, and how these factors vary across different companies and industries.

In the combination phase: Researchers integrate the findings from the survey and case study phases, using the quantitative data to provide a broad overview of the industry, and the qualitative data to provide a more detailed understanding of the specific experiences and strategies of individual companies. This type of sequential mixed method design allows researchers to gain a comprehensive understanding of construction business model design and performance in a specific industry, by providing a broad overview of the industry through quantitative data and a more in-depth understanding of specific companies through qualitative data. This provides a deeper understanding of the factors that influence construction business model design and performance, and how these factors vary across different companies and industries.

It is important to note that the construction business is a complex and dynamic field with many different variables that affect business models. Therefore, the sequential mixed methods research design is particularly useful for studying construction business models, as it allows researchers to gather both quantitative and qualitative data to provide a comprehensive

understanding of the topic. Survey data is analysed, and case studies selected as per designed criteria. The preliminary primary case study selection criteria involve the selection of established constructors who employ a minimum of two business models within their organisations, operating within South Africa.

4.3.1 Research constructs

Constructs refer to the key concepts or variables that are being studied. These constructs vary depending on the specific research question and focus. This thesis identifies the research constructs using the research framework illustrated in Figure 11 where the identified research constructs include Business Model layer data. This data allows the reviewer to review how diverse the construction services of contractor organisations are, by the classes of work that they offer and are registered for. On the case study richer data, the diversification of business models also includes factors such as geographical base and clients, with an international diversification matrix applied, as well as industry diversification. Figure 12 details the research constructs in relation to the conceptual model of this study. The conceptual framework of the thesis is underpinned by the primary theories, namely the resource-based view of the firm, the dynamic capabilities theory and the theory of differential performance. The latter theories both arise from the Strategic and Business Management domains.

Figure 13 illustrates the methodology of the research process. The methodology of the research process is the backbone of any research endeavour. It provides the structure and guidelines necessary for conducting systematic inquiries, collecting valid data, and drawing meaningful conclusions. A well-defined research methodology ensures that the research is rigorous, ethical, and contributes to the body of knowledge in the chosen field of study. Careful consideration and application of the components is crucial to ensure that the research is credible, valuable, and reliable.

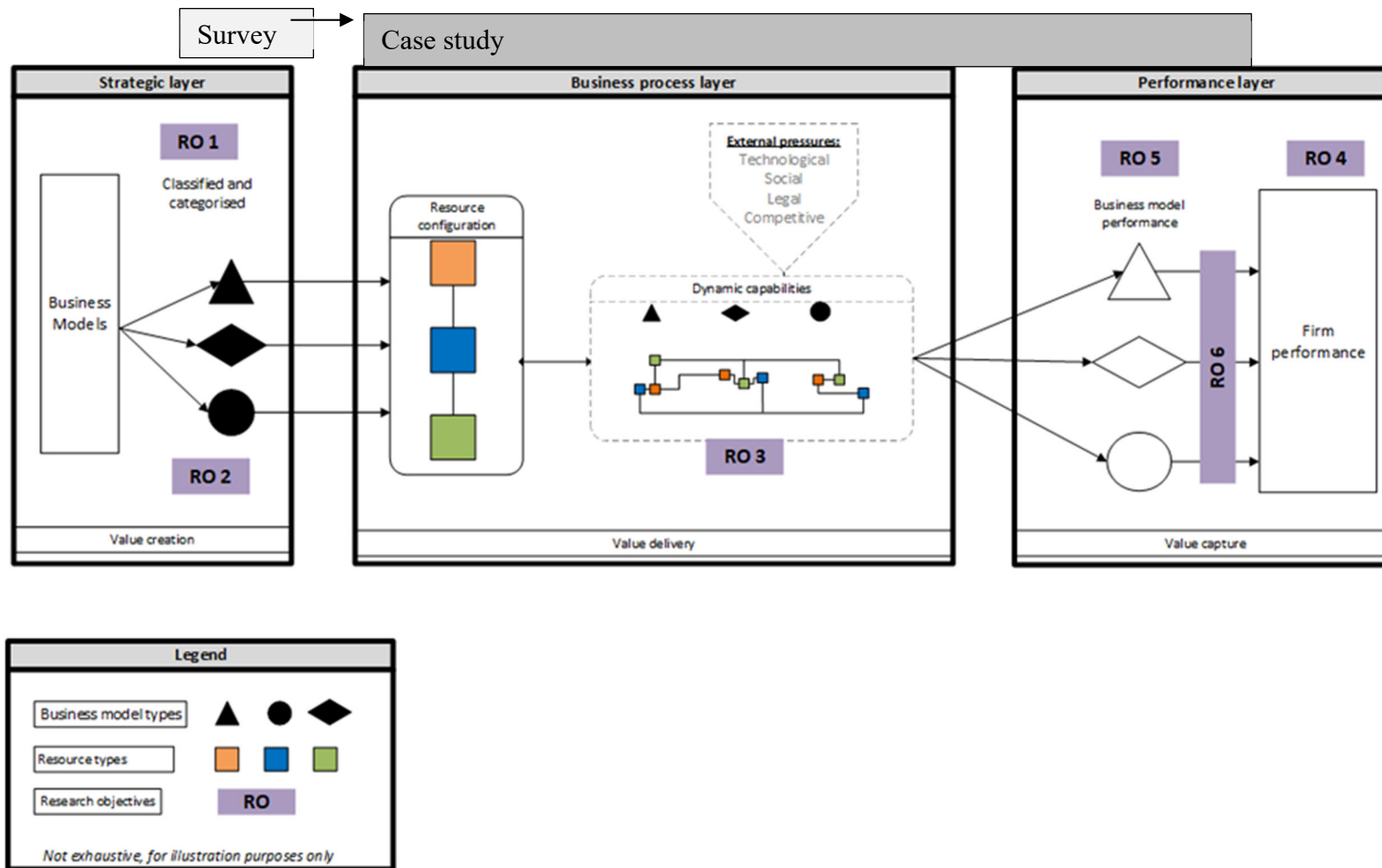


Figure 11: Research design, objectives and constructs

Table 4: Research variables

Business model dimensions	Business layers	Constructs	Code	Variables
Value creation	STRATEGIC LAYER	Business model diversification	DIV1_ID	Industry Diversfication
			DIV2_CW	Class of work diversification
			DIV3_ITD	International diversification
Value delivery	OPERATIONS LAYER	Dynamic capabilities (configuration of resources, competencies and capabilities)	RES1_PHYS	Resources_Physical_value
			RES2_HUM	Resources_Human_value
			RES3_FIN	Resources_Financial_value
			RES_Employees	Resources_no_employees
			RES_ASSETS	Resources_assets_value
			RES_LIABILITIES	Resources_liabilities
			RES4_CAPEX	Resources_capex
Value capture	PERFORMANCE LAYER	Business performance	PERF1_REV	Performance_revenue
			PERF1_OPM	Performance_operating profit margin
			PERF3_REVgrowth	Performance_revenue growth
			PERF_MARKET_cap	Performance_market capitalisation
			PERF_DEratio	Performance_debt equity ratio
			PERF2_NAV	Performance_net asset value
			PERF_REVrank	Performance_revenue rank
			EQUITY	Performance_equity
			ROA	Performance_return on assets
			ROE	Performance_return in equity
ROCE	Performance_return on capital employed			

Figure 11 illustrates the conceptual framework of the thesis using the three key components of business models, namely value creation, value delivery and value capture. These components are also depicted in line with the strategic, business processes and performance layers of organisations. Within the studied firms, the identified business models were observed, captured, and observed through implementation. The key research factors in this process are the evaluation of the alignment of business models to the organisational strategy, by means of gathering data, and also the evaluation of the alignment of business models and business processes. Figure 12 and Table 4 further provides a visual presentation of the research variables. These variables provide measurable indicators across the research constructs. The business model dimensions from literature and business layers from business operations are broken into the research constructs, coded and variables named, as illustrated in .

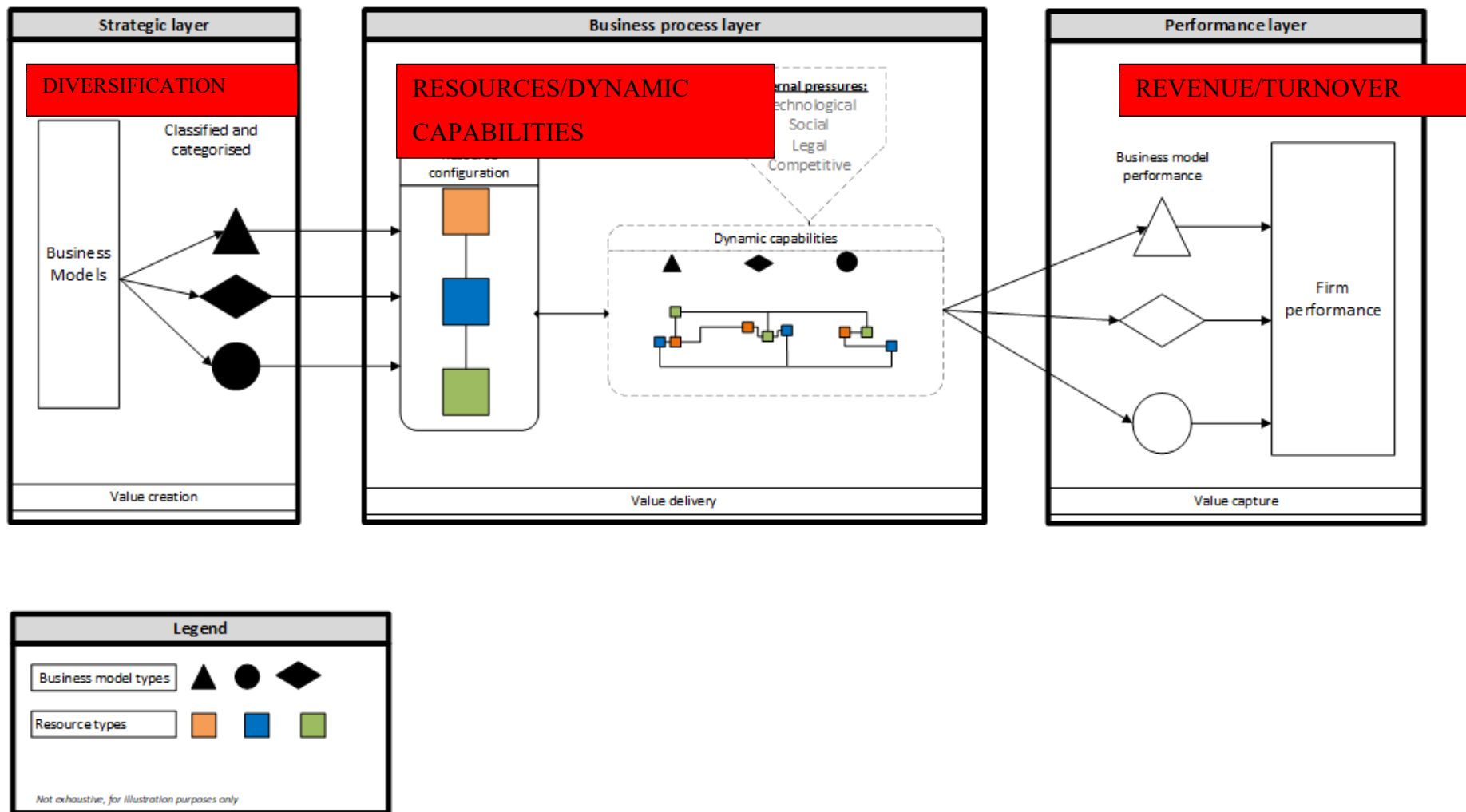


Figure 12: Alignment of Research constructs to conceptual framework

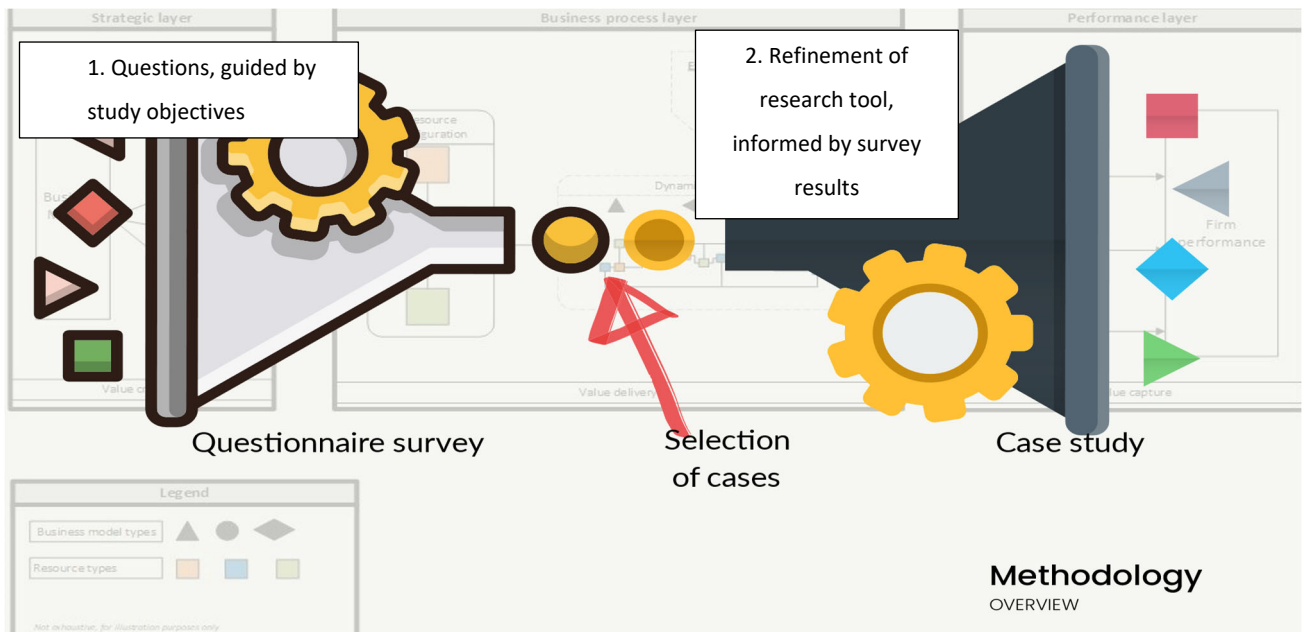


Figure 13: Research approach

In the implementation phase, the configuration and reconfiguration of resources (dynamic capabilities) and business model performance were captured. Lastly, the performance of the business models is analysed, assessed and correlations are tested among the identified critical success key factors. The operating profit margin of the three construction businesses, calculated by proportioning the profit as a percentage of the total revenue, shows the differences in outcome, depending on the business model which was applied.

4.3.2 Research unit of analysis

In this mixed methods research, construction businesses are used as the unit of analysis. Data is collected and analysed at the level of the organisation. This includes financial performance data, employee data, customer or client's data, and other metrics that provide insights into the company's operations, strategies, and outcomes. Data was collected from a variety of sources such as financial reports, surveys, interviews, and observational studies. The data was then analysed to identify patterns, trends, and relationships that provided insights about the research question and study objectives.

4.3.3 Construction business models: key components

The key components of the business models, are:

4.3.3.1 Revenue streams

These are the sources of income for the construction business, such as contracts for new construction projects, recurring revenue from maintenance or repair services, or revenue from the sale of products or materials.

4.3.3.2 Value proposition

This is made up of the unique benefits that the construction business offers to customers, such as high-quality workmanship, competitive pricing, or specialized expertise.

4.3.3.3 Customer segments

These are the specific groups of customers that the construction business targets, such as residential builders, commercial developers, or government agencies.

4.3.3.4 Key resources

These are the resources that the construction business needs to operate, such as equipment, skilled labour, or materials.

4.3.3.5 Key activities

These are the core activities that the construction business performs, such as project planning and design, site preparation, and construction.

Figure 14 below, shows how different business models and resources combine to provide revenue as a successful outcome.

4.3.3.6 Key partners

Key partners are the external organisations or individuals with whom the construction business works, such as suppliers, sub-constructors, or financial partners. Cost structure refers to the costs associated with operating the construction business, such as labour costs, materials costs, and equipment costs. The survey and case study will extract these components.

4.3.4 Registered construction businesses in South Africa

The Construction Industry Development Board (cidb) of South Africa is a regulatory body established by the government to oversee and regulate the construction industry in the country. Its primary objective is to promote sustainable growth, transformation, and competitiveness within the construction sector. The cidb's database is used to extract registered construction businesses in South Africa. The cidb uses contractor gradings to categorise the capacity and or

competency of construction businesses, within a contractor-specialisation category, as illustrated in Table 5.

Table 5: cidb Contractor grading - SA

Designation (Grade)	Maximum value of contract that a contractor is considered capable of performing
1	
2	R 1 000 000,00
3	R 3 000 000,00
4	R 6 000 000,00
5	R 10 000 000,00
6	R 20 000 000,00
7	R 60 000 000,00
8	R 200 000 000,00
9	No limit

In addition to the works capability, the cidb has specialist contractor categories, as illustrated in Table 6. Construction businesses can register for as many categories as they can prove competency and capability.

Table 6: cidb Classes of contractor specialisation

Class	Main contractor categories
CE	Civil Engineering
EB	Electrical engineering - Building
EP	Electrical engineering - Civil
GB	General Building
ME	Mechanical Engineering
	Specialist classes of works
SB	Asphalt works (supply and lay)
SC	Building excavations, shaft sinking, lateral earth support
SD	Corrosion protection (cathodic, anodic, and electrolytic)
SE	Demolition and blasting
SF	Fire prevention and protection systems
SG	Glazing, curtain walls and shop fronts
SH	Landscaping, irrigation and horticulture works
SI	Lifts, escalators and travellers (installation, commissioning and maintenance)
SJ	Piling and specialised foundations for buildings and structures
SK	Road markings and signage
SL	Structural steelwork fabrication and erection
SM	Timber buildings and structures
SN	Waterproofing of basements, roofs and walls using specialist systems
SO	Water supply and drainage for buildings (wet services, plumbing)
SQ	Steel security fencing or precast concrete

4.3.5 Case study selection

The preliminary primary case study selection criteria involve the selection of established constructors who employ a minimum of two business models within their organisations, operating within South Africa. Figure 14 shows the criteria to be used in selecting case study firms, namely the size, active registration, whether they are publicly listed, and have operations in more than one construction sector, especially General Building and Civil Engineering construction. The selection was made to identify entities that met **most of the pre-established criteria**.

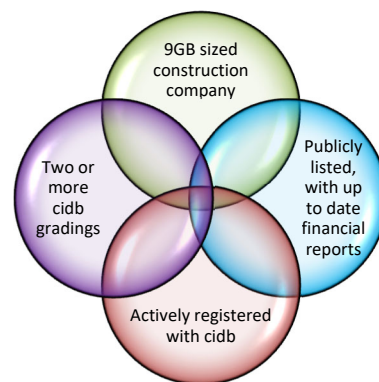


Figure 14: Case study selection criteria

4.4 Research study population

In research, the population is the group of individuals or entities that the researcher wishes to study or make inferences about. The thesis population is the specific subset of the population that the researcher intends to include in their study. Sampling is the process of selecting a subset of the thesis population to participate in the research. The goal of sampling is to select a group of participants that is representative of the larger population, so that the findings from the thesis is generalized to the population as a whole.

4.4.1 Study Population

The construction companies listed as grade 9GB contractors on the construction industry development board register of contractors make up the thesis population. These are contractors with the maximum capacity, which is represented by the grade nine (9) under the General Building (GB) main contractor specialisation. There are about 137 registered 9GB construction

companies in South Africa, with varying status from deregistered, expired, suspended or active. At the time of this study, there were 80 active 9GB construction companies (cidb, 2022).

4.4.2 Business models – devising diversification matrix

Table 7 details the weighting of the General/Main Contractor classes of work devised using the cidb classes of construction work as well as the cidb capacity/competency grading. The maximum diversification points, indicating a very large entity with numerous classes of work, at the maximum registration capacity (grade 9), is 9 points. Table 7 details the points scaled for this study, awarded to each grade of work the contractor is registered at, with five main construction contractor classifications, namely Civil Engineering (CE), Electrical Engineering – Building (EB), Electrical Engineering – Infrastructure (EP), General Building (GB), Mechanical Engineering (ME) construction contractors. For an entity with a grading of 9 across these main contractor gradings, would have a point score of 5 (maximum).

The specialist's construction contractor gradings have sixteen (16) categories, totalling 4 points maximum (0.25 per highest grade in this category). Table 7 details the calculation matrix devised in this study, in achieving the diversity scores by level of diversity and diversity index of construction contractors. Further use of this table is illustrated in Table 14: Diversification results.

4.4.3 Resources

Each registration category discussed also signifies the capacity of each firm, as the registration process requires contractors to prove their competencies and capabilities in delivering under each class of work registered for. The resources within a firm are a combination of assets, as reported by the firms.

4.5 Sampling technique and sample size

This section details the sampling techniques employed and the sample size of the study.

4.5.1 Sampling techniques

Researchers have at their disposal various sampling strategies that is employed for data collection, encompassing:

Table 7: Diversification matrix and class of works(source – own)

Main classes of works as business model types										
Grade	9	8	7	6	5	4	3	2	1	0
CE	1,00	0,89	0,78	0,67	0,56	0,44	0,33	0,22	0,11	0
EB	1,00	0,89	0,78	0,67	0,56	0,44	0,33	0,22	0,11	0
EP	1,00	0,89	0,78	0,67	0,56	0,44	0,33	0,22	0,11	0
GB	1,00	0,89	0,78	0,67	0,56	0,44	0,33	0,22	0,11	0
ME	1,00	0,89	0,78	0,67	0,56	0,44	0,33	0,22	0,11	0
Sum	5,00	4,44	3,89	3,33	2,78	2,22	1,67	1,11	0,56	0,00
Specialist classes of works as business model types										
Grade	9	8	7	6	5	4	3	2	1	0
SB	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SC	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SD	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SE	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SF	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SG	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SH	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SI	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SJ	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SJ	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SK	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SL	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SM	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SN	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SO	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
SQ	0,25	0,22	0,19	0,17	0,14	0,11	0,08	0,06	0,03	0,00
Sum	4,00	3,56	3,11	2,67	2,22	1,78	1,33	0,89	0,44	0,00

- Random sampling: which is the selection of participants from a large population in a manner that is entirely random, ensuring that each individual has an equal opportunity to be chosen.
- Stratified sampling: which is the division of the thesis population into distinct subgroups, or strata, according on specific criteria. From each stratum, a random sample is then picked.
- Cluster sampling: which is a method used in research where the population of a thesis is separated into distinct groups, known as clusters. A random selection of clusters is then made, and all individuals inside the selected clusters are included in the thesis study.
- Convenience sampling: refers to the method of selecting participants for a thesis based on their voluntary willingness or availability to participate.

The selection of a sampling method is contingent upon the specific research inquiry, the attributes of the target population, and the available resources allocated for the thesis. It is imperative for researchers to duly acknowledge and address the potential sources of bias that may arise during the sampling process, and to implement measures aimed at mitigating their impact (Krejcie and Morgan, 1970; Morse, 2000; Kotrlik and Higgins, 2001). It is crucial to acknowledge that a non-representative sample may hinder the researcher's ability to generalize findings to the broader population, perhaps resulting in erroneous conclusions. Therefore, it is important to choose a sampling method that is appropriate for the research question, and to have a large enough sample size to ensure the results are statistically meaningful (Krejcie and Morgan, 1970; Morse, 2000; Kotrlik and Higgins, 2001; Giesen *et al.*, 2007; Guest *et al.*, 2017).

4.5.2 Sample size

Sample size calculations are used to determine the number of participants needed in a study to achieve a certain level of precision and statistical power. The sample size is influenced by several factors, including:

- The level of precision desired: The smaller the margin of error desired, the larger the sample size needed.
- The level of confidence desired: The higher the level of confidence desired, the larger the sample size needed.
- The variability of the population: The greater the variability of the population, the larger the sample size needed.
- The effect size: The larger the effect size being studied, the smaller the sample size needed.

There are different methods for calculating sample size, depending on the type of study and the statistics being used. Some common methods include:

- Simple random sampling: Sample size is calculated based on the margin of error and the level of confidence desired, using a formula that takes into account the population size, variability, and desired level of precision.
- Stratified sampling: Sample size is calculated separately for each stratum, taking into account the proportion of the population in each stratum and the desired level of precision and confidence.

- Power analysis: Sample size is calculated based on the desired level of power (the probability of detecting an effect if one exists) and the effect size being studied, using a formula that takes into account the population size, variability, and desired level of precision.

Sample size calculation:

$$Ss = \frac{z^2 \times p(1 - p)}{e^2}$$

Equation 1: sample size

Where: Ss = sample size

z^2 = level of confidence

p = population proportion

e^2 = confidence interval (decimal)

Using Equation 1, the sample size of the study

$$fpc = \sqrt{\frac{N-n}{N-1}}$$

Equation 2: Finite population correction factor

Where: fpc = finite population correction factor

N = population

n = sample size

Using the fpc formula and the population 137 firms as identified and discussed in Study Population 4.4.1, for sample size 46, fpc is 0.818, which is closer to one, meaning there is almost no effect.

4.6 Methods of data collection

Observation was made of construction business performance over a six-year financial period: 2016 – 2022. Due to the businesses not having the same financial year period, Table 8 details the adjustment to the reporting timeframes to ensure consistency, coherence and quality of reported data. Performance and operational data of the businesses, from the 1st March 2015 until 28 February 2022 (7 years) were used in this thesis. The three key construction businesses are coded as CB and each given a code, CB001 (construction business case 1); CB002 (construction business case 2) and CB003 (construction business case 3). Financial Year End is represented by the key – FYE. CB002 and CB003 have the same financial reporting period,

presented in Table 8, which is in line with the thesis’s selected financial period. CB001 had the necessary adjustments when doing comparisons across firms. For CB001, there are four months that fall on the firm’s 2015 financial reporting period and are required for the purposes of cross-firm comparison. There are also four months of the June 2022 financial year that fall outside the scope of the financial period of this thesis. These months then balance the reporting period fairly, in that, the four months of March - June 2022 serve as the four months that needed to be considered of March till June 2015. It is worth noting that there are performance differentials within these years 2015 and 2022, and the order book may not necessarily report a similar performance. Distributing the annual performance into 12 months and multiplying the result by 4 months on either side would also not have led to any more accurate reflection of the performance and operational activities in these four months.

Table 8: Adjusted financial years – CB001, CB002 and CB003

FYE 28 FEB 2016	FYE 28 FEB 2017	FYE 28 FEB 2018	FYE 28 FEB 2019	FYE 28 FEB 2020	FYE 28 FEB 2021	FYE 28 FEB 2022
01-Mar-15	01-Mar-16	01-Mar-17	01-Mar-18	01-Mar-19	01-Mar-20	01-Mar-21
01-Apr-15	01-Apr-16	01-Apr-17	01-Apr-18	01-Apr-19	01-Apr-20	01-Apr-21
01-May-15	01-May-16	01-May-17	01-May-18	01-May-19	01-May-20	01-May-21
01-Jun-15	01-Jun-16	01-Jun-17	01-Jun-18	01-Jun-19	01-Jun-20	01-Jun-21
01-Jul-15	01-Jul-16	01-Jul-17	01-Jul-18	01-Jul-19	01-Jul-20	01-Jul-21
01-Aug-15	01-Aug-16	01-Aug-17	01-Aug-18	01-Aug-19	01-Aug-20	01-Aug-21
01-Sep-15	01-Sep-16	01-Sep-17	01-Sep-18	01-Sep-19	01-Sep-20	01-Sep-21
01-Oct-15	01-Oct-16	01-Oct-17	01-Oct-18	01-Oct-19	01-Oct-20	01-Oct-21
01-Nov-15	01-Nov-16	01-Nov-17	01-Nov-18	01-Nov-19	01-Nov-20	01-Nov-21
01-Dec-15	01-Dec-16	01-Dec-17	01-Dec-18	01-Dec-19	01-Dec-20	01-Dec-21
01-Jan-16	01-Jan-17	01-Jan-18	01-Jan-19	01-Jan-20	01-Jan-21	01-Jan-22
01-Feb-16	01-Feb-17	01-Feb-18	01-Feb-19	01-Feb-20	01-Feb-21	01-Feb-22

The thesis maintains the solution of balancing the financial reporting period for CB001, where the portion of March – June 2015 is replaced by the portion of March – June 2022. Thus, all firms within the case study have the same number of months under review, in the period 2016 till 2022.

4.6.1 Quantitative methods

4.6.1.1 Secondary sources – construction contractors

To supplement the data received, additional data sourced from a reliable industry institution, with all the necessary ethical clearances obtained, to further analyse the construction business models at sector level. 9GB registered constructors were selected as a filter from the institution and the following presentations are made. There are 137 registered 9GB constructors on the cidb register of constructors. From this list, Figure 15 further illustrates that, 2 companies are deregistered, 31 are expired and 24 are suspended. Leaving only 80 active 9GB companies.

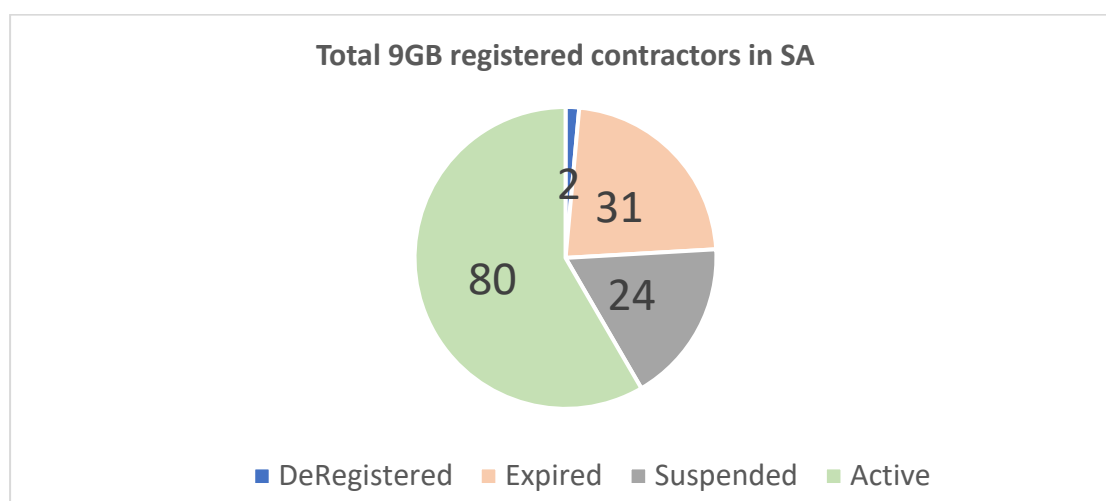


Figure 15: 9GB constructors in SA

To further explain the notion of grading, Table 9 details the cidb's grading table, with the works capability given as a grade of registration after the application and assessment of a construction business. Table 10 further details the best annual turnover as well as the capital the companies need to maintain in order to retain grading.

Table 9: cidb constructor grading and works capabilities (cidb, 2023)

Designation (Grade)	Works Capability	
	Maximum value of contract that a contractor is considered capable of performing	Track record/ Largest contract completed, during the 5 years immediately preceding the application, in the class of construction works applied for
1		
2	R 1 000 000,00	R 130 000,00
3	R 3 000 000,00	R 450 000,00
4	R 6 000 000,00	R 900 000,00
5	R 10 000 000,00	R 1 500 000,00
6	R 20 000 000,00	R 3 000 000,00
7	R 60 000 000,00	R 9 000 000,00
8	R 200 000 000,00	R 30 000 000,00
9	No limit	R 90 000 000,00

Table 10: cidb turnover and capital requirements (cidb, 2023)

Designation (Grade)	Best annual turnover	Available capital
1	-	-
2	-	-
3	R 1 000 000,00	R 100 000,00
4	R 2 000 000,00	R 200 000,00
5	R 3 250 000,00	R 650 000,00
6	R 6 500 000,00	R 1 300 000,00
7	R 20 000 000,00	R 4 000 000,00
8	R 65 000 000,00	R 13 000 000,00
9	R 200 000 000,00	R 40 000 000,00

From the 80 active 9GB companies, a further filter was applied for businesses that had more than two types of registration categories, where both categories are above cidb grade 7.

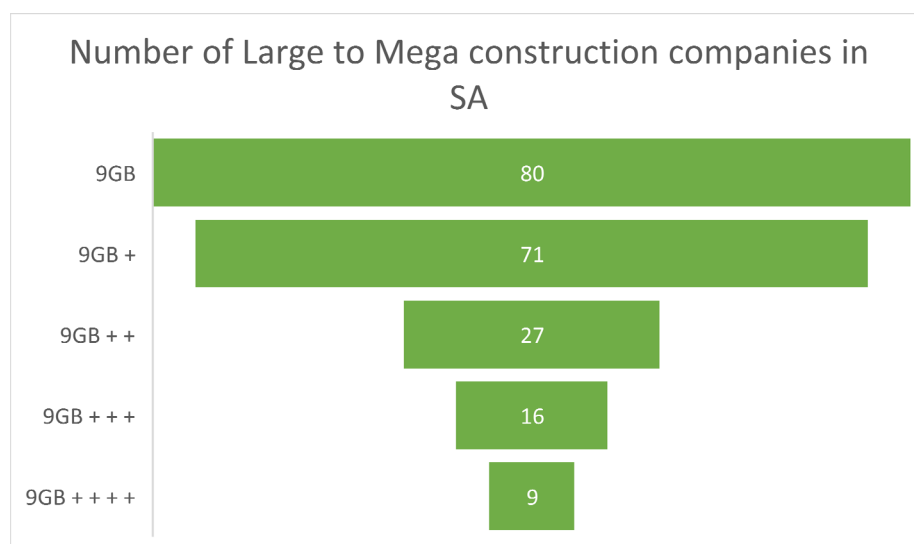


Figure 16: Number of Large to Mega construction companies in SA (own source)

Table 11: Large to Mega construction companies in SA (own-source)

Large construction company	L	9GB	80
eXtra large construction company	XL	9GB +	71
eXtra eXtra large construction company	XXL	9GB ++	27
eXtra eXtra eXtra Large	XXL	9GB +++	16
Mega construction company	MEGA	9GB ++++	9

Figure 16 and Table 11 show the number of large to mega-size construction companies in South Africa, with 80 active 9GB companies, termed Large in this thesis, 71 9GB and other cidb registration equal to or above grade 7, termed Extra Large. 27 9GB and other two cidb gradings equal to or above grade 7, 16 Extra Extra Large, Extra Extra Extra-Large companies and nine mega-sized construction companies, with more than 5 cidb gradings equal to or above grade 7.

4.6.1.2 Questionnaire

Data is also collected from questionnaires distributed within 9GB value networks. Questionnaire was collected from representatives and stakeholders of 9GB enterprises within South Africa. In over 400 responses, only 215 responses were complete and triangulated to fit the study focus and purpose.

4.6.2 Qualitative method – case study

Case study research is a qualitative methodology that involves the examination of a confined system, known as a case, inside a particular environment or context. This approach entails the collection of comprehensive and detailed data over a period of time (Stake, 1995; Swanborn, 2010; Feagin *et al.*, 2016; Heale and Twycross, 2018; Mcloughlin *et al.*, 2019). Scholars who have conducted case study research in business models include (Kshetri, 2007; Hacklin and Wallnöfer, 2012; Cao, 2014; Ranta *et al.*, 2021; Calandra *et al.*, 2023). In case study research on construction business models, a small number of carefully selected construction companies are studied in-depth to understand the specific experiences, challenges, and strategies associated with business model innovation and implementation. The goal of the case study research is to gain a detailed understanding of the factors that influence business model design and performance, and how these factors vary across different companies and industries.

The sample size for case study research on construction business models vary depending on the research question and the level of detail required to understand it. In general, case study research on construction business models often involves studying from three to ten companies, with the number of cases determined by factors such as the research question, data saturation and resources. The number of cases needed to answer the research question may vary depending on the complexity of the phenomenon being studied and the level of detail required to understand it. Data saturation refers to a situation where no new insights are gained by studying additional cases, in which case, the sample size is considered sufficient. Resources for research refers to the availability of resources such as time and funding, which also influence the sample size. Case study selection and procedure for selection has been discussed in section 4.3.5. The Construction Industry Development Board (cidb) of South Africa is a regulatory body established by the government to oversee and regulate the construction

industry in the country. Its primary objective is to promote sustainable growth, transformation, and competitiveness within the construction sector. The cidb's database is used to extract registered construction businesses in South Africa. The cidb uses contractor gradings to categorise the capacity and or competency of construction businesses, within a contractor-specialisation category, as illustrated in Table 5.

Table 5: cidb Contractor grading - SA

Designation (Grade)	Maximum value of contract that a contractor is considered capable of performing
1	
2	R 1 000 000,00
3	R 3 000 000,00
4	R 6 000 000,00
5	R 10 000 000,00
6	R 20 000 000,00
7	R 60 000 000,00
8	R 200 000 000,00
9	No limit

In addition to the works capability, the cidb has specialist contractor categories, as illustrated in Table 6. Construction businesses can register for as many categories as they can prove competency and capability.

Table 6: cidb Classes of contractor specialisation

Class	Main contractor categories
CE	Civil Engineering
EB	Electrical engineering - Building
EP	Electrical engineering - Civil
GB	General Building
ME	Mechanical Engineering
	Specialist classes of works
SB	Asphalt works (supply and lay)
SC	Building excavations, shaft sinking, lateral earth support
SD	Corrosion protection (cathodic, anodic, and electrolytic)
SE	Demolition and blasting
SF	Fire prevention and protection systems
SG	Glazing, curtain walls and shop fronts
SH	Landscaping, irrigation and horticulture works
SI	Lifts, escalators and travellers (installation, commissioning and maintenance)
SJ	Piling and specialised foundations for buildings and structures
SK	Road markings and signage
SL	Structural steelwork fabrication and erection
SM	Timber buildings and structures
SN	Waterproofing of basements, roofs and walls using specialist systems
SO	Water supply and drainage for buildings (wet services, plumbing)
SQ	Steel security fencing or precast concrete

4.7

4.8 Case study selection Methods of data analysis

(Hair et al., 2019) explain the reasons for choosing PLS-SEM over other methods, such as exploratory research, small samples, complex models. Partial Least Squares Structural Equation Modeling (PLS-SEM) is a statistical methodology that combines elements of causal analysis with prediction. It focuses on estimating statistical models that are specifically tailored to offer causal explanations. This approach, first introduced by Wold in 1982 and further developed by Sarstedt et al. in 2017, places a strong emphasis on prediction within the context of structural equation modeling. The technique effectively resolves the perceived division between explanation, which is commonly stressed in scholarly research, and prediction, which serves as the foundation for generating management implications (Hair et al., 2019). The recommended sample size for PLS-SEM, depends on the minimum R-squared value, the maximum number of arrows pointing at a latent variable, and the desired statistical power level. The distributional assumptions of PLS-SEM, are less stringent than those of other methods, such as covariance-based SEM. The issue of using secondary data in PLS-SEM, requires careful consideration of data quality, validity, and reliability. PLS-SEM allows for the use of the statistical power concept, which is the probability of rejecting a false null hypothesis. Data analytical tools are essential components of modern research projects, facilitating data management, analysis, and interpretation. In this research, IBM SPSS, NVivo, Excel, SmartPLS4 and Endnote are extensively used as research software applications.

4.8.1 IBM SPSS

IBM SPSS is a piece of comprehensive statistical software widely used for quantitative data analysis. It offers a user-friendly interface for various statistical tests, regression analyses, and data visualization. Researchers often rely on SPSS for its robustness in handling large datasets and its ability to generate descriptive statistics and inferential analyses. SPSS is particularly useful for researchers in fields like social sciences, psychology, and economics where statistical analysis is integral. This application has been used for quantitative data analysis. In cases of qualitative data -this has been weighted, given numeric representaiton and the application used to visualise the data for in-depth meaning.

4.8.2 NVivo

NVivo is a qualitative data analysis tool designed to manage and analyze unstructured data, such as text, audio, video, and images. It aids in identifying themes, patterns, and relationships in qualitative data. NVivo enables researchers to code and categorize data, facilitating the interpretation of complex narratives. Researchers in fields like anthropology, sociology, and qualitative psychology find NVivo valuable for in-depth exploration and understanding of qualitative data. In this research – this tool has been used extensively in the qualitative data sets and extracting meaning and cross referencing themes.

4.8.3 Excel

Microsoft Excel is a versatile tool used for various data-related tasks, including data entry, basic analysis, and visualization. While not as advanced as dedicated statistical software, Excel's simplicity makes it accessible for a wide range of researchers. It is often used for basic calculations, creating graphs, and managing small datasets. Excel's widespread familiarity and ease of use make it a go-to tool for preliminary data manipulation and visualization. This tool has been used extensively in the financial reporting section of this research, as well as general data presentation summaries in table format – generated in excel.

4.8.4 SmartPLS 4

SmartPLS 4 is structural equation modeling (SEM) software that focuses on both reflective and formative measurement models. It is used for testing complex relationships and hypotheses among latent variables. SmartPLS is appreciated for its user-friendly interface and graphical outputs, which help researchers in disciplines like marketing, management, and social sciences understand complex models. It's particularly suitable for exploratory research aiming to uncover latent constructs. This has been the key tool used in testing the hypothesis of the study as well as provide meaningful insights to the various constructs and variables studied.

4.8.5 EndNote

EndNote is reference management software used to organize and cite sources in research papers. It streamlines the process of collecting and organizing references, which is crucial for maintaining a well-structured literature review. EndNote integrates with word processors to

help researchers create citations and bibliographies efficiently. Researchers in all disciplines benefit from EndNote's ability to maintain a database of references and streamline the citation process. This tool has been used as the reference management tool in this research, with its additional plug-in applications in word documents as well as browser add-ons, allowing for efficient and effective reference management.

4.9 Research quality

The validity, reliability, and trustworthiness of the data collected and the tools utilized in the research are all aspects that contribute to the overall quality of the research.

4.9.1 Internal and external validity

Internal validity pertains to the extent to which a study accurately assesses the constructs it claims to test (Joppe, 2000). On the other hand, external validity relates to the ability to generalize research findings outside the specific setting of the study (Bryman, 2004). The concept of validity pertains to the likelihood that a statement or finding is accurate (Dooley, 1984). The research questionnaire was pre-tested, as outlined in Section 3.4.3, in order to establish internal validity.

4.9.2 Reliability and credibility

Reliability refers to the degree of consistency in study findings throughout time, which may be duplicated or reproduced by other scholars (Joppe, 2000; Hussey & Hussey, 1997). It is plausible to achieve comparable outcomes through the replication of the tests. The primary objective of this study synopsis is to comprehend the existing body of knowledge in the field of innovation research. It is plausible that with the same methodology and dataset, another researcher would have arrived at comparable findings. However, the inclusion of reviews by another researcher would introduce an element of subjectivity. The reason for the great reliability of the verification approach is its integration of established empirical research. The concept of research credibility has several key dimensions, including reliability, portability, trustworthiness, and confirmability (Berard et al., 2012). Reliability refers to the internal validity of parallels, while portability pertains to the external validity of parallels. Trustworthiness relates to the reliability of parallels, and confirmability concerns the

objectivity of parallels. According to Golafshani (2003), the legitimacy of qualitative research is contingent upon the researcher's competence and dedication. According to Lincoln and Guba (1986), credibility is attained by engaging in persistent and rigorous examination of the phenomena under investigation, which involves ongoing observation of significant aspects. The pursuit of what Popper (1963) referred to as the falsifiability of scientific theories constitutes another significant aspect. This entails identifying instances that deviate from the established patterns and disseminating one's research findings to unbiased peers. The ultimate component entails conducting iterative assessments to gauge the comprehension of the observed phenomena, employing a representative subset of individuals in the role of actors. Ensuring reliability in research is achieved by the implementation of long-term studies, to the point of reaching data saturation. Additionally, the use of triangulation, involving several methodologies such as interviews and observations, diverse sources including individuals and documentation, as well as engagement in discussions of findings with participants, focus groups, and other professionals, further enhances the reliability of the research outcomes.

4.9.3 Transferability, Dependability and Confirmability

Transferability, according to Lincoln and Guba (1986), is attained through thorough and in-depth explanations of study phenomena. Detail-oriented explanations of the situation under examination were chosen by Bijker et al. (1987). (see Section 10.3.2). The thorough description enables other researchers to voice their own opinions regarding whether the findings may be applied to different contexts. Portability is achieved by documenting research activities in a thesis for publication in OpenUCT, allowing other researchers and practitioners to determine if the results are transferrable to their situation. The results' consistency over time is what reliability refers to (Bowen 2005). The dependability of quantitative studies, which concerns whether the same outcomes would be attained if the same object were observed repeatedly, is comparable to this. However, no two social settings are the same, therefore reliability must take into account the constantly shifting environment in which the research is conducted (Trochim 2006). Conformability, according to Trochim (2006), is the degree to which the findings may be verified by other people. Credibility and verifiability consist in “establishing an audit trail and having a competent and uninterested external auditor conduct the audit” (Lincoln and Guba, 1986).

Assessing data and conclusions relates to verifiability. Bryman (2004) noted that external audits are not popular because of the amount of work and time required to conduct a comprehensive audit. If an external audit is not possible, the assessment of reliability and compliance is left to the reader. Figure 17 details the process used to scan for missing data within the variables of the research. Once these are found, more effort is made to further collect, recheck and correct the data files to reflect all data available. SPSS ran multiple imputations on the data file and from the report, business model diversity variables were identified as missing. Performance data for revenue growth, operating profit margin, debt equity ratio and the returns data....

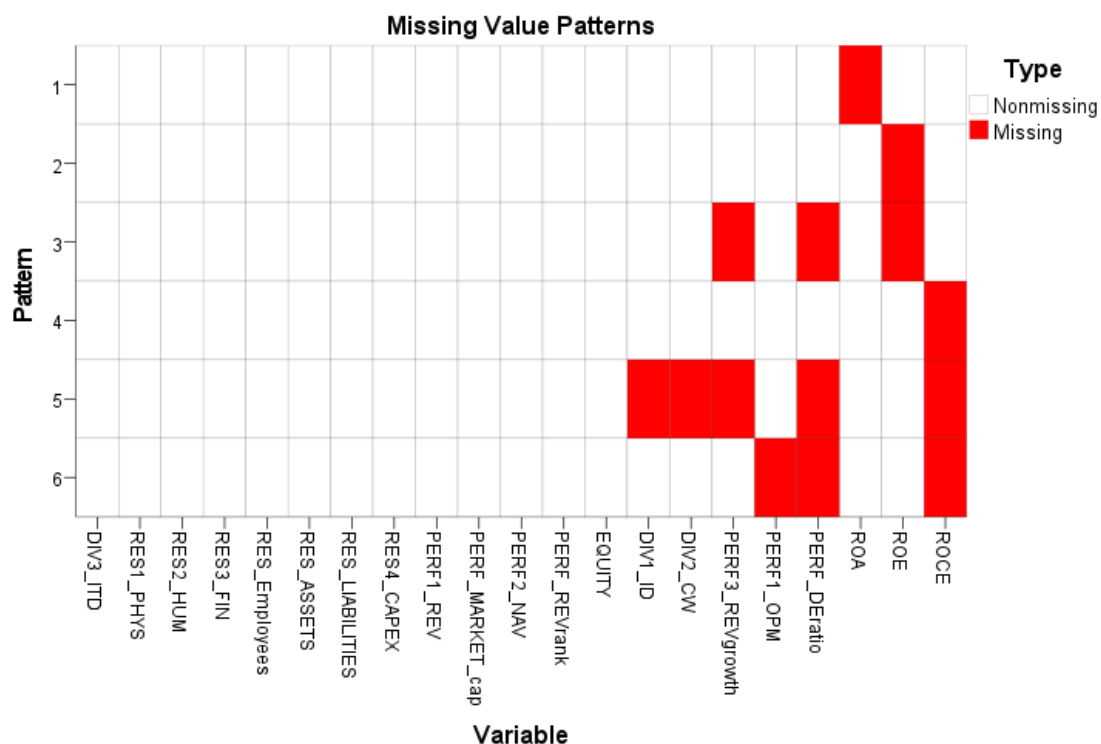


Figure 17: Reliability and Credibility

4.9.4 Tests of normality/non-linearity

The Figure 19 detail the results obtained across the various data sources on the tests conducted for data distribution. The assessment of normality and non-linearity is a crucial statistical approach used to determine the extent to which data conforms to a normal distribution or exhibits non-linear patterns. These tests aid researchers and analysts in assessing the appropriateness of particular statistical methodologies and assumptions. It is crucial to recognise that the choice of a test or methodology is dependent on the attributes of the data and

the research question. The first step in assessing non-linearity often entails a visual inspection, primarily employing scatterplots and residual plots. Additionally, it is crucial to acknowledge that in statistical analyses, rigorous adherence to the assumptions of normality and linearity is not always obligatory. In some circumstances and utilising the relevant statistical methodology, deviations from these assumptions may be considered permissible.

In cases where the data is not parametric, which is when data is distribution-free and rely on ranks or ordinal data, the non-parametric correlations are used, which include Spearman's rank correlation coefficient (ρ) and Kendall's tau coefficient (τ). Non-parametric correlations are useful when the data violates the assumptions of normality or linearity, or when working with categorical or ordinal variables. They are also suitable for analyzing small sample sizes or data with outliers. Non-parametric correlations capture monotonic relationships between variables, regardless of their specific form.

4.9.5 Dependability and authenticity

According to Bryman (2004), reliability is established by demonstrating a sincere and honest approach in accurately documenting the decisions and modifications undertaken during the investigation. According to Trochim (2006), the attainment of confirmability is facilitated by means of many strategies. These include the thorough documenting of verification and post-verification procedures, the inclusion of a researcher who assumes the role of a devil's advocate to critically evaluate the findings, and the reporting of negative examples that challenge or contradict prior observations. Reliability is assessed through the explication of the decisions and modifications undertaken during the study, so demonstrating the author's adherence to ethical principles and commitment to conducting the research in a trustworthy manner. The documentation of confirmability poses challenges due to the inherent difficulty in establishing that another researcher has arrived at identical results using the same dataset. The researcher has facilitated data accessibility to data subjects upon their request, allowing for digitization of the data. Furthermore, the researcher has ensured that the data would also be accessible to the review board. Lincoln and Guba (1986) argue that the concept of authenticity is not commonly associated with quantitative research methodologies, but instead is primarily defined within the context of qualitative research paradigms.

The concept of authenticity encompasses various dimensions, namely honesty, ontological authenticity, educational authenticity, catalytic authenticity, and tactical authenticity. Lincoln and Guba (1986) propose that justice is achieved by the presentation of a comprehensive and equitable perspective encompassing all values and constructions. Ontological authenticity facilitates the conscious world experience of an individual or group, whereas pedagogical authenticity fosters a respect for the conscious world experience of another individual or group, without necessarily implying consensus. The impetus for action is propelled by catalytic authenticity, which is derived from thorough investigation and analysis. According to Lincoln and Guba (1986), the concept of tactical authenticity empowers people or groups to engage in purposeful actions.

This thesis employed ethical concerns to assure the protection of respondents' dignity and uphold ethical standards. These considerations encompassed getting informed consent, maintaining confidentiality, ensuring anonymity, and fostering honesty. The research questionnaire has received ethical approval and has been cleared by the Ethics in Research committee.

In the context of this study, such information was utilized, ensuring that the participant's identity remains safeguarded. Anonymity refers to the condition in which the identities of participants were withheld, hence preventing any possibility of associating specific responses with any individual other than the participant in question (Walford, 2005). It is customary and widely accepted within the research community to adhere to standard practices that prioritize the protection of participants' identities. The research findings were obtained through gathering survey replies through various internet platforms, including email attachments, direct responses to online surveys, and manual paper format. There was no discernible connection or identifiable attribution of any of the replies in the analysis to any specific participant.

4.9.6 Bias

Bias refers to the presence of systematic errors or prejudices that influence the design, conduct, interpretation, or reporting of research findings. Biases occur at various stages of the research process and affect the objectivity and reliability of the results. To mitigate, manage, and eradicate biases in this study, a panel of industry and academic professionals was engaged.

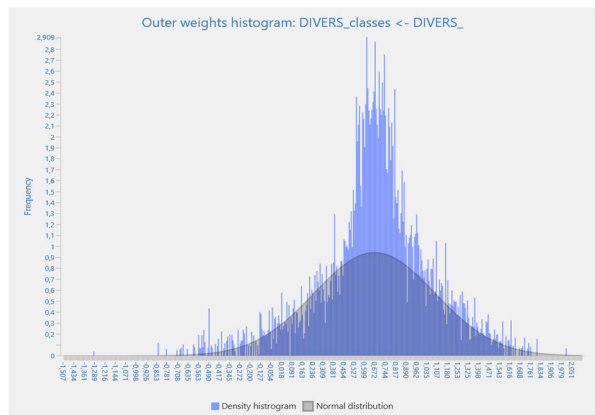
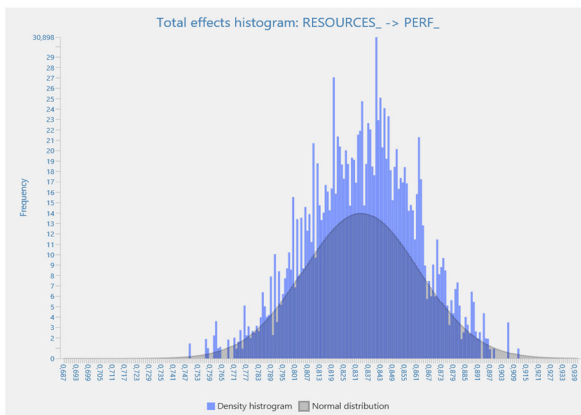
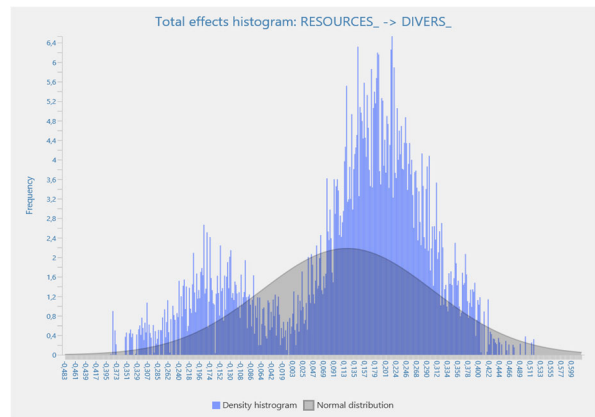
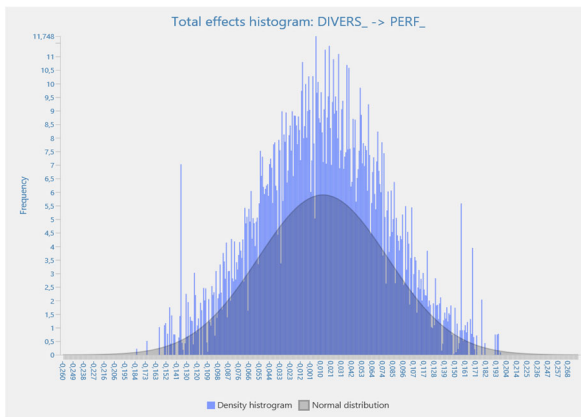
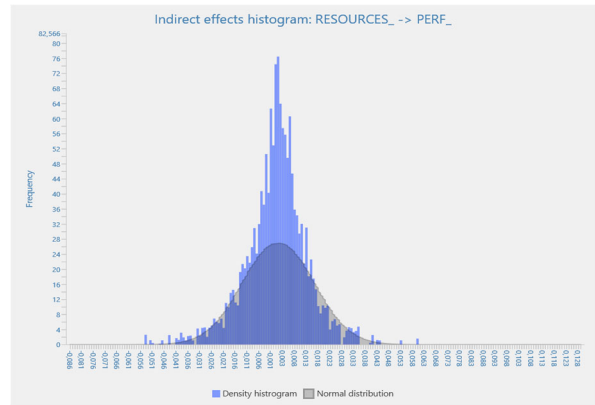
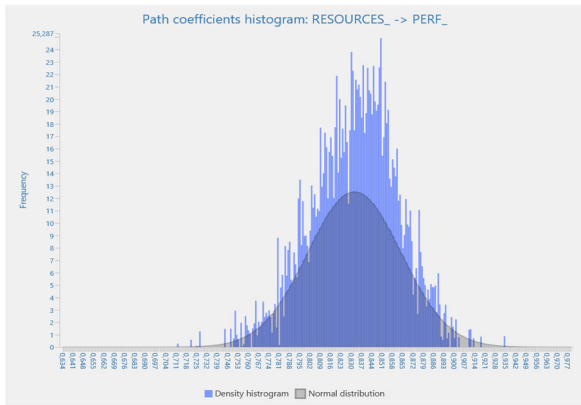
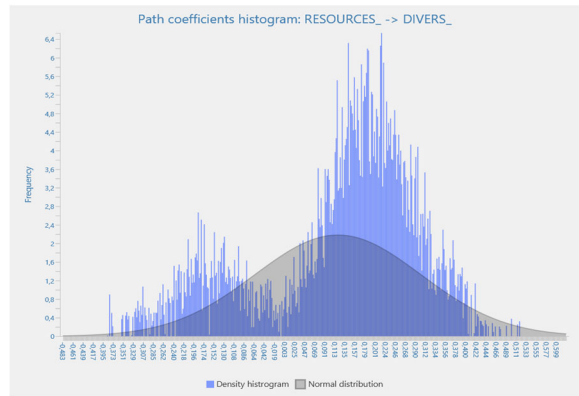
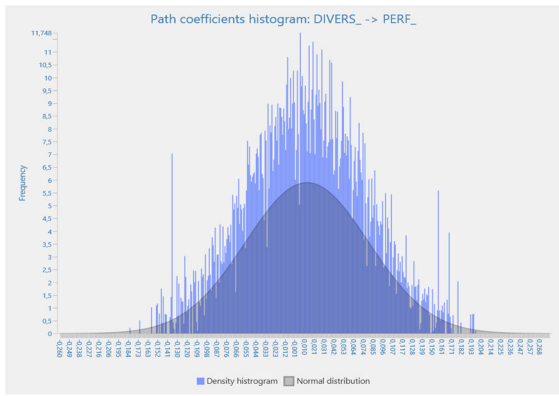


Figure 18: Test of normality - set 1

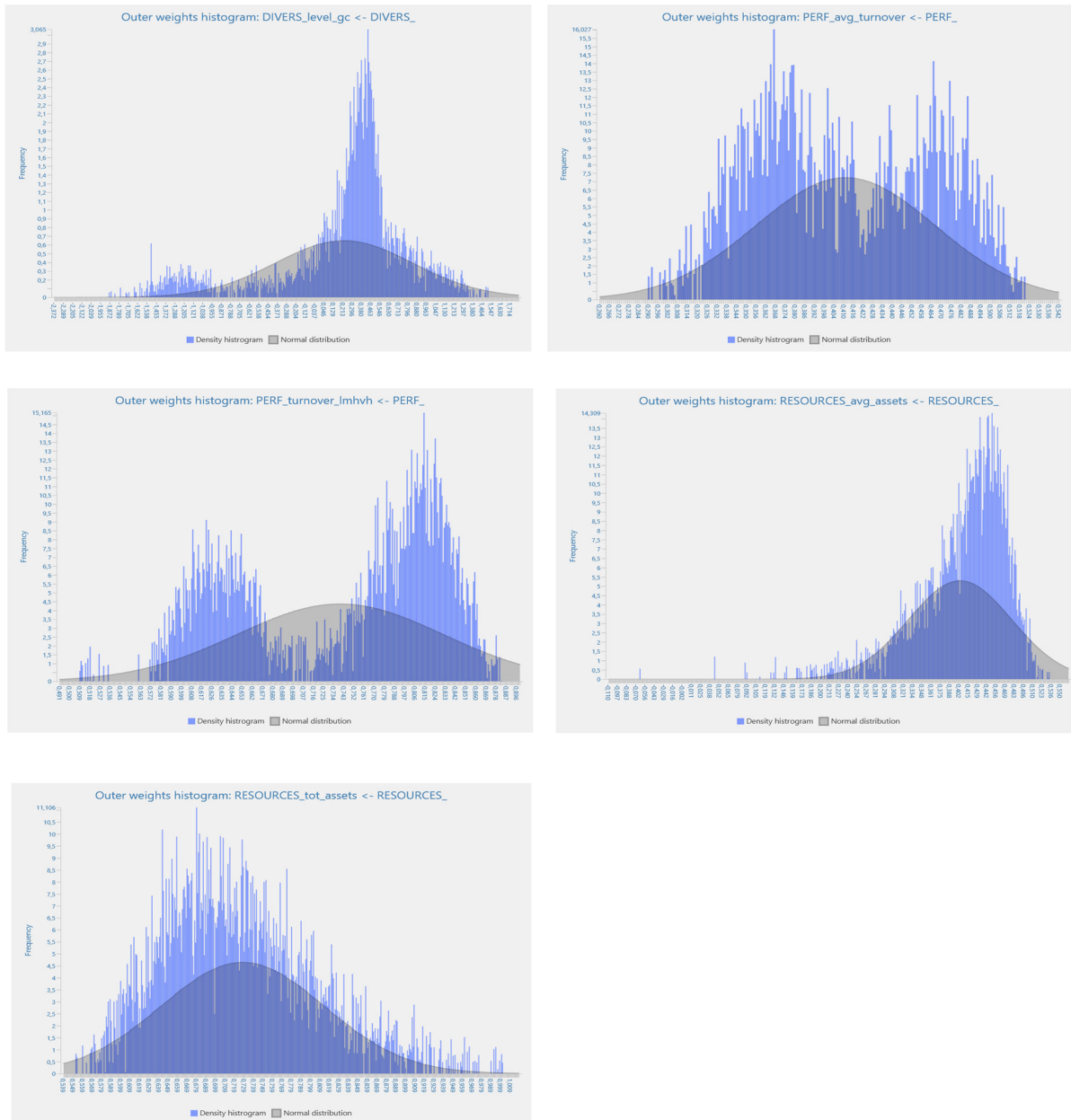


Figure 19: Tests of normality - set 2

Their primary task was to evaluate the questionnaire for potential ambiguities that could impede respondents' comprehension of the questions or result in erroneous data analysis. The efficacy of these strategies is verified by scholars such as Grimes and Schulz (2002). The surveys underwent evaluation to determine the presence of any blurring effects. In order to enhance clarity, statistical analysis methods were employed to examine the data. The conclusions and correlations drawn were not reliant on the researcher's subjective judgment, but rather on the application of statistical equations and reasoning. Some answered the research questions posed indirectly, with the use of tools such as the Likert scale, To test participant

bias, two of the questions were designed as a set, one direct, one indirect (Question 8, 9 and 10) from the attached Survey questionnaire, see appendix A.

4.10.1 Development of questionnaire: expert interviews and secondary data sources

Expert interviews is an important part of research questionnaire development, as they provide valuable insights into the subject matter and can help identify key constructs and variables to include in the questionnaire. Expert interviews involve collecting data through in-depth, semi-structured or structured conversations with individuals who have a high level of knowledge or experience in the subject area being studied. The researcher typically develops a list of open-ended questions or prompts to guide the conversation but allows the expert to elaborate on their responses and provide additional information. Expert interviews is used in the early stages of questionnaire development. This aids in identifying key constructs and variables to include in the questionnaire. It is important to understand how experts define and measure key constructs, and how to identify potential measurement issues and biases. Researchers should identify gaps in existing knowledge and areas that need further investigation. It is thus possible to generate new research questions and hypotheses.

Added to the questionnaire development, an existing questionnaire from another study withing the Construction Business Management research group aided this study, by not duplicating questions to the same stakeholders, but rather triangulating the data and extracting components that relate to the focus and targeted research in this study. Utilising a similar dataset from previous research offers advantages over duplicating questions to the same audience. Firstly, it avoids respondent fatigue and potential biases associated with repetitive questioning, leading to higher response quality. Secondly, it enables researchers to build upon existing knowledge, fostering continuity and cumulative understanding within the field. Additionally, reusing data promotes efficiency by reducing redundancy in data collection efforts and allocating resources more effectively.

4.11 Chapter summary

The pragmatist philosophical framework, which incorporates aspects of both positivism and interpretivism, serves as the basis for this investigation. The employment of both inductive and

deductive reasoning was required for the successful completion of the information acquisition process. As a consequence of this, a study strategy known as "mixed methods" was used, which consisted of employing both quantitative and qualitative approaches for the purpose of data collection and analysis. In this chapter, we take a look at the philosophical underpinnings of the study, as well as the methodology of the research. Following the selection of the population that was going to be investigated, the study talked about the different sampling procedures that were used. The researchers outlined the procedures that were utilized for the collecting of the data as well as the procedures that were utilized for the analysis of the data. The conversation covered a wide range of topics pertaining to the caliber of the research, including the study's internal and external validity, its dependability, and its overall trustworthiness as an investigation that had been carried out. During the course of the conversation, a number of different ethical issues were discussed. Among these were the significance of obtaining informed consent from participants, protecting their anonymity and confidentiality, and minimizing the impact of any potential biases.

CHAPTER FIVE

5 DATA PRESENTATION AND ANALYSIS

This section presents the data collected using questionnaires distributed to representatives of 9GB firms, interviews and case studies. Presentation techniques include tables, graphs and charts.

5.1 Survey – quantitative data

This section presents the survey results, the quantitative data collected, in summary form.

5.1.1 Demographics of survey respondents

Table 12 represents the demographics of the survey respondents. The majority of the respondents have a National Qualifications Framework of six, seven and eight, meaning that more than 52% respondents have a diploma, bachelor degree, or an honours level qualification. Only one respondent had a PhD and more than 31% respondents did not specify their level of qualification. Table 12 further details the management level of the respondents, with more 62% of the respondents in Executive Management positions and 48% of total respondents having more than 20 years in the construction industry. The process of gathering and examining demographic data enables researchers to discern trends, patterns, and discrepancies in responses that are contingent upon various demographic factors. The utilisation of stratified sampling aids in the establishment of representative survey samples, thereby enabling the exploration of subgroup analyses to investigate the potential influence of diverse demographic characteristics on the research outcomes.

5.1.2 Firmographics of represented businesses

In terms of firm specific data Table 13 presents the firmographics, with 64% of firms reporting to have less than 50 permanent employees and only 7% representing large firms with an excess

of 501 permanent employees. The majority of the firms (75%) classify as main constructors with a 3.6% sub/trade constructor representation. The comprehension of firmographic characteristics, within the framework of a main contractor, pertains to the distinctive business attributes that are specific to companies fulfilling the role of primary contractors in construction and building endeavours.

Table 12 Survey Respondents' Demographics

Demographics	Grouping/ranking	Classification	N	%
Construction industry experience	5	20 years and above	47	22%
	4	10 - 20 years	86	40%
	3	5 - 10 years	41	19%
	2	Less than 5 years	20	9%
	n/a	Not specified	21	10%
		Total	215	100%
Highest qualification	10	NQF 10	1	0,5%
	9	NQF 9	20	9,3%
	8	NQF 8	4	1,9%
	7	NQF 7	23	10,7%
	6	NQF 6	90	41,9%
	5	NQF 5		0,0%
	4	NQF 4	8	3,7%
	3	NQF 3	1	0,5%
	n/a	Not specified	68	31,6%
	Total	215	100,0%	
Management level	5	Executive Management	153	71,2%
	4	Senior Management	24	11,2%
	3	Middle Management	11	5,1%
	2	Entry level Management	10	4,7%
	1	Other	5	2,3%
	n/a	Not specified	12	5,6%
	Total	215	100,0%	

A comprehensive grasp of the firmographics pertaining to primary contractors holds significant importance for a range of stakeholders, encompassing subcontractors, suppliers, project owners, and industry analysts. The following are several fundamental firmographics frequently linked to main contractor firms.

Table 13: Firmographics

Firmographics	Grouping/ ranking	Classification	N	%	
Number of permanent employees in the firm	5	500+	1	0%	
	4	251 - 500	4	2%	
	1	3	51 - 250	12	6%
	2	1 - 50	190	88%	
	n/a	Not specified	8	4%	
			215	100%	
Services offered within the firm	1	Construction services	212	98,6%	
	2	Consulting services	25	11,6%	
	2	3	Plant and Machinery	13	6,0%
	4	Developer	11	5,1%	
	5	Other solutions	15	7,0%	
	n/a	Not specified	12	5,6%	
		Total	215		
Construction services	1	Building construction	209	97,2%	
	2	Civil construction	174	80,9%	
	3	3	Specialist contractor	26	12,1%
	n/a	Not specified	4	1,9%	
			Total	215	

5.1.3 Core services – business offerings

The study sought to know from the respondents, their firm’s core, distinct service to the construction market. Their responses were captured in the word clouds in Figure 20 till Figure 22 is a presentation of all the core services identified.



Figure 20: Core services 1

Figure 20 shows that “construction” was listed as the main and first core service, and infrastructure, engineering, civil, design and geology as other key services, within those firms that took part in the survey.



Figure 21: Core services 2

Figure 21 indicates that “construction” and “building” describe the second listed core services within these firms, both of which add to the “construction” listed in Figure 20. Figure 22 presents the third core service, identified as management services, development and facilities services within the firms.



Figure 22: Core services 3

Figure 23 visualised the aggregated core services, with construction, management, engineering, development and project services being core.



Figure 28: Key partners 1



Figure 29: Key partners 2



Figure 30: Key partners 3



Figure 31: Key partners aggregated

5.2 Diversification of construction business models

5.2.1 Diversification results

Table 14 details the application of the diversity matrix from Table 7. From the eighty (80) active 9GB construction businesses, 53 had sufficient data sets to compute diversification analysis and 46 had sufficient detail to compute the financial analysis.

Table 14: Diversification results

Construction Business No	Contractor Grading Designation	Classes of works Diversification Score (Main and Specialist classes of work)	Classes of works Diversification %
1	PE 9CE, 9GB	2,11	0,23
2	9GB, 9CE, 8ME	2,89	0,32
3	9GB	1,00	0,11
4	9CE, 9GB, 8EP, 8ME	3,78	0,42
5	1SE, 9CE, 9GB, 9ME	3,03	0,34
6	9CE, 9GB	2,00	0,22
7	9GB, 8CE	1,89	0,21
8	PE 5CE, 9GB	1,67	0,19
9	8CE, 9GB	1,89	0,21
10	8CE, 9GB, 9SL, 8ME	3,78	0,42
11	9CE, 9GB	2,00	0,22
12	PE 8EP, 8ME, 9CE, 9GB	3,89	0,43
13	9GB	1,00	0,11
14	PE 8CE, 9GB	2,00	0,22
15	8CE, 9GB	1,89	0,21
16	9GB, 9CE, 1ME	2,11	0,23
17	8CE, 9GB	1,89	0,21
18	9GB, 9CE, 9SB	2,25	0,25
19	PE 9ME, 9GB, 8CE	3,00	0,33
20	9CE, 9GB	2,00	0,22
21	PE 9CE, 7EB, 8EP, 9GB, 8ME, 7SF, 1SQ	4,78	0,53
22	PE 9GB, 9CE, 9ME	3,03	0,34
23	7CE, 6EP, 9GB, 8ME, 1SH, 7SI, 6EB	4,23	0,47
24	9CE, 9GB, 9ME, 1SB	3,03	0,34
25	9CE, 9GB	2,00	0,22
26	PE 1EP, 7CE, 9EB, 9GB, 9ME	3,89	0,43
27	PE 9GB, 6SE, 1SQ, 9CE	2,20	0,24
28	9CE, 9GB, 9SE, 7SC, 7SJ	3,63	0,40
29	9CE, 9GB, 9SB	2,19	0,24
30	PE 8CE, 9GB, 8SB, 1SQ, 1SL	1,31	0,15
31	PE 9GB	1,03	0,11
32	PE 9GB, 8CE	1,92	0,21
34	PE 5SQ, 6EP, 6ME, 9CE, 9GB, 9SB	3,73	0,41
35	PE 8CE, 6EB, 7EP, 1ME, 8SB, 9GB	3,67	0,41
36	8EB, 9EP, 9GB	2,89	0,32
37	9CE, 9EP, 9GB, 9ME, 5SC, 9SJ	4,39	0,49
38	PE 6EB, 9GB, 9CE, 5ME	3,86	0,43
39	PE 9GB, 9CE	2,03	0,23

40	PE 9CE, 9GB, 7SH, 7EP, 6ME, 8SB	3,97	0,44
41	PE 9CE, 9GB	2,03	0,23
42	PE 8CE, 9GB	1,92	0,21
43	PE 8CE, 9GB	1,92	0,21
44	9GB	1,00	0,11
45	PE 7CE, 9GB	1,81	0,20
46	PE 9CE, 9GB	2,03	0,23
47	PE 9GB	1,03	0,11
48	9CE, 9GB	2,00	0,22
49	PE 9CE, 9GB, 1ME, 1EB, 1EP	2,36	0,26
50	9GB, 9ME, 9SL	2,25	0,25
51	9CE, 9GB, 9ME, 1SF	3,03	0,34
52	8SB, 9CE, 9GB, 9ME	3,22	0,36
53	9EB, 9EP, 9GB, 9ME	4,00	0,44
54	9GB, 1ME, 1SQ, 1SH, 1CE	1,28	0,14

Seven contractors had insufficient financial performance data and as such, were removed from the study. The number of entities is thus 46 contractors, in the following sections.

5.2.2 Diversification by Construction Contractor Classes

Figure 32 shows the types of Construction Contractors, where T1 represents the four construction companies (8%) with a single registered class of work, as General Construction Contractor for Building works (9GB). This class has no diversification in its construction contracting revenue, where the sum of its revenue is primarily achieved from General Building contracts. T2 represents the seventeen firms (37%) with two classes of work, mainly being 9GB and General Civil Engineering Contractor (9CE) or any other Main Contractor class of work. T3 represents twelve firms (26%) with more than three Main Contractor classes and specialist classes of work, and T4, the thirteen firms (29%) with more than four classes of Main Contractor registration.

5.2.3 Performance

Tracking, tracing and reporting the financial performance of these firms has been the most difficult task – as most of the firms did not submit their financial statements annually; rather, the submissions seem to align with the three year renewal process. As a result, six of the firms reported thus far had no financial statements at all and were removed from further analysis. The weighted, scaled and ranked financial performance by turnover is shown in Table 15.

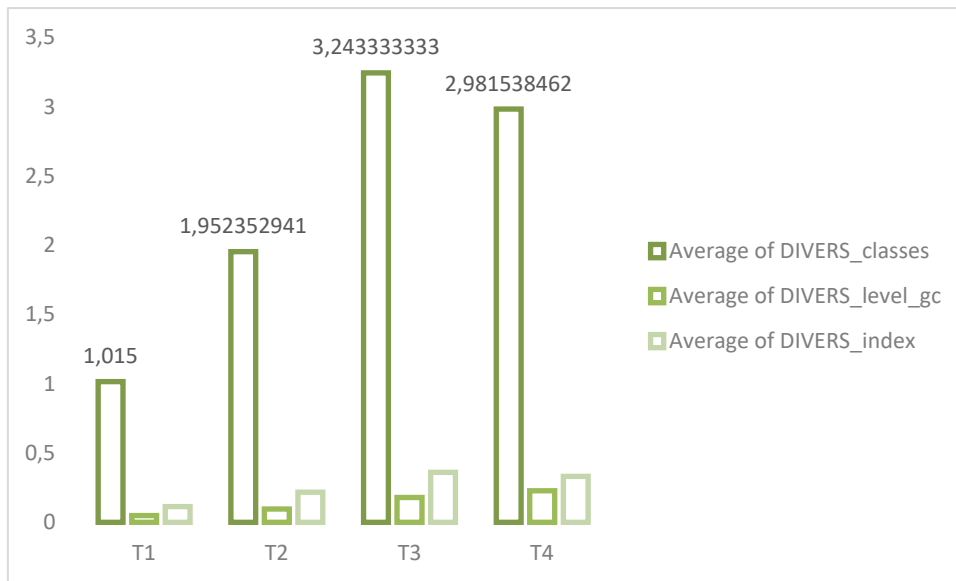


Figure 32: Diversification by Construction Contractor types

5.3 Case Study data presentation

In this thesis, the three case study businesses have been used to analyse the current construction market to understand the current demand for construction services, the competitive landscape, and the needs and preferences of customers. Unique benefits of each construction business have been captured, in terms of distance services offered to clients, such as cost savings, quality workmanship, speed, convenience, or expertise. Second, project delivery methods have been observed and captured. Test of alignment has been conducted through comparing observed project delivery methods with literature. These could include general contracting, design-build, construction management, or integrated project delivery. Three construction business organisations were selected as case studies based on the business models employed by the firms. The three companies meet the criteria of being publicly listed entities as well as registered with the construction industry development board as 9GB enterprises, amongst other registrations. The three businesses have been given research suitable business identities and their trading names removed from all research presentation and reporting. The business identities are CB001; CB002 and CB003. Table 16 shows the summary data of the firmographics – i.e., information relating to the demographics of the firm.

Table 15: Performance_turnover

Business Code No.	TURNOVER RANKING 2016 - 2021	TURNOVER SCALED 2016- 2021	Business Code No.	TURNOVER RANKING 2016 - 2021	TURNOVER SCALED 2016- 2021
0	0,18	1,00	27	0,07	1,00
1	0,40	2,00	28	0,91	4,00
3	0,42	2,00	29	0,29	2,00
4	0,98	4,00	30	0,51	3,00
5	0,93	4,00	32	0,53	3,00
6	0,49	2,00	34	0,31	2,00
7	0,22	1,00	35	0,44	2,00
10	0,89	4,00	36	0,96	4,00
11	0,58	3,00	37	0,76	4,00
12	0,69	3,00	38	-	1,00
13	0,64	3,00	39	0,11	1,00
14	0,47	2,00	40	0,09	1,00
15	0,02	1,00	41	0,27	2,00
16	0,71	3,00	42	0,33	2,00
17	0,82	4,00	44	0,36	2,00
18	0,13	1,00	45	0,73	3,00
19	0,84	4,00	46	0,78	4,00
20	0,60	3,00	47	0,38	2,00
21	0,67	3,00	48	0,56	3,00
23	0,62	3,00	50	1,00	4,00
24	0,04	1,00	51	0,87	4,00
25	0,20	1,00	52	0,80	4,00
26	0,24	1,00	53	0,16	1,00

Table 16: Case study firmographics

FIRMOGRAPHICS	Organisation CB001	Organisation CB002	Organisation CB003
cidb GB designation	9GB	9GB	9GB
Other cidb designations	9CE, 9ME, 1SF	PE	9CE, 9EP, 9ME, 5SC, 9SJ
Publicly listed	Yes	Yes	Yes
Financial Year End	30 June	28 February	28 February
Period of reporting selected for this thesis	1 March 2016 – 28 February 2022	1 March 2016 – 28 February 2022	1 March 2016 – 28 February 2022

5.3.1 Construction organisation CB001

Construction business CB001 was established in 1970 and offers services that cover the full construction spectrum, which the firm has divided into three main operating divisions – Building Construction, Civil Engineering and Roads and Earthworks. For the purposes of this thesis, Civil Engineering and Road and Earthworks operations are reported as a single division – Civil Engineering, as aligned with the cidb ROC. Roads and Earthworks form part of the Civil Engineering discipline and as a business offering, this thesis does not distinguish between the two.

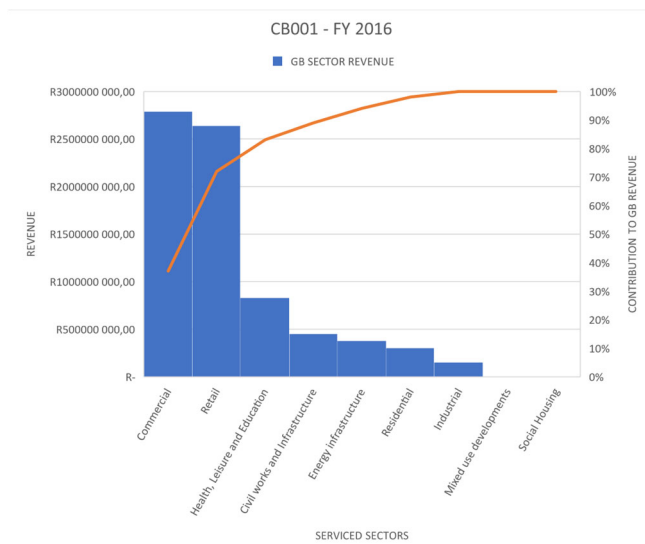


Figure 33: CB001 GB Sector Revenue

The following section details the segments of business for Construction organisation CB001, starting off with the segments by business operations. The business operations within are categorised into four divisions, namely, Building and Civil Engineering, Roads and Earthworks, Developments, and Materials. Client segments are identified by their location – the business has clients in South Africa, Africa, Australia and the United Kingdom.

The business offering which was further analysed to detail as a key focus in this thesis, was that of General Building, which business CB001 has reported under the division of Building and Civil Engineering. In this division, the GB serviced sectors include retail, commercial, residential, health and leisure, industrial, civil works and infrastructure, mixed use developments, social housing and energy infrastructure. Business CB001 also offers services outside the general contracting environment. The division of Materials and Developments comprises other services offered by CB001 and they are grouped as other industries.

5.3.2 Construction organisation CB002

The following section details the segments of business for Construction organisation CB002, starting off with the segments identified by their business operations. The business operations within each segment are categorised into three divisions, Infrastructure, Roads and Earthworks and Materials. The serviced regions are South Africa, and International.

The sector of focus in this thesis is that of General Building which this entity has reported under the division of Building and Civil Engineering. Infrastructure. The serviced sectors within this division include retail, commercial, residential, health, leisure and education, industrial, civil works and infrastructure, mixed use developments, social housing and energy infrastructure.

5.3.3 Construction organisation CB003

The following information is based on the organisations' annual reports and the segments as identified within the documents. The segments identified by their business operations, are: Inland, Coastal, Western Cape, Africa, Mechanical Electrical Piping, Construction and Mining (including Structures and Roads), Building, Roads, Pipelines and Mining Services, Structures. Segments identified by their geography, are: Clients and projects in South Africa, Africa, Australia and the United Kingdom. The General Building service sectors include: Inland, Coastal, Western Cape, Africa, Factories & Warehouse, Shopping and Retail Office and Commercial, Tourism and Leisure, Housing/Residential, Education, Hospitals and medical centres, and Energy generation.

5.3.4 Cross-case data presentation

5.3.4.1 Performance of the construction firms

The following graphs present the performance data collected from the financial records of the three case study firms. Figure 34 shows the percentage revenue growth for the three firms over the observed financial periods, 2016 – 2022. Figure 35 shows the operating profit margin of the three construction businesses, calculated by proportioning the profit as a percentage of the total revenue. All three firms experienced a drop in margins over the 2019 and 2020 financial years. A possible explanation is the impact of the Covid-19 pandemic.

The following graphs present the performance data collected from the financial records of the three firms. Figure 34 show the percentage revenue growth for the three firms over the observed financial periods, 2016 – 2022. Figure 36 shows the ratio of price to sales, which is obtained by dividing the company's market capitalization by the revenue in each financial year.

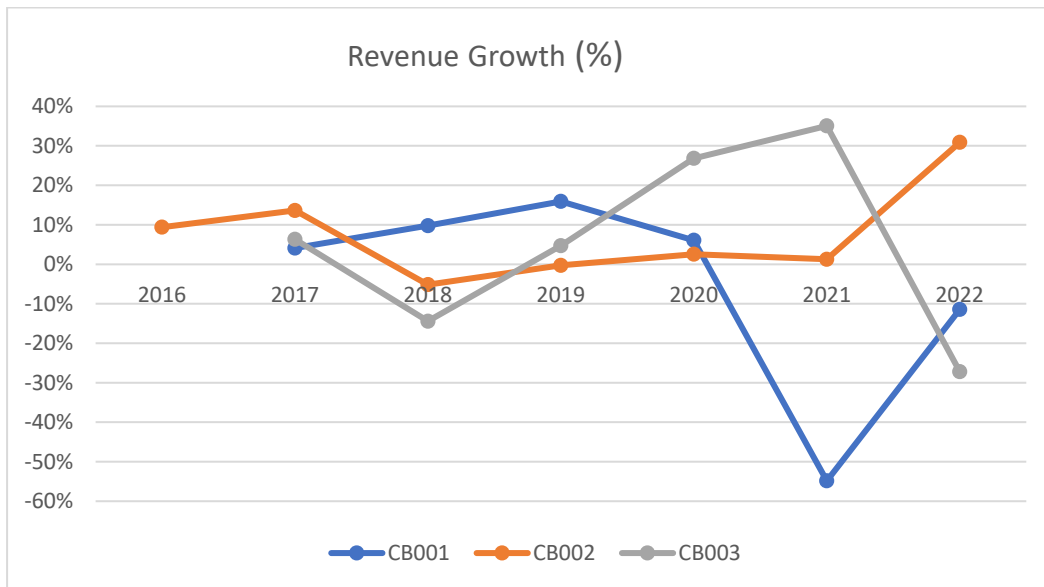


Figure 34: Revenue growth – from three 9GB companies

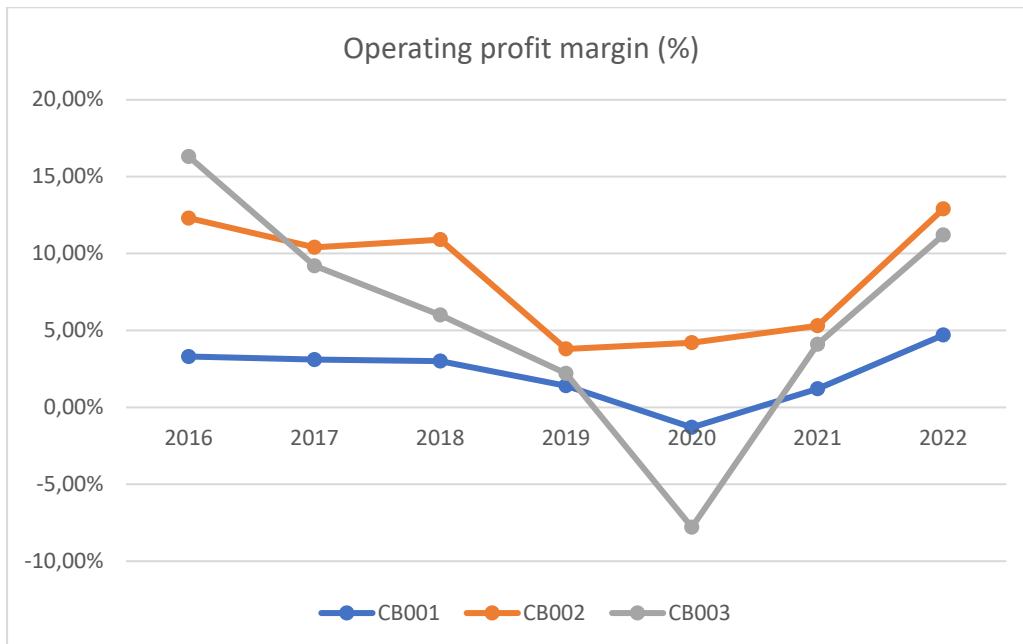


Figure 35: Operating profit/loss margin - from three 9GB companies

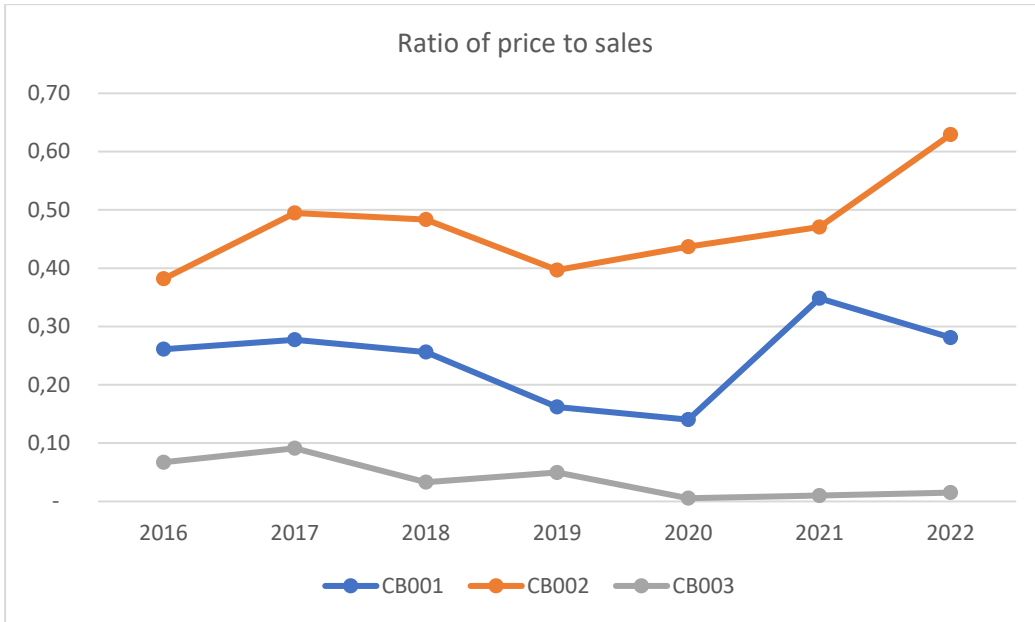


Figure 36: Ratio of price to sales - from three 9GB companies

5.3.4.2 Performance of General Building service sector

Figure 37 shows the overview in revenue, of the serviced sectors over a six-year period, where Industrial Building increased from 2019, with the highest peak in 2021.

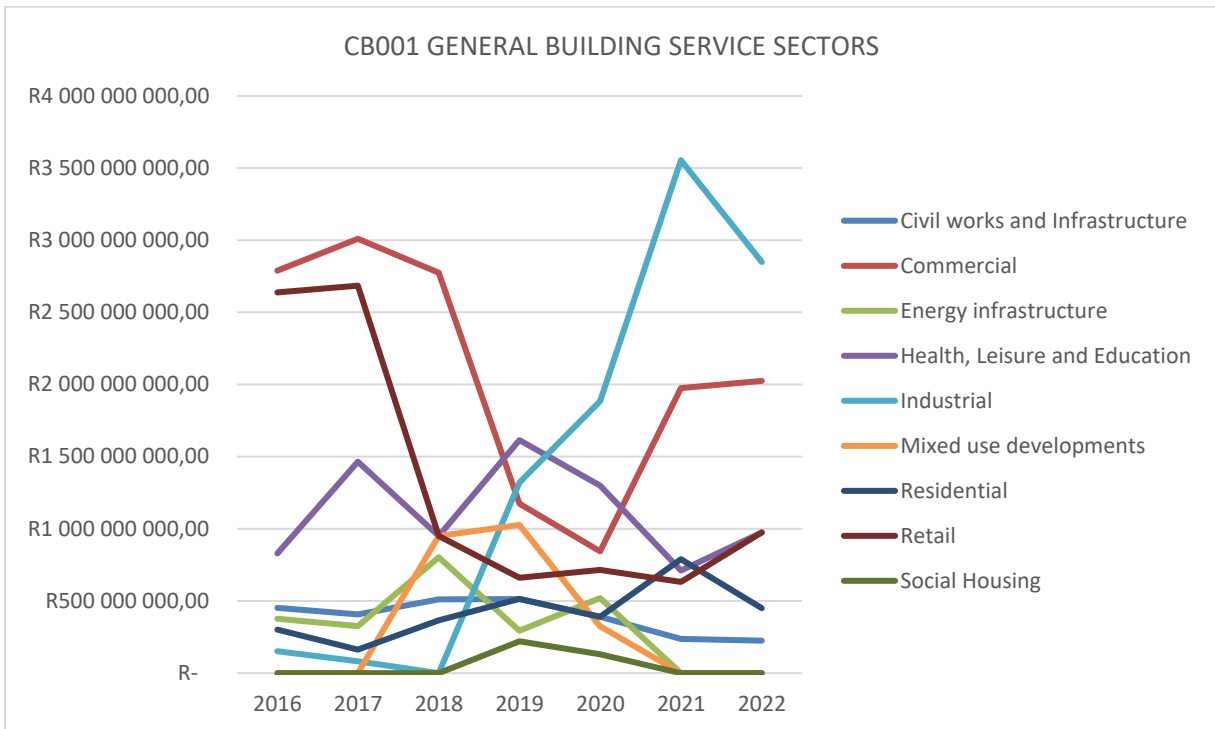


Figure 37: CB001 GB sector revenues

5.3.4.3 Qualitative data presentation – use of business models

The qualitative analysis to capture the value logic within the construction business has been conducted using the NVivo application. 2 shows the test search query conducted within the construction businesses annual reports and documents. The first query across the organisations was the search of the use of “business model”. The result is shown in Figure 38. The term has been used in a similar context across the three case studies. The firms report that they offer diversified business models. The inserts detailed below show the use of the term “business model” within the three case study firms. The insertions are a reflection of thirteen captions found of the term “business model” from the original **total** of over 900 pages worth of company reporting documents, spanning over the 5 year financial periods (2017 – 2022).

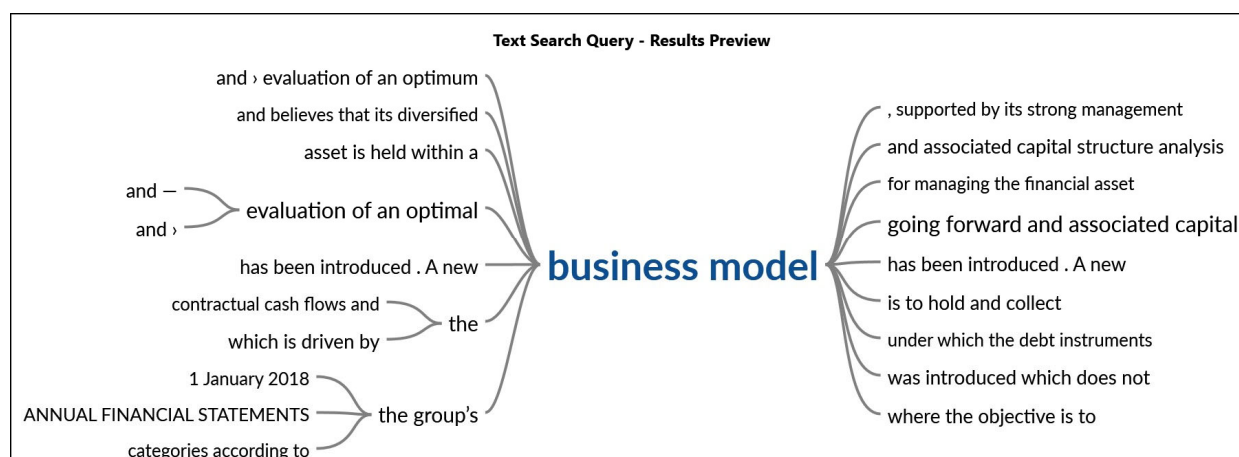


Figure 38: Business model concept in construction



Figure 39: Frequent words - Financial statements

Figure 39 shows the frequent word text search within NVivo, from the files containing financial data.

5.4 Data analysis

5.4.1 Recap of data analysis models

To set the scene and context for this data analysis section, the conceptual framework of the thesis is revisited. At the strategic level, the business model(s) are categorised by the features identified from the participating companies. In this static view, the diversification of business models in construction organisations is assessed. From the assessment, it was found that the key research constructs in this process were the diversification levels within construction organisations. In the implementation phase, the configuration and reconfiguration of resources (dynamic capabilities) was captured. The key constructs were identified as resources. Lastly, the performance of the business was analysed, assessed and correlations were tested among the identified critical success key factors. The key construct was performance, primarily measured through revenue data. In analysing the data to identify correlations and significant meaningful correlations, the data was organized and cleaned to remove any errors or inconsistencies.

To guide the data analysis process, the research objectives and research hypotheses were revisited. The objectives to be further explored in this section should establish whether there were significant relationships between the business model elements and business performance as well as the development of business model framework for construction organisations. In terms of the research hypothesis, the study sought to test if there was a significant correlation between business model configurations and construction organisation performance. The three sub-hypotheses are:

H1₀ : There is no significant relationship between business model diversification and organisational performance.

H1 : There is a significant positive relationship between business model diversification and organisational performance.

*H2₀ :: There is no significant relationship between **dynamic capabilities** and organisation performance*

*H2 : There is a significant relationship between the **dynamic capabilities** and organisation performance*

H3₀ :: The relationship between the business models of a firm and organisation performance is not moderated by its dynamic capabilities

H3 :The relationship between the business models of a firm and organisation performance is moderated by its dynamic capabilities

The data analysis tools employed in this research include IBM SPSS, Excel and NVivo as well as SmartPLS4. These tools have been introduced in the research methodology section of this thesis.

5.4.2 Construct quality analysis

Quality analysis is presented first. It is important to assess goodness of fit in research because it helps to ensure that the model is accurate and reliable. A good fit means that the model is able to accurately predict the values of the data. A poor fit means that the model is not able to accurately predict the values of the data and may not be useful for making inferences about the data. The following quality analyses have been conducted and the results detailed: R-square analysis, construct reliability, discriminant validity and collinearity statistics, in the form of variance inflation factor (VIF).

5.4.2.1 Construct reliability and validity

Reliability refers to the consistency of the data. In other words, it measures how well the investigation has been set up to measure the results, and that that process is replicable. If the data are reliable, then repeated measurements should produce similar results. Validity refers to the accuracy of the data. In other words, it measures how well the data measure what they are supposed to measure. If the data are valid, then they should accurately reflect the true state of the phenomenon being studied. *Table 17* details the construct reliability and validity. Composite reliability is a measure of the internal consistency of a scale. It is calculated by dividing the variance of the observed scores by the sum of the variance of the observed scores and the variance of the error scores. A high composite reliability indicates that the scale is internally consistent and that the items are measuring the same construct. Composite reliability is important because it helps to ensure that the scale is measuring what it is supposed to measure. If the scale is not internally consistent, then the scores on the scale may not be reliable and the results of any analysis using the scale is invalid. There are a number of different ways

to calculate composite reliability. One common method is to use Cronbach's alpha. Cronbach's alpha is a statistic that ranges from 0 to 1. A value of 0 indicates that the items on the scale are not at all related to each other, while a value of 1 indicates that the items are perfectly related to each other. A value of 0.70 or higher is generally considered to be acceptable for composite reliability.

There exist multiple methodologies for evaluating the reliability and validity of constructs. The test-retest reliability approach is the administration of the identical test to the identical subjects on two separate times. The identical test will be administered to the identical subjects on two separate occasions as a component of this protocol. The scores obtained from the two administrations are thereafter compared in order to assess the extent of their divergence. Internal consistency reliability refers to a process wherein a test comprising many items is administered. The items are subsequently subjected to correlation analysis in order to assess the degree to which they effectively capture the same underlying construct. Construct validity refers to the process of evaluating the degree to which the collected data accurately capture the intended theoretical construct that they are intended to represent.

This is accomplished through the analysis of the associations between the data and other indicators of the construct, or through the evaluation of the data's face validity, content validity, and criterion validity. It is imperative to acknowledge that the reliability and validity of constructs are not inherently absolute. It is argued that no metric possesses absolute reliability or validity. Nevertheless, researchers can enhance their confidence in the correctness and significance of their findings by employing diverse techniques to evaluate the reliability and validity of their constructs. There are several supplementary justifications for the significance of construct reliability and validity in the context of data analysis. In order to guarantee the precision and reliability of the data, it is important to verify that they possess sufficient accuracy to substantiate the findings drawn from the study.

In order to ascertain any potential issues associated with the data, such as measurement error or bias, it is imperative to conduct a thorough analysis. In order to draw conclusions about the data, such as making estimations about the parameters of a model or doing hypothesis testing. In order to conduct a comparative analysis of several studies and derive informed conclusions regarding the issue under investigation.

Construct reliability and validity are important concepts in data analysis. By understanding these concepts, researchers ensure that their data are accurate and meaningful, and that their conclusions are valid. R-square is an important metric that indicates the number of the components explained by the factors.

Table 17: Construct validity and reliability

Constructs	Cronbach's alpha	Composite reliability (rho a)	Composite reliability (rho c)	Average variance extracted (AVE)	R-square	R-square adjusted
DIVERS_	0,7808	0,9211	0,8959	0,8119		
PERF_	0,4934	0,8518	0,7636	0,6306	0,8061	0,7923
RESOURCES_	0,1666	0,6577	0,6037	0,5160		

5.4.2.2 Variance inflation factor

A multiple regression model's variance inflation factor (VIF) is a gauge of multicollinearity. When the independent variables in a model have a strong correlation, multicollinearity occurs. This causes problems with the model. The standard errors of the regression coefficients will be larger than they would be if there was no multicollinearity. This means that the coefficients will be less precise, and the p-values will be larger. The confidence intervals for the regression coefficients will be wider than they would be if there was no multicollinearity. This means that there is a wider range of values that the coefficients could be, and that the results are less reliable. The R-squared value for the model will be inflated. This means that the model appears to be better at predicting the dependent variable than it actually is. Table 18 details the VIF results from the study constructs. $VIF > 0,25$ is acceptable and in this study, all VIF values are above 1,00 and less than the recommended maximum of 4 (Hair et al., 2019).

5.4.2.3 Structural analysis model

Structural analysis of a research model is a method of examining the relationships between the different components of a research model. This is done by using a variety of methods, such as graphical analysis, path analysis, and structural equation modelling. Structural analysis is used to answer a variety of research questions, such as assessing how different components of the research model relate to each other, what the impact is of each component to the other components, and to the overall model, and how the model is improved.

Table 18: Variance inflation factor (VIF)

	VIF
DIV_CBM -> PERF_	1,0435
RES_ASSETS_SCALED -> PERF_	1,0073
RES_ASSETS_SCALED x DIV_CBM -> PERF_	1,0373

<u>DISCRIMINANT VALIDITY</u>	DIVERS_	PERF_	RESOURCES_	RESOURCES_ X DIVERS_
DIVERS_				
PERF_	0,2378			
RESOURCES_	1,8482	2,1141		
RESOURCES_ X DIVERS_	0,3168	0,3127	0,6766	

Structural analysis is used to answer a variety of research questions, such as assessing how different components of the research model relate to each other, what the impact is of each component to the other components, and to the overall model, and how the model is improved. Table 19 details the construct reliability and validity figures in this research. Construction business model diversification represented by: DIV_CBM and ; business performance (PERF_) and dynamic capabilities (RESOURCES_) are detailed in Table 19

Table 19: Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DIV_CBM	0,9845	1,0234	0,9922	0,9846
PERF_	0,6000	0,7349	0,8225	0,7012

An essential statistical metric for evaluating a model's general fit is F-squared. A measure of how much variance in the dependent variable is explained by the model's independent variables is called F-squared. A higher F-squared value indicates a better fit of the model. Table 20 indicates the f-square values from the study's key constructs. The resources have the highest f-square value compared to diversification levels and thus, are a better fit for a construct that has the biggest correlation to performance. F-square values of more than 0,20 are considered a good fit.

Table 20: f-square

	f-square
DIV_CBM -> PERF_	0,0343
RES_ASSETS_SCALED -> PERF_	3,9847
RES_ASSETS_SCALED x DIV_CBM -> PERF_	0,0169

Table 21 details the latent variables scores from the PLS-SEM analysis. These figures are further used in various sections going forward. The detailed PLS-SEM report is included in the PLS-SEM annex of this thesis.

Table 21: Constructs and scores

General Contractor No.	DIVERS_	PERF_	RESOURCE S_	RESOURCES_ x DIVERS_
0	-0,5921	-1,2099	-1,3644	0,8079
1	0,3891	-0,4516	-1,2426	-0,4835
2	1,0191	-0,4496	-1,1208	-1,1422
3	0,9173	1,3788	1,3621	1,2494
4	-0,6700	1,2964	1,2174	-0,8157
5	-0,7479	-0,4472	-0,5190	0,3882
6	-0,9036	-1,2085	-1,4253	1,2879
7	-0,6700	1,1294	1,2174	-0,8157
8	1,0970	0,3134	0,6157	0,6754
9	-1,8070	0,3306	0,2198	-0,3971
10	-0,6700	0,3232	0,3416	-0,2289
11	-0,7479	-0,4474	-0,5190	0,3882
12	-0,1631	-1,2171	-1,3491	0,2200
13	-0,7479	0,3312	0,3416	-0,2555
14	0,3651	1,1000	1,2859	0,4695
15	0,4670	-1,2105	-0,3820	-0,1784
16	-0,6700	1,1088	1,2174	-0,8157
17	2,1561	0,3153	0,7679	1,6557
18	0,4882	0,3253	0,4939	0,2411
19	0,9173	0,3213	0,5015	0,4600
20	-0,6700	-1,2164	-1,3644	0,9141
21	1,0970	-1,2090	-0,2449	-0,2687
22	0,3297	-1,2082	-1,3111	-0,4323
23	1,3420	-1,2153	-1,1893	-1,5960
24	0,3226	1,1348	1,2859	0,4149
25	-0,3003	-0,4553	-0,4276	0,1284
26	-1,7857	0,3075	0,2198	-0,3925
27	-1,8070	0,3090	0,2198	-0,3971
28	1,3703	-0,4552	-0,2449	-0,3356
29	0,3891	-0,4487	0,4786	0,1862
30	1,8800	1,2971	1,5981	3,0044
31	1,0758	1,0944	0,5243	0,5640
32	-0,6488	-1,2179	-1,3644	0,8852
33	1,5827	-1,2122	-1,0522	-1,6654
34	-0,6488	-1,2125	-0,5038	0,3268
35	-0,7266	-0,4554	-0,5190	0,3771
36	-0,7266	-0,4539	-1,3796	1,0025
37	-0,8045	-0,4522	-0,5342	0,4298
38	-0,6488	0,3332	1,2174	-0,7898
39	-1,7857	1,0966	1,0804	-1,9293
40	-0,6700	-0,4518	-0,5038	0,3375
41	0,0139	0,3115	-0,4581	-0,0064
42	0,9173	3,1408	1,3621	1,2494
43	0,6227	1,1178	1,4154	0,8813
44	1,1749	1,0998	1,4915	1,7523
45	-0,3216	-1,2103	-1,4557	0,4681

5.4.3 Test of significant correlation within construction business model elements

The development and validation of a construction business model is a critical element of this thesis. The result of this process is a well-designed and validated business model that defines the construction company's value proposition, target customers, revenue streams, and the resources and activities needed to deliver the value proposition in the construction industry.

Table 22: Correlations & covariance

Correlations	DIV_CBM	PERF_	RES_ASSETS_SCAL ED	RES_ASSETS_SCAL ED x DIV_CBM
DIV_CBM	1,0000	0,1681	0,0836	0,1889
PERF_	0,1681	1,0000	0,8911	0,1028
RES_ASSETS_SCAL ED	0,0836	0,8911	1,0000	0,0325
RES_ASSETS_SCAL ED x DIV_CBM	0,1889	0,1028	0,0325	1,0000
Covariances				
DIV_CBM	1,0000	0,1681	0,0836	0,1797
PERF_	0,1681	1,0000	0,8911	0,0978
RES_ASSETS_SCAL ED	0,0836	0,8911	1,0000	0,0309
RES_ASSETS_SCAL ED x DIV_CBM	0,1797	0,0978	0,0309	0,9048

In assessing correlations between the business model constructs, Table 23 details the analysis. It uses the in-depth data – mappings across the constructs – Diversification of Business models (by sector and internationalisation) and Resources (Physical, Human, and Financial).

International diversification proved significant across all the other variables, with a negative, significant correlation with industry diversification, construction sector diversification and physical resources, and a positive correlation with human resources.

An increase in human resources leads to an increase in international diversification levels, and an increase in international diversification reduces industry diversification and/ or construction sector diversification, as well as physical resources.

Table 23: Construct correlations

		Industry Diversification	Construction Sector Diversification	Physical Resources	Human Resources	Financial Resources
Construction Sector Diversification	Pearson Correlation	-.011				
	Sig. (2-tailed)	.962				
	N	20				
Physical Resources	Pearson Correlation	.373	.612**			
	Sig. (2-tailed)	.105	.004			
	N	20	20			
Human Resources	Pearson Correlation	-.358	-.753**	-.764**		
	Sig. (2-tailed)	.121	<.001	<.001		
	N	20	20	21		
Financial Resources	Pearson Correlation	.049	-.177	-.366	.023	
	Sig. (2-tailed)	.836	.455	.103	.920	
	N	20	20	21	21	
International diversification	Pearson Correlation	-.589**	-.700**	-.817**	.924**	.172
	Sig. (2-tailed)	.006	<.001	<.001	<.001	.456
	N	20	20	21	21	21

** . Correlation is significant at the 0.01 level (2-tailed).

5.4.4 Hypothesis testing

The study hypothesises that: *There is a significant relationship between business model diversification (DIV_CBM), dynamic capabilities (RESOURCES) and construction organisation performance (PERFORMANCE)*. This hypothesis has three sub-hypotheses:

- H_0 : *There is no significant relationship between business model diversification and organisational performance.*
 - H_a : *There is a significant positive relationship between business model diversification and organisational performance.*
-
- H_1 : *There is a significant relationship between the **dynamic capabilities** and organisation **performance***
 - H_{1a} : *There is no significant relationship between **dynamic capabilities** and organisation **performance***
-
- H_2 : *The relationship between the business models of a firm and organisation performance is moderated by its dynamic capabilities*
 - H_{2a} : *The relationship between the business models of a firm and organisation performance is not moderated by its dynamic capabilities*

Figure 40 revisits the conceptual framework to be tested, through the hypothesis formulated.

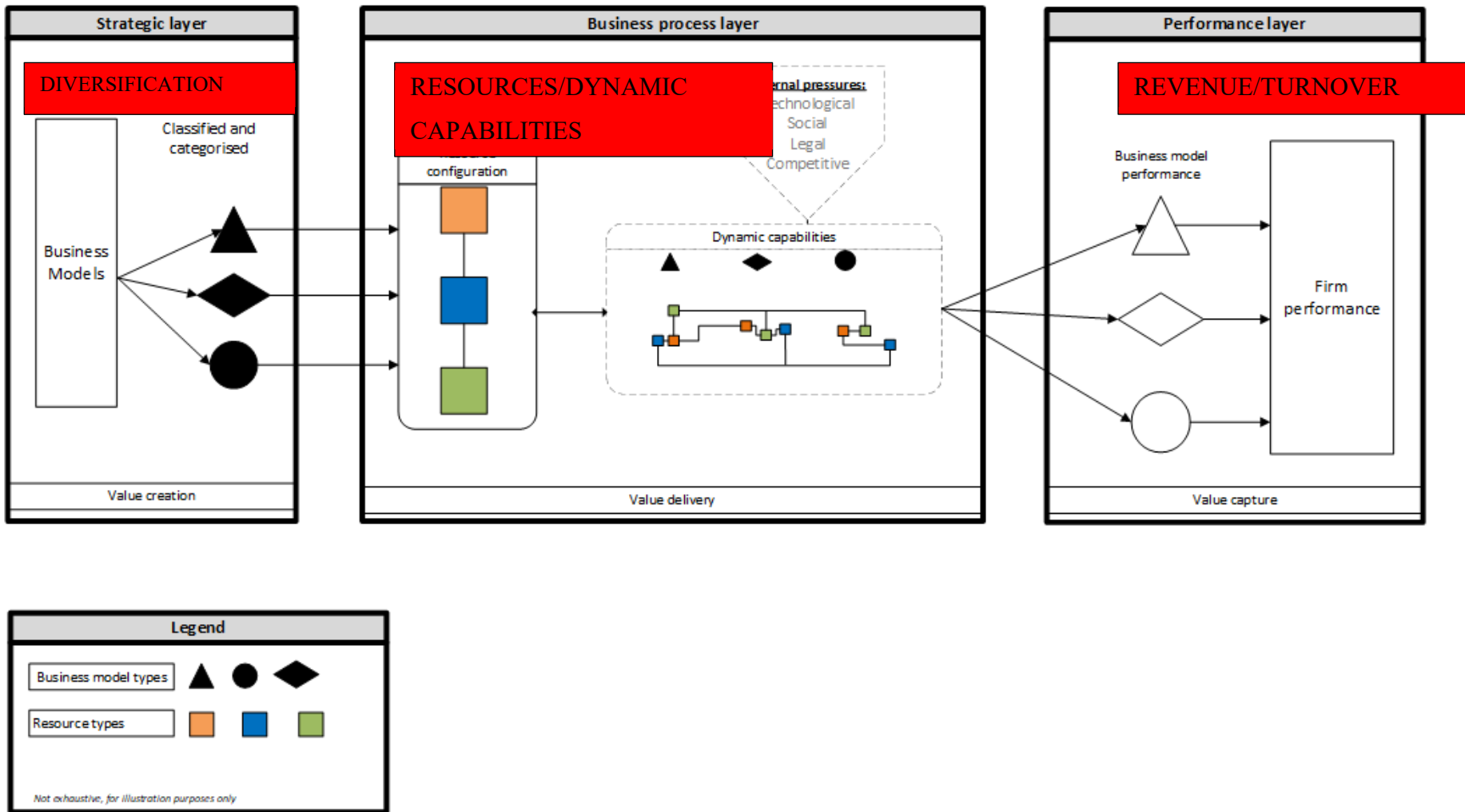


Figure 40: Revisiting research framework

Figure 41 details the PLS-SEM analysis conducted to test the hypothesis. This iteration tested the correlation where the construction business model diversity (DIV_CBM) represents the latent variable, resources the mediating factor and relative impact to business performance. The data received from the firms was ranked, scaled and weighted to allow for meaningful analysis.

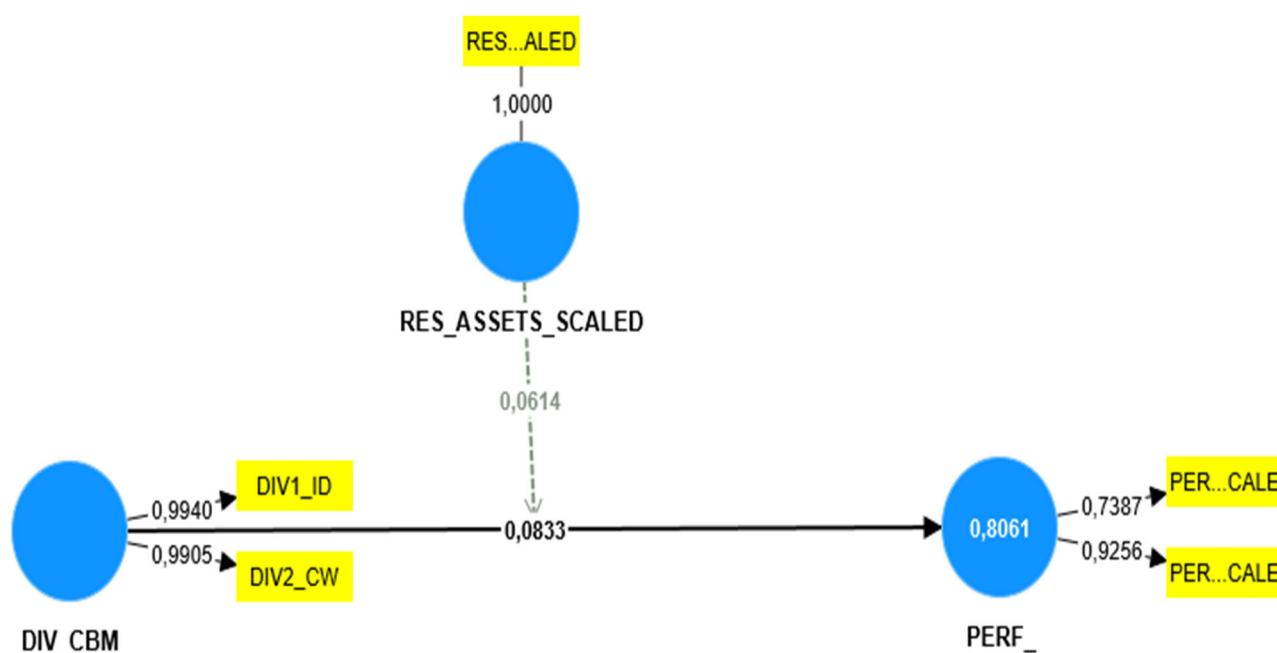


Figure 41: Hypothesis testing

Table 24: Constructs Path coefficients

CONSTRUCTS	Path coefficients
DIV_CBM -> PERF_	0,0833
RES_ASSETS_SCALED -> PERF_	0,8822
RES_ASSETS_SCALED x DIV_CBM -> PERF_	0,0614

Path coefficients are displayed in Table 24, and Table 25 shows the loadings and weights of the constructs. These results are a continuation of the details of the PLES-SEM analysis in Figure 41. The hypothesis results from these illustrations are discussed next. The p-values from the bootstrapping process are displayed in Table 25 and Table 26.

Table 25: Loadings and weights

<u>Outer loadings</u>	DIV_CBM	PERF_	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
DIV1_ID	0,9940			
DIV2_CW	0,9905			
PERF_NAV_SCALE		0,7387		
PERF_REV_SCALE		0,9256		
RES_ASSETS_SCALED			1,0000	
RES_ASSETS_SCALED x DIV_CBM				1,0000
<u>Outer weights</u>				
DIV1_ID	0,5613			
DIV2_CW	0,4463			
PERF_NAV_SCALE		0,4189		
PERF_REV_SCALE		0,7460		
RES_ASSETS_SCALED			1,0000	
RES_ASSETS_SCALED x DIV_CBM				1,0000

Table 26: p-values

	P values
DIV_CBM -> PERF_	0,2862
RES_ASSETS_SCALED -> PERF_	0,0000
RES_ASSETS_SCALED x DIV_CBM -> PERF_	0,4530

5.4.4.1 Diversification of business models and firm performance

The following hypothesis is tested:

- H_0 : There is no significant relationship between business model diversification and organisational performance.
- H_a : There is a significant positive relationship between business model diversification and organisational performance.

The results of the PLS-SEM analysis indicate a path coefficient of 0,0833, for the path diversification levels of business models (DIV_CBM) and firm performance (PERF). This result shows a very weak positive path as it is closer to zero than one, in the range (-1;1). Though not significant, it is a positive path, in that, increase in the level of diversity within a firm, would result in an increase in its performance, though this is very weak. With a p-value of 0,286, the relationship is not significant, thus, H_0 is accepted:

- H_0 = There is no significant relationship between business model diversification and organisational performance.

Null hypothesis accepted.

No further statistics are presented beyond this point.

5.4.4.2 Dynamic capabilities and firm performance

The results of the PLS-SEM analysis indicate a path coefficient of 0,8822, for the path dynamic capabilities (RES_ASSETS) and firm performance (PERF). This result shows a very strong positive path as it is closer to one in the range (-1;1). An increase in the dynamic capabilities path result to an increase in performance. With a strong magnitude in the path, the p-value also proved significance of the relationship, with a p-value of 0,000; less than 0.05 the relationship is significant, thus, H_1 is accepted:

- H_1 : There is a significant relationship between the **dynamic capabilities** and **organisation performance**

5.4.4.3 Dynamic capabilities as a moderating construct

With the resources removed from the equation, and diversification tested for correlation with business performance, the result indicates a weak, non-significant path as shown in

Figure 42 The results from

Figure 41 are used to further test for correlation when dynamic capabilities are introduced as the mediating factor.

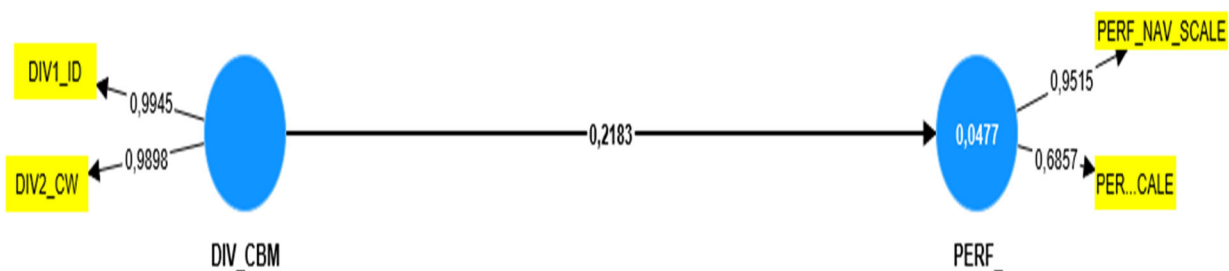


Figure 42: Hypothesis testing for mediating construct

The results of the PLS-SEM analysis indicates a path coefficient of 0,8822, for the path dynamic capabilities (RES_ASSETS) as mediating factor towards firm performance. This result shows a very strong positive path as it is closer to one in the range (-1;1). An increase in the dynamic capabilities path resulted in an increase in performance. With a strong magnitude

in the path, the p-value also proved the significance of the relationship, with a p-value of 0,000; less than 0.05 the relationship is significant, thus, H_2 is accepted:

- H_2 : *The relationship between the business models of a firm and organisation performance is moderated by its dynamic capabilities*

5.5 Validation of the conceptual model

The conceptual framework presented in this study is grounded in the resource-based view of the company. According to this theoretical perspective, the services generated by resources are influenced by their utilization, as well as their interaction with many other resources of varying types and quantities. This perspective additionally argues that in order for a company's strategy to be enduring, it must be deeply rooted in the company's resources and capabilities. The case study rich data is used to validate both the conceptual model and the hypothesis tested earlier. Dynamic capabilities proved to have a significant impact on the performance of business models and thus, the organisational performance of the firm. Figure 43 illustrates shows the overlay of the conceptual model over the conceptual framework of the study.

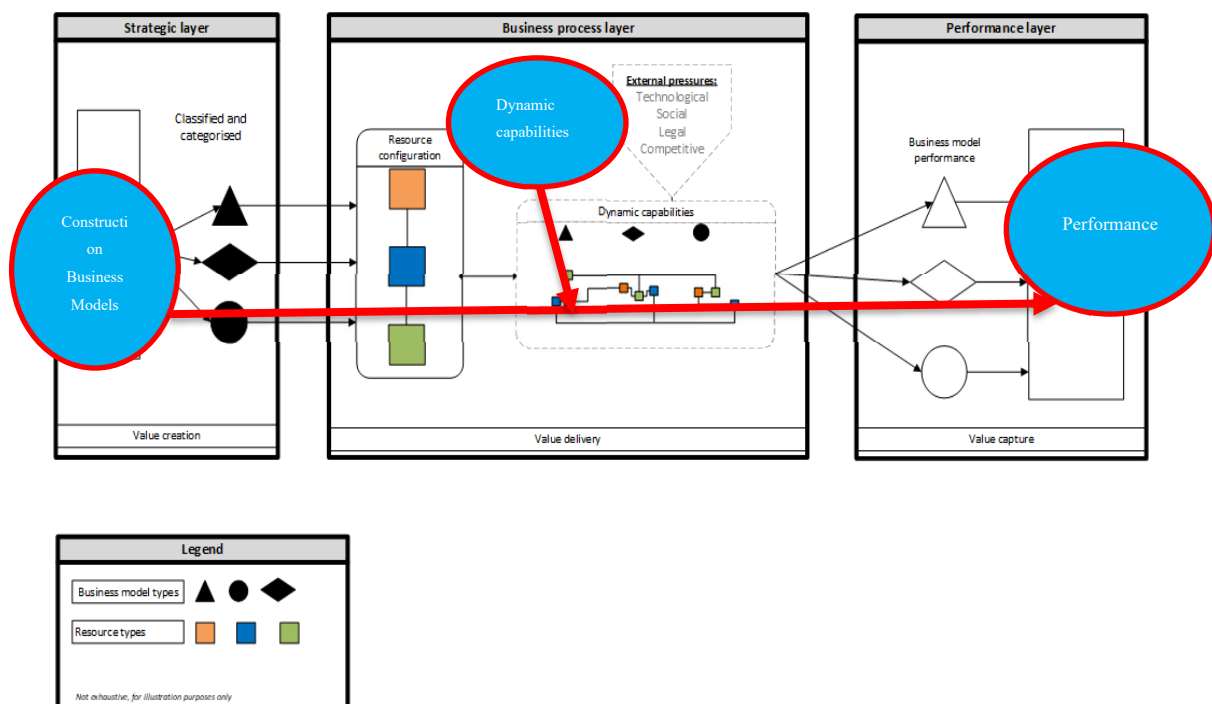


Figure 43: Validating the conceptual model

The conceptual framework of the thesis is underpinned by the primary theories, the resource-based view of the firm, the dynamic capabilities theory and the theory of differential performance. These both arise from the Strategic and Business Management domains. Figure 43 illustrates the framework of the thesis using the three key components of business models, namely value creation, value delivery and value capture. These components are also depicted in line with the strategic, business processes and performance layers of organisations. The tested hypothesis is also layered over the illustration to visualise the paths that are tested and the directions. The conceptual model using richer case study data is of similar 9GB firms' within depth data, as earlier presented under the case study section of the data presentation chapter. The PLS-SEM in Figure 44 details the results obtained from the validation data set. The overall r-square value is 0,7458.

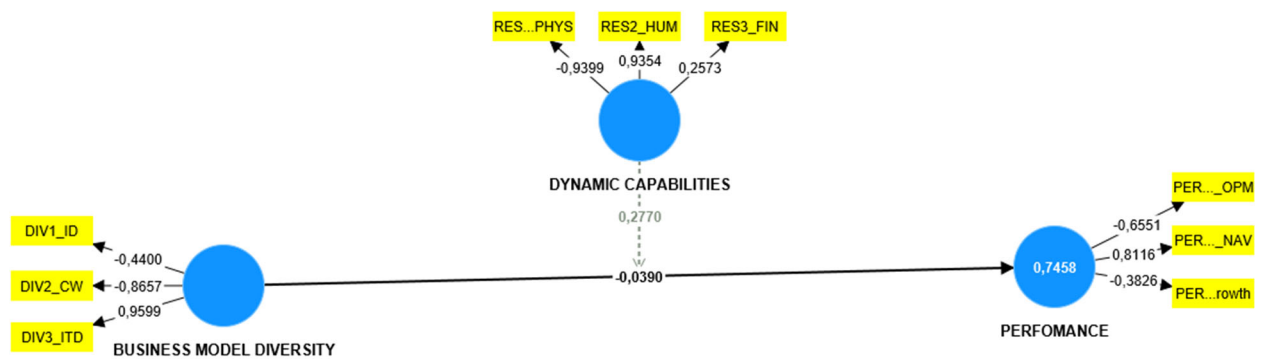


Figure 44: Validation of conceptual model

5.6 Coded framework for optimum construction business performance

Business model frameworks are crucial for understanding, analyzing, and designing business models. Table 28 illustrates the coded framework for construction business models. This coded construction business model canvas is a presentation of the components within a construction business, as found within the survey and validated with the case study data. This study found that the aggregated core services within construction organisations are construction, management, engineering, development and project services being core. Table 27 re-introduces the key measures used in the rich case study data, in validating the conceptual model designs and variables that make up each dimension within a business model.

Table 27: Validation of conceptual model

Business model dimensions	Business layers	Constructs	Code	Variables
Value creation	STRATEGIC LAYER	Business model diversification	DIV1_ID	Industry Diversification
			DIV2_CW	Class of work diversification
			DIV3_ITD	International diversification
Value delivery	OPERATIONS LAYER	Dynamic capabilities (configuration of resources, competencies and capabilities)	RES1_PHYS	Resources_Physical_value
			RES2_HUM	Resources_Human_value
			RES3_FIN	Resources_Financial_value
			RES_Employees	Resources_no_employees
			RES_ASSETS	Resources_assets_value
			RES_LIABILITIES	Resources_liabilities
			RES4_CAPEX	Resources_capex
Value capture	PERFORMANCE LAYER	Business performance	PERF1_REV	Performance_revenue
			PERF1_OPM	Performance_operating profit margin
			PERF3_REVgrowth	Performance_revenue growth
			PERF_MARKET_cap	Performance_market capitalisation
			PERF_DEratio	Performance_debt equity ratio
			PERF2_NAV	Performance_net asset value
			PERF_REVrank	Performance_revenue rank
			EQUITY	Performance_equity
			ROA	Performance_return on assets
			ROE	Performance_return in equity

The key partners within construction businesses are found to be suppliers, materials providers, adding onto suppliers, manufactures and constructors. In assessing correlations between the business model constructs, the study found that international diversification is found to have a negative, significant correlation to industry diversification, construction sector diversification and physical resources with a positive correlation to human resources. The study also found out that an increase in human resources leads to an increase in international diversification levels and an increase in international diversification reduces industry diversification and or construction sector diversification as well as physical resources.

Table 28: Construction business model coded canvas

<p>Key partners</p> <p>% Input variables Partners_suppliers = input("Enter value of key suppliers: "); Partners_subbies = input("Enter value of key subbies: "); Partners_other = input("Enter value of key other partners: ");</p>	<p>Key activities</p> <p>% Input variables act_building = input("Enter value for GB: "); act_civil = input("Enter value for CE: "); act_constr_other = input("Enter value for other construction activities: "); act_constr_all = input("Enter value for all construction activities: "); act_non_construction = input("Enter value for non construction activities: ");</p>	<p>Value proposition(s) – key offering(s)</p> <p>% Input variables Construction_all = input("Enter all construction goods and services offered: "); non_construction_goods_and_services = input("Enter non-construction goods and services offered: ");</p>	<p>Client relationships</p> <p>% Input variables client_satisfaction = input("Enter client satisfaction value: "); client_repeat = input("Enter repeat/return client value: ");</p>	<p>Client segments</p> <p>% Input variables client_public = input("Enter sales from public clients: "); client_private = input("Enter sales from private clients: ");</p>
	<p>Key resources</p> <p>% Input variables resource_financial = input("Enter financial resource: "); resource_physical = input("Enter physical resource: "); resource_human = input("Enter human resource: ");</p>		<p>Distribution channels</p> <p>% Input variables Proc_designbidbuild = input("Enter sales from traditional procurement: "); Proc_designbuild = input("Enter sales from design and build: "); Proc_managementcontract = input("Enter sales from managementcontract: ");</p>	
<p>Cost models</p> <p>% Input variables cost_building = input("Enter cost from GB: "); cost_civil = input("Enter cost from CE: "); cost_constr_other = input("Enter cost from other construction activities: "); cost_constr_all = input("Enter cost from all construction activities: "); cost_non_construction = input("Enter cost from non construction activities: ");</p>		<p>Revenue streams</p> <p>% Input variables rev_building = input("Enter revenue from GB: "); rev_civil = input("Enter revenue from CE: "); rev_constr_other = input("Enter revenue from other construction activities: "); rev_constr_all = input("Enter revenue from all construction activities: "); rev_non_construction = input("Enter revenue from non construction activities: ");</p>		

The coded construction business model maps out all the key variables across the nine business model elements. This coded canvas is developed using all the key business model dimensions and variables that make up each of the constructs.

5.7 Chapter summary

The data presentation and analysis chapter, which presents the data in a systematic manner, is a crucial element. This study's data set comprises survey information that describes the firmographics of the represented businesses as well as the demographics of those who answered to the survey. Comprehensive corporate settings and performance information for the three examples that were chosen for this study were included in the case study data. The data is then analyzed using the methods and instruments provided in the section on research methodology. Both hypothesis testing and conceptual model validation are carried out. The chapter comes to a close with a presentation of the coding foundation for the best possible design and performance of a construction business model.

CHAPTER SIX

6 DISCUSSION OF FINDINGS

This chapter offers a discussion of the findings of the thesis. Research findings are a crucial component of this research study, as they present the results of the thesis in an organized and systematic manner. This chapter is structured by firstly revisiting the background of the thesis and providing a repeat statement of the research problem, identifying the thesis objectives and research questions. The research objectives are used to guide the discussion, and for coherence in reporting and addressing the aim of the thesis. In discussing the findings, the research methodology is also explained in relation to the findings observed, and in comparison to the existing body of knowledge on related studies. The data analysis methods are also discussed to enhance the arguments made within this chapter.

6.1 Review of the study

The research question in this study sought to find out the levels of diversity within construction business models and their impact on business performance. The implicit question was: What are the common business models within construction contractor businesses? The levels of diversity within construction organisations have been analysed using the cidb's register of contractors' (ROC) grading as a basis of the weighting, as discussed in Chapter Four of this study. The findings presented show that the key offerings within construction businesses (in addition to construction services) are: management services (management contractor), project management, and property development, amongst other non-construction business activities. The key resources included engineering equipment, knowledge, materials, plant, employees and software. Key partners are found to be suppliers, other contractors, manufacturers and consultants.

6.2 Business models as strategic management tool

The qualitative data analysis of the case study firms are in line with what was introduced and discussed in the literature review, where business models are used by organisations as a management tool, and the term “evaluation of an optimum business model” is common across entities (Seddon and Lewis, 2003; Seddon et al., 2004; Casadesus-Masanell and Ricart, 2010; Teece, 2010).

6.3 Objective I - Predominant construction business models

As discussed in the literature review chapter earlier in this thesis, there is a wide range of research on construction business models (CBM's), as the construction industry is a large and complex field. Some common topics under which these business models are classified include project delivery methods, procurement strategies, risk management, and innovation in the industry. These classifications within the literature offer different types of construction business models. Under the procurement method classification, business models include design-bid-build, design-build, construction management, and public-private partnerships (PPP). In this research, classes of works are used in measuring and identifying predominant construction business models within construction contractors.

The study narrowed its focus to the large General Building Contractors, defined as Grade 9 General Building (9GB) on the list of contractors as per the cidb ROC. Within these construction business, the study found that contractors register for numerous other classes of work. Each business model has its own advantages and disadvantages, and the choice of a business model will depend on the specific business, project and the goals of the stakeholders. Markides and Charitou (2004) as reviewed in Chapter Two of this thesis, identified that it is possible to run two business models concurrently while sufficiently integrating them to take advantage of all possible synergies. This notion has been visible on the studied construction entities, in that, a single construction entity has been found to be active in multiple classes of construction business activities. As the focus of the study was narrowed to General Building construction contractors, 8% of companies showed a single registered class of work, as General Construction Contractor for Building works (9GB). This class has no diversification in its construction contracting revenue, where the sum of its revenue is primarily achieved from General Building contracts. Firms with two classes of work accounted for 37%, mainly being

9 GB and General Civil Engineering Contractor (9 CE) or any other Main Contractor class of work. About 26% have more than three Main Contractor classes and Specialist classes of work, and 29% of firms have more than four classes of Main Contractor registration.

According to Markides (2013), there is a lack of a theoretical framework about the ability of a firm to operate many business models concurrently. According to Markides (2013), the suggestion is made to incorporate concepts from the ambidexterity literature in order to effectively manage several business models concurrently. This approach focuses on three key domains that enable the simultaneous handling of many business models. The concept of spatial separation, which involves the physical separation of two distinct activities into separate units, brings forth the question of how to effectively harness the potential synergies that may exist between these two competing activities. Temporal separation is a viable approach to attain this objective, indicating that an organisation engages in two tasks that may appear contradictory, but not concurrently (such as exploration and exploitation). Contextual ambidexterity may be effective in situations where a company is able to provide a suitable environment that fosters and facilitates the attainment of a state of equilibrium among the various competing demands on an employee's time and attention (Markides, 2013). Casadesus-Masanell and Ricart (2010) elucidated the coexistence of numerous business models within a singular organisational entity, so reinforcing the assertions made by other scholars that strategy has a pivotal role in both the selection and the configuration of a business model.

6.4 Objective II- Value logic used by construction organisations

Based on a review of literature, Alexius Meinong (1853-1920) proposed a theoretical framework for understanding value, which consists of four essential components. These components include a value subject, who is the individual experiencing the value; a value feeling, which is either positive or negative and is directed towards a value object; the value feeling arises as a consequence of the value subject's contemplation; and finally, a judgement is made regarding the actualization or existence of the value object (Rescher, 1982, as cited in Nailer and Buttriss, 2020). In their study, Achtenhagen et al. (2013) examined and analyzed three distinct important competencies that play a crucial role in facilitating the creation of value within the context of opportunities, resources, and organisational culture. The capacity to

explore and capitalize on business prospects is a crucial competency that necessitates the evaluation, modification, and potential augmentation of the current company model. Using resources in a balanced way, which talks to the dynamic capabilities, where firms reconfigure the use of resources to best suit the business model. Lastly, Achtenhagen *et al.* (2013) identifies a critical capability by firms being able to achieve coherence between leadership, a strong organisational culture and employee commitment. All these critical capabilities in the value creation process, are aligned with the theories presented in this thesis, that of differential performance, the resource-based view of the firm, the dynamic capability theory and contingency theory.

This study found that the aggregated core services within construction organisations were construction, management, engineering, development and project services. Value proposition logic refers to the way a construction organisation communicates the value it provides to its customers, stakeholders, and other partners. The following are some of the common types of value proposition logic used by construction organisations. The first form of value is in cost savings. This type of value proposition logic focuses on reducing costs for the customer by providing more efficient and cost-effective solutions. Second is the value of quality improvement; this type of value proposition logic focuses on improving the quality of the construction process and the end product, resulting in better outcomes for the customer. Third is the value of time saving. This type of value proposition logic focuses on reducing the time required to complete a construction project, allowing the customer to realize benefits sooner. Fourth is the value of innovation. This type of value proposition logic focuses on introducing new and innovative solutions to construction problems, helping the customer to achieve better outcomes. Fifth is the value of customization. This type of value proposition logic focuses on providing customized solutions to meet the specific needs of the customer, resulting in a better fit for their individual requirements. Sixth is the value of expertise. This type of value proposition logic focuses on the expertise and experience of the construction organisation, helping the customer gain a unique benefit from the organisation's knowledge and skills. Lastly, reputation is a form of value. This type of value proposition logic focuses on the reputation of the construction organisation, using its past performance and track record to demonstrate its ability to deliver high-quality results. The construction organisations' studies use these various types of value proposition logic to articulate the benefits they offer to their customers, and differentiate themselves from their competitors.

6.5 Objective III & IV - Business model performance as predictor of performance

The results of the PLS-SEM analysis indicate a path coefficient of 0,0833, for the constructs: diversification levels of business models (DIV_CBM) and firm performance (PERF). This result shows a very weak positive path as it is closer to zero than one, in the range (-1;1). Though not significant, it is a positive path, in that, increase in the level of diversity within a firm, would result in an increase in its performance, though this is very weak. With a p-value of 0,286, the relationship is not significant. As the business model of a construction company provides valuable information about its past performance and is used to make predictions about its possible future levels of performance. However, it is important to note that a company's business model is just one of several factors that influence its future performance. Some of the key elements of a construction company's business model, such as its project delivery method, focus, and resource allocation, provide insights into its strengths and weaknesses. They also articulate how it is able to respond to market changes and opportunities. For example, a construction company with a strong focus on technology and innovation is better positioned to adapt to changes in the industry, and take advantage of new opportunities.

In addition, the financial performance of a construction company, such as its revenue growth, profitability, and return on investment, provide insight into its past performance. This is useful to make predictions about its future performance. For example, a construction company with a consistent track record of profitability is better positioned to weather economic downturns and maintain its performance over the long term. However, it is important to keep in mind that the construction industry is subject to many external factors, such as changes in the economy, regulations, legislation, and competition, that have a significant impact on a company's performance. As such, it is important to consider a wide range of factors when making predictions about a construction company's future performance.

The results of the PLS-SEM analysis indicate a path coefficient of 0,8822, for the path dynamic capabilities (RES_ASSETS) and firm performance (PERF). This result shows a very strong positive path as it is closer to one in the range (-1;1). An increase in the dynamic capabilities path result to an increase in performance. With a strong magnitude in the path, the p-value also

proved significance of the relationship, with a p-value of 0,000; less than 0.05 the relationship is significant. While a company's business model provides valuable information about its past performance and is used to make predictions about its future performance, the model is just the one of several factors that should be considered. The elements of a business model, such as the project delivery method, ownership structure, focus, management structure, resource allocation, and business processes, all impact the future performance of a construction company. For example, a construction company with a well-defined and efficient project delivery method, a strong management structure, and a focus on high-quality work is more likely to successfully complete projects on time and within budget, leading to improved performance. Similarly, a construction company with a well-defined resource allocation strategy and a focus on investment in technology and equipment is more likely to improve its productivity and efficiency, leading to improved performance. However, it is important to note that business model performance is not the only factor that impacts the future performance of a construction company. Other factors such as the state of the economy, competition, regulations, and the availability of skilled labour also have a significant impact.

The results of the PLS-SEM analysis indicates a path coefficient of 0,8822, for the path dynamic capabilities (RES_ASSETS) as mediating factor towards firm performance. This result shows a very strong positive path as it is closer to one in the range (-1;1). An increase in the dynamic capabilities path resulted in an increase in performance. With a strong magnitude in the path, the p-value also proved the significance of the relationship, with a p-value of 0,000; less than 0.05 the relationship is significant

6.6 Objective V & VI Relationships between the business model elements

There are significant differences in the elements of different construction business models. The study found the choice of construction business model depends on factors such as the type of project, the complexity of the project, the risk tolerance of the parties involved, and the preferences of the owner. The study also found that the ownership structure of a construction business may vary from a sole proprietorship to a multinational corporation. This impacts the resources available to the business, the level of risk involved, and the decision-making process. The method used to deliver construction projects is found to vary between business models,

such as general contracting, design-build, construction management, or integrated project delivery. The focus of a construction business varies depending on the type of projects it specializes in, such as residential, commercial, industrial, or infrastructure and the focus of a business also varies in the type of services it offers, such as design, construction, or maintenance.

The management structure of a construction business varies from a flat organisational structure with few layers of management, to a hierarchical structure with multiple levels of management. This impacts the level of control and oversight exercised over the business. The allocation of resources, such as capital, equipment, and labour, varies between construction business models. For example, some businesses prioritize investment in technology, while others focus on acquiring and maintaining a large fleet of equipment.

The processes used by a construction business to manage projects varies, such as project planning, scheduling, budgeting, and risk management. The level of standardization and automation of these processes also vary between businesses. The level of responsibility for design, construction, and project management vary between construction business models. For example, in a general contracting model, the general constructor is responsible for overseeing all aspects of the project, while in a design-build model, the design-build firm is responsible for both design and construction.

The level of collaboration between stakeholders varies between construction business models. In an Integrated Project Delivery (IPD) model, all stakeholders work together as a team, while in a construction management model, the construction manager works on behalf of the owner to manage the construction process. The type of contracts used, and the responsibilities of the parties involved, vary between construction business models. For example, in a design-build model, the design-build firm has a single contract with the owner, while in a general contracting model, there are separate contracts between the owner and each trade constructor. The distribution of risk between the parties involved varies between construction business models. In a general contracting model, the general constructor bears more risk, while in a design-build model, the owner bears more risk. The level of control and decision-making authority vary between construction business models. In a construction management model, the construction

manager has more control over the construction process, while in a design-build model, the design-build firm has more control over both design and construction.

6.7 Objective VI - Development of a business model and a performance framework

The construction industry plays a vital role in the economic development of a country and is influenced by various internal and external factors. To understand the impact of these factors, the PESTELE framework is used as a tool to analyse the macro-environmental influences on the construction industry. The industry is significantly impacted by government policies and regulations. The building codes, labour laws, and environmental standards are just a few examples of regulations that vary across countries and regions, affecting the ease of doing business. The political stability and trend of predictability of a country's status play a crucial role in investment decisions, particularly in large-scale infrastructure projects. Government investment in infrastructure projects and public-private partnerships (PPPs) also provide opportunities for construction companies. The state of the economy and the economic growth rate have a direct impact on the demand for construction services. Changes in interest rates, inflation, and currency exchange rates affect the cost of construction materials and labour, leading to changes in the profitability of construction companies.

The availability of financing and investment capital also plays a crucial role in the growth and competitiveness of construction companies. Demographic trends, such as population growth, migration, and urbanization, drive demand for construction services and new infrastructure. Consumer preferences, attitudes, and spending patterns also affect the demand for specific types of construction projects, such as single-family homes or commercial buildings. The availability and skills of the labour force are critical factors for construction companies, and impact the quality and efficiency of construction projects. Advances in technology have a significant impact on the construction industry. The use of 3D printing, drones, and prefabrication, among other technologies, increase efficiency, reduce costs, and improve quality in construction projects. The adoption and integration of new technologies also creates new opportunities for construction companies, such as smart building solutions. The pace of

technological change and innovation impact the competitiveness of construction companies, and those that adopt and integrate new technologies have a competitive advantage.

Environmental regulations and sustainability considerations, such as energy efficiency, water conservation, and waste management, play a crucial role in construction projects. Climate change and extreme weather events also have a significant impact on the construction industry, particularly in terms of increased costs and disruptions to supply chains. The construction industry's carbon footprint and contribution to environmental degradation also affect its reputation and public support, leading to increased pressure for companies to adopt more sustainable practices. Contractual arrangements and intellectual property rights play a significant role in the construction industry, particularly in terms of project delivery and risk management. Liability and dispute resolution mechanisms impact the financial performance and stability of construction companies. Changes to labour laws and employment regulations also affect the availability and cost of labour for construction companies. Ethical considerations, such as bribery, corruption, and fraud, have a significant impact on the reputation and success of construction companies. Labour rights and working conditions, as well as the treatment of suppliers and sub-constructors, are also important ethical considerations for construction companies. The environmental impact of construction projects and the responsible use of natural resources are also critical ethical considerations, and companies that prioritize these issues are often more successful in the long-term. The PESTELE framework provides a comprehensive and structured approach to analysing the macro-environmental factors affecting the construction industry. By considering political, economic, social, technological, environmental, legal, and ethical factors, construction companies make informed decisions; they can also develop strategies to navigate a complex and rapidly changing business environment.

6.8 Chapter summary

This study focuses on the levels of diversity within construction business models and their impact on business performance. The common business models within construction contractor businesses management services, project management, and property development are discussed. Key resources and partners for these businesses are also reviewed. The chapter then

discusses the use of business models as a strategic management tool, drawing on the literature review. The themes that emerge from the analysis of case study firms align with the existing literature, highlighting the use of business models for evaluation and optimization.

Next, the chapter discusses the predominant construction business models, categorizing them based on project delivery methods, procurement strategies, risk management, and innovation. The advantages and disadvantages of different business models are discussed, highlighting the importance of considering the specific business, project, and stakeholder goals. The chapter concludes by discussing the relationship between business model performance and the performance of construction businesses. It highlights that while a company's business model provides insights into its past performance and future potential, it is just one factor among many that influence performance. Other factors, such as the state of the economy, competition, regulations, and the availability of skilled labour, as described in the literature, play a significant role. Finally, the business model and performance framework introduced for construction organisations, a contribution to knowledge drawn from the study, will help construction companies make informed decisions and develop strategies to navigate a complex and changing business environment.

CHAPTER SEVEN

7 CONCLUSIONS AND RECOMMENDATIONS

The chapter is concluded by identifying the contribution to knowledge made by this research. One of the key objectives and contributions of this research, is the development of a business model framework for construction organisations. The development of a robust business model framework specifically designed for construction enterprises is of utmost significance for a number of critical reasons. Firstly, for strategic clarity, as a well-defined business model framework provides clarity on the strategic direction of the construction organisation. It outlines the value proposition, target markets, revenue streams, and key resources and activities required to achieve business objectives. This clarity enables stakeholders to align their efforts and resources towards common goals, enhancing overall strategic coherence. Secondly, a well-defined business model framework provides clarity on the strategic direction of the construction organization. It outlines the value proposition, target markets, revenue streams, and key resources and activities required to achieve business objectives. This clarity enables stakeholders to align their efforts and resources towards common goals, enhancing overall strategic coherence.

Construction projects are inherently complex and subject to various risks, including financial, regulatory, and operational uncertainties. A well-designed business model framework helps organizations anticipate and mitigate these risks by establishing clear risk management strategies, diversifying revenue streams, and ensuring financial resilience through prudent resource allocation. By systematically mapping out key resources, processes, and relationships within the organization, a business model framework enables construction firms to optimize resource utilization and improve operational efficiency. This includes streamlining workflows, optimizing supply chain management, and leveraging technology to enhance productivity and cost-effectiveness. In today's rapidly evolving business environment, construction organizations must continuously innovate and adapt to stay relevant and competitive. A dynamic business model framework provides a structured framework for experimentation,

innovation, and adaptation, allowing firms to respond swiftly to changing market dynamics, technological advancements, and regulatory requirements.

A well-crafted business model framework helps construction organizations identify opportunities for value creation and capture. By aligning customer needs with organizational capabilities, firms can design value propositions that resonate with customers and capture value through effective pricing strategies, revenue models, and monetization strategies. Sustainable business practices are increasingly important in the construction industry, driven by growing environmental concerns, regulatory requirements, and stakeholder expectations. A business model framework that incorporates principles of sustainability and resilience enables organizations to integrate environmental, social, and governance (ESG) considerations into their business strategies, fostering long-term viability and stakeholder trust.

7.1 Revisiting the aim and objectives of the study

Research question:

What relationship exists between business model diversification and business performance?

Research aim:

This thesis evaluates the relationship between business model diversification and business performance and their impact on business performance.

Research Objectives (RO):

- Critically analyse the predominant business models used within organisations;
- Determine the key value logic within construction organisations;
- Establish the levels of organisational performance of construction businesses;
- Assess the performance of business models in construction organisations;
- Establish whether there are significant relationships between the business model elements and business performance;
- Develop a business model framework for construction organisations.

7.2 Summary of research findings

This thesis evaluates the levels of business model diversity within construction businesses in the South African construction industry. The implementation of some of these business models within the African region has not been coupled with the empirical evidence about how they transform either value creation, value delivery or value capture. As the focus of the study is narrowed to General Building construction contractors, in answering the objectives on diversification and the types of business models within construction firms – the study found that 8% of companies have a single registered class of work, as General Building contractor (9GB). This group of companies have no reported diversification in construction contracting revenue, where the sum of its revenue is primarily achieved from General Building contracts. Firms with two classes of work accounted for 37%, mainly being 9GB and Civil Engineering contractor (9CE) or any other Main Contractor class of work. About 26% have more than three Main Contractor classes and specialist classes of work; 29% of firms have more than four classes of Main Contractor registration. In terms of firmographics from the survey data of this study, 64% of firms reported having fewer than 50 permanent employees. Only 7% representing large firms have an excess of 501 permanent employees. The majority of the firms (75%) classify as main constructors with a 3.6% sub-trade constructor representation. The following section provides a summary of the key research findings and in relation to the study Research Objectives (RO).

7.2.1 International diversification of business models: RO I

The findings of this study provide insights into the relationship between international diversification within the business and industry sphere and the implications of international diversification on organisational strategy and performance of construction companies. The results of the investigation revealed a statistically significant correlation between international diversification and all, with a negative, significant correlation with industry diversification, construction sector diversification and physical resources, and a positive correlation with human resources.

7.2.2 Diversification of business models and organisational performance: RO III & IV

It emerged that there is a lack of statistically significant evidence to support a correlation between the diversification of business models and organisational performance. Specifically, no significant relationship has been found between business model diversification and organisational performance.

7.2.3 Dynamic capabilities as a moderating construct: RO V & VII

The finding implies that the correlation between a company's selected business model and its organisational performance is not a simple or static association. However, it is subject to the influence and moulding of another crucial factor, namely the dynamic capabilities of the organisation.

7.3 Conclusions

7.3.1 International diversification of business models

The findings of this study provide insights into the relationship between international diversification and many key aspects within the business and industry sphere and the implications of international diversification on organisational strategy and performance. The results of the investigation revealed a persistent and statistically significant correlation between international diversification and all the other variables, with a negative, significant correlation with industry diversification, construction sector diversification and physical resources, and a positive correlation with human resources. Organisations involved in international diversification place less emphasis on tangible assets and infrastructure. The subsequent redistribution of resources indicates a strategic transition towards multinational operations that prioritise intangible assets and adapt to changing market dynamics and global uncertainties.

A notable and statistically significant negative correlation between international and industrial diversification. The aforementioned observation highlights the strategic focus of multinational corporations on particular sectors or industries as they extend their global presence. The prioritisation strategy relies on factors such as the attractiveness of the market, the presence of

a competitive advantage, and the allocation of resources. In addition, this research has uncovered a strong and statistically significant inverse correlation between international diversification and diversity within the construction sector.

This study revealed that there is a significant negative correlation between global international diversification and the allocation of organisational resources. An evident correlation was found between human resources and international diversification, emphasising the significance of prioritising human capital, talent acquisition, and workforce development when engaging in international expansion.

7.3.2 Diversification of business models and organisational performance

There is a lack of statistically significant evidence to support a correlation between the diversification of business models and organisational performance. Specifically, no significant relationship has been found between business model diversification and organisational performance. Though not significant, the results suggest a positive relationship between the diversification of the business models of construction companies and organisational performance, in that, increase in the level of diversity within a firm, would result in an increase in its performance.

7.3.3 Dynamic capabilities as a moderating construct

The finding implies that the correlation between a company's selected business model and its organisational performance is not a simple or static association. However, it is subject to the influence and moulding of another crucial factor, namely the dynamic capabilities of the organisation. The results show that an increase in the dynamic capabilities path result to an increase in performance of the construction company. This discovery deepens the understanding of how dynamic capabilities shape competitive advantages and contribute to organisational success in modern, rapidly changing, and dynamic business environments.

Organisations possessing strong dynamic capabilities possess an enhanced capacity to adjust to change market conditions, recognise emerging prospects and overcome competitive obstacles. Dynamic capabilities confer organisations with the ability to adapt and respond swiftly, thus enhancing their overall performance. These capabilities enable organisations to identify external changes, such as changes in customer preferences, market trends, and

technological advancements. This, in turn, promotes proactive decision-making and strategic positioning, leading to improved performance. Resource reconfiguration, also known as dynamic capabilities, enables organisations to realign their tangible and intangible assets in accordance with changing strategic objectives or market demands. This enhances their capacity to capitalise on emerging opportunities and overcome obstacles.

Dynamic capabilities are also responsible for fostering a corporate culture that promotes innovation and knowledge acquisition. This research has conclusively demonstrated that organisations that possess dynamic capabilities are more inclined to introduce innovative products, services and processes, thereby gaining a competitive advantage and achieving superior performance. Effective implementation of adaptive strategies relies heavily on the indispensability of dynamic capabilities. Agile organisations demonstrate proficiency in rapidly developing and implementing inventive strategies, effectively translating strategic ambitions into measurable performance results.

The study found that dynamic capabilities significantly impact sustainable competitive advantages. Companies that cultivate, improve, and use their dynamic capabilities are more likely to maintain their competitive advantage and perform well over time.

7.3.4 General conclusions

The introduction of diverse business models may not always lead to improved organisational performance through the exploration of new sources of revenue. The lack of a significant correlation suggests that the effectiveness of a diversified business model depends on factors such as industry dynamics, current market conditions, and the timing and implementation of diversification strategies. The implementation of these strategies is inherently shaped by the managerial proficiency, allocation of resources, and competitive positioning of the organisation.

The absence of a notable correlation highlights the necessity of considering additional variables that impact the performance of organisations. These variables include leadership, innovation, operational efficiency, and the ability to adapt to market changes. Diversified business models have a less significant impact on organisational outcomes compared to these factors. Although

this research results do not demonstrate a statistically significant correlation, the diversification of company models offers both benefits and drawbacks. From a strategic standpoint, the implementation of diversification serves to mitigate risks, delve into unexplored consumer segments, and optimise the synergistic potential among various business divisions. However, the effects of these diversification initiatives vary depending on the specific context and therefore require further assessment and execution.

Organisations considering the expansion of their business models customise their choices based on their specific circumstances, goals, and competitive environments. Diversification is considered by businesses as a strategic alternative, necessitating an assessment of its advantages and disadvantages in comparison with other strategic priorities.

7.4 Contribution to knowledge

Through the literature reviewed, gaps in existing similar studies were identified, including the procurement view of construction business models from scholars such as (Pekuri, 2015). This study further built on the concept of business models by collecting and organising literature relating to the value generation concept, across its diverse uses and applications within the business model literature. As discussed in the literature, scholars have found that dynamic capabilities impact the performance of construction firms; this study has further validated this notion, applying the business model approach in studying construction organisations. The literature reviewed states that scholars in this field also found that dynamic capabilities have a positive impact on the performance of construction firms; also, that three dimensions of dynamic capabilities (sensing, seizing, and reconfiguring) are all important for performance (Marichova; Fainshmidt et al., 2019; Al-Manasrah, 2020). The construction businesses are resource intensive businesses. There is a strong correlation between physical Resources and construction sector diversification, where construction businesses with more physical resources, are in a better position and able to diversify their construction sector offerings. There is also a significant negative correlation between international diversification and industry diversification, construction sector diversification, and physical resources. There is a significant positive correlation with human resources. This theory aids in the identified problem

statement in that, little is known about the ways in which *dynamic capabilities in the business model context* affect the emergence of differential intra-industry and intra-firm construction performance.

The research conducted in this study has made a substantial contribution to the body of knowledge in the field of strategic management and organisational theory. Specifically, the study has yielded crucial insights into the relationship between dynamic capabilities and sustainable competitive advantages. The key finding that "dynamic capabilities significantly impact sustainable competitive advantages" is a seminal contribution to the understanding of how organisations can maintain and enhance their competitiveness in today's dynamic business environment.

Prior to this research, while dynamic capabilities were recognised as essential for adaptability and agility in organisations, the precise nature and extent of their impact on competitive advantages were not fully understood. This study bridges this gap by providing empirical evidence that firmly establishes the pivotal role of dynamic capabilities in shaping sustainable competitive advantage representing a paradigm shift in strategic management thinking, offering a more nuanced and comprehensive perspective of the mechanisms that underlie long-term organisational success.

Moreover, this research goes beyond theoretical conjecture by presenting concrete evidence of the relationship between dynamic capabilities and sustainable competitive advantages. This empirical foundation strengthens the credibility and applicability of the findings, making them invaluable for both academic scholars and practitioners in the field.

The significance of this contribution to knowledge extends to strategic decision-makers in organisations across various industries. Armed with the understanding that dynamic capabilities play a pivotal role in securing and maintaining competitive advantages, executives and managers can make more informed decisions regarding resource allocation, strategy development, and organisational development. By effectively leveraging dynamic capabilities, organisations can not only respond to market changes but also proactively shape their competitive positions to thrive in an ever-evolving business landscape.

This study underscores the fundamental importance of dynamic capabilities in fostering sustainable organisational performance. By shedding light on this critical relationship, the study has advanced the field of strategic management and provided valuable insights that can inform the practises of organisations striving for long-term success and resilience in the construction industry's dynamic and competitive markets. This contribution will inspire further exploration and innovation in the realm of dynamic capabilities and their impact on organisational performance.

7.5 Implications of the research and recommendations

This research has major implications for scholars and practitioners. Examining the complex relationship between dynamic capabilities and organisational performance encourages academics to study the mechanisms and contingencies that affect it. This research emphasises the strategic importance of developing dynamic capabilities to achieve and maintain exceptional performance in dynamic and competitive markets. Given the persistent and extraordinary difficulties and uncertainties that organisations face, this study's findings can help strategic decision-makers use dynamic capabilities to achieve organisational success and adapt to a constantly changing business landscape. Research on construction business models is strongly recommended in future research projects, especially in the construction industry, as it is a complex, fragmented and dynamic industry. In tracing the concept of value, detailed analysis with similar in-depth data as those presented in this research's case study data, will add more value in knowledge creation and empirical analysis. Such data may be collected at business divisions level and or projects level to add more richness and depth to the factors and constructs presented in this research. The categorised construction business models from this research may be broken down further, with more firm and project detailed data, into various other classifications. These classifications vary from procurement to production, including project information delivery methods. This section details the next phase of this research, for continuation in this field of research, to inspire more research projects and for general academic interest, for emerging and established scholars within the field.

A major literature finding within this thesis is that the bulk of existing literature uses a different lens for each activity, to define, to categorise and to classify business models. The construction

industry is a large and complex field, with firms within the industry mirroring these complexities. From the wide range of specialist services offered and different project delivery methods, the procurement strategies, risk management, and innovation in the industry also resemble some of these complexities. The extent to which the core value that defines each project, each firm, each production typology, in response to or attending to the PESTELE factors, enables it to be used as a framework of defining construction business models at these levels of definition.

From the procurement perspectives, the core value is derived from design-bid-build, design-build, construction management, and public-private partnerships (PPP) as classifications of business models. Each model has its own advantages and disadvantages, and the choice of model will depend on the specific project and the goals of the stakeholders.

This study provides an in-depth analysis of the complex interplay among international diversification, industrial diversification, sector-specific Resource allocation, and human capital. The aforementioned findings provide valuable insights for individuals in leadership positions, strategists, and policymakers who face the complex challenges and opportunities associated with international operations. Considering the significant influence of these dynamics on strategic decision-making and long-term viability in the current globalised economy, it is crucial to conduct additional research to thoroughly understand these interdependencies.

This study revealed a lack of statistically significant association between the diversity of business models and the performance of organisations. The implications of this discovery have significant implications for the understanding of corporate operations in dynamic and highly competitive environments.

7.6 Recommendations of the study

The study makes the following recommendations to address the study problems:

- To improve profitability, construction companies, should build relationships with repeat customers. This is done by providing excellent customer service and delivering projects on time and within budget. Investing in training and development is another boost to profitability. The construction industry is constantly evolving, so it is important

for construction firms to invest in training and development for their employees. This will help them to stay up-to-date on the latest technologies and best practices.

- Construction firms should be proactive in managing risks and identifying opportunities. This includes things like developing contingency plans for unexpected events and seeking out new business opportunities. It is also important to build a strong team made up of experienced and qualified professionals who are committed to the company's success.
- The allocation of resources is a crucial element within building business models. To enhance production and manage expenses, it is imperative for organisations to efficiently deploy their resources. Efficient management of labour, equipment, materials, and subcontractors is encompassed under this scope. A meticulously designed business model establishes a framework for the allocation of resources, allowing organisations to effectively manage the competing demands of projects and the limited resources at their disposal.
- The construction sector experiences ongoing transformations due to the influence of technological innovations, changes in regulations, and volatility in the market. The incorporation of business models is of utmost importance in facilitating the ability of construction enterprises to effectively respond and adjust to the ever-changing dynamics of the industry. They enable and support the development of strategic planning and decision-making procedures that enable organisations to capitalise on opportunities and address obstacles effectively. An illustration of this phenomenon is observed in the incorporation of sustainable building practises as a response to environmental issues, which represents a contemporary adjustment facilitated by the progression of business models. Construction business models also prioritise client engagement and happiness. These models serve as a framework for organisations to build efficient communication channels with clients, ensuring regular project updates and timely resolution of complaints. Clients that are content with a company's products or services are more inclined to engage in repeat business and offer referrals, so making a significant contribution to the company's sustained success.
- In the construction industry, innovation plays a pivotal role as a catalyst for progress, necessitating the adaptation of business models to effectively incorporate it. Organisations that integrate cutting-edge technology, such as Building Information

Modelling (BIM), into their operational frameworks, get a distinct advantage in the marketplace. Business models facilitate the cultivation of an innovative culture through the provision of a well-organized environment for conducting experiments and using novel construction techniques and materials.

- Efficient risk management practises serve as a protective measure against the occurrence of cost overruns and delays. Risk management is a crucial process in several industries and sectors. It involves identifying, assessing, and mitigating potential risks that may impact. Construction projects naturally encompass various hazards, necessitating the inclusion of risk assessment and management procedures within business models. These models facilitate the identification of potential hazards, the development of contingency plans, and the allocation of resources for the purpose of risk reduction by enterprises.
- The establishment of a sustainable financial model is of utmost importance for ensuring the long-term viability of construction enterprises. Business models involve several strategic and operational activities, such as financial planning, budgeting, and monitoring, which are aimed at guaranteeing the long-term financial sustainability of the organisation, especially in the face of economic downturns.
- The utilisation of business models is crucial for the growth, competitiveness, and overall success of construction companies as they undergo continuous evolution. Within the intricate and ever-evolving realm of construction, business models function as fundamental frameworks that provide guidance for the operations and strategies employed by construction organisations. They perform a diverse range of functions to enhance the implementation of projects, allocate resources effectively, manage risks, and communicate with clients. Furthermore, these models facilitate the ability of organisations to respond to evolving market dynamics, promote the development of new ideas and solutions, and guarantee long-term financial viability.
- To ensure a sustained competitive advantage in the dynamic construction industry, construction companies should embrace business models as a strategic approach to efficiently integrate the supply chain. The implementation of construction business models is of utmost significance in the realm of management, as they serve as essential visual and holistic strategies for seamlessly integrating the value chain within the construction sector. These models aim to optimise project delivery, improve

competitiveness, and position construction enterprises for sustained success in the long run by establishing strategic alliances, implementing effective procurement strategies, adopting advanced technologies, mitigating risks, and implementing cost-efficient practises.

- Construction companies should prioritise the development of dynamic capabilities within their organisations. This includes fostering a culture of innovation, adaptability, and continuous learning. Allocate resources and efforts to enhance the organization's ability to respond to changing market conditions. Ensure that resources, both tangible and intangible, are allocated strategically to support dynamic capabilities. This may involve reallocating resources to align with changing strategic objectives and market dynamics.
- Leadership plays a crucial role in promoting dynamic capabilities. Construction companies should invest in leadership development programs that emphasize innovation, strategic thinking, and the ability to navigate uncertainty. Additionally, provide training and development opportunities for employees to enhance their skill sets and adaptability.
- Explore strategic partnerships with suppliers, subcontractors, and technology providers. Collaborative relationships can provide access to external resources and expertise, enhancing dynamic capabilities.
- The research finding of a strong link between dynamic capabilities and organisational performance provides construction companies with a valuable roadmap for improving their performance. By prioritising dynamic capabilities, fostering an innovative culture, and adapting to changing market conditions, construction firms can enhance their overall performance and competitiveness in the industry.

7.7 Recommendations for future research

The following detail the possible future research classifications of construction business models (CBMs) and the factors that could be mapped, to analyse the core value within firms, projects or construction production methodologies.

There are important concepts which may be explored to demonstrate which factors impact on the success of construction companies' business models. Some of these are: analysis of business supply chains, costing models, funding models and value integration models.

The nature or distinct procurement typologies, project delivery methodologies, sustainable construction, digital construction, socio-economic or a combination of these factors as specialisation areas can all be studied and analysed to determine distinct and differential business strategies and performance areas in the construction supply chains.

Additional investigation is necessary to comprehend the complexities of business model diversity and to clarify the circumstances that maximise performance. Examining the impact of organisational factors and contextual variables on performance outcomes will enhance comprehension of the complex correlation between business model diversification and organisational achievement.

7.8 Critical reflection

One of the foremost lessons gleaned from this study was the inherent complexity of value chains within the construction industry. The multitude of subcontractors, suppliers, and interdependencies made it challenging to trace all the business model components accurately. As such, the sum of values was utilised in this research. Understanding this complexity is essential when designing research methodologies and data collection strategies. The challenges faced in tracing cost of production and revenue emphasised the need for greater data accessibility and transparency within the construction sector. Many subcontractors and suppliers operate independently, making it difficult to obtain granular financial data. Researchers must advocate for increased transparency and standardised reporting practices in the industry.

It became evident that in a holistic value chain view, costs in the construction industry are not isolated but interconnected. Changes or disruptions at one point in the value chain can have ripple effects on costs and revenues throughout the project. This interconnectedness necessitates a systems thinking approach when analysing financial structures. Construction

businesses rely heavily on contracts with subcontractors and suppliers, and the terms of these contracts can significantly impact the allocation of costs and revenue. What could be done better is further tracing cost of sales and revenue throughout the supply chain, in a longitudinal study approach. These costs rely heavily on the quality and reliability of financial data provided by subcontractors and suppliers. Researchers must scrutinize data sources and establish rigorous data validation processes to ensure the accuracy of the findings. Business leaders must consider the entire value chain when making decisions that impact costs and revenues. Focusing solely on isolated cost centres can lead to suboptimal outcomes. Collaborative research efforts involving academia, industry associations, and construction businesses themselves can facilitate data sharing and enhance research outcomes. Such collaborations can bridge the gap between academic research and industry practice.

Finally, this research experience emphasised the need for continuous adaptation in research methodologies. The dynamic nature of the construction industry requires researchers to be flexible and willing to adjust their approaches as new challenges and opportunities arise. In conclusion, the study of construction business models provided valuable insights into the challenges and complexities of the industry. It reinforced the importance of data accessibility, transparency, and a system thinking approach. Moreover, it underscored the need for collaboration and continuous adaptation in research efforts. These lessons will undoubtedly inform future research endeavours in the construction industry, contributing to a better understanding of how cost and revenue flow through the intricate web of subcontracting and supply chains, for the improved performance of construction businesses, for a high performing and sustainable built environment.

REFERENCES

- Abuzeinab, A., Arif, M., Kulonda, D.J. and Awuzie, B.O. (2016) Green business models transformation: evidence from the UK construction sector. *Built Environment Project and Asset Management*, **6**(5), 478-490.
- Achtenhagen, L., Melin, L. and Naldi, L. (2013) Dynamics of business models—strategizing, critical capabilities and activities for sustained value creation. *Long range planning*, **46**(6), 427-442.
- Afuah, A. and Tucci, C. (2001) Internet business models: A strategic management approach. *Irwin/McGraw*.
- Aghimien, D.O., Aigbavboa, C.O. and Oke, A.E. (2020) Critical success factors for digital partnering of construction organisations—a Delphi study. *Engineering, Construction and Architectural Management*, **27**(10), 3171-3188.
- Ahmed, S.M. and Kangari, R. (1995) Analysis of client-satisfaction factors in construction industry. *Journal of Management in Engineering*, **11**(2), 36-44.
- Ahuja, V., Yang, J., Skitmore, M. and Shankar, R. (2010) An empirical test of causal relationships of factors affecting ICT adoption for building project management: an Indian SME case study. *Construction Innovation*, **10**(2), 164-180.
- Al-Manasrah, E.A. (2020) The Impact Role of Dynamic Capabilities in Enhancing the Performance of Fa Mily Business: Quantitative Evidence from the Jordanian Construction Industry Sector. *Academy of Strategic Management Journal*, **19**(3), 1-10.
- Albaum, G. (1996) Thinking about answers: The application of cognitive process to survey methodology. *JMR, Journal of Marketing Research*, **33**(3), 373.
- Ali, K.A.M., Yasak, A.N. and Bakar, A.A.A. (Causes That Contribute to the Failure of Construction Project Among Small Contractors in Pulau Pinang. In, *Proceedings of Civil Engineering Colloquium 2020*, 167.
- Alinaitwe, H.M. (2020) 14.1 An overview of the national construction industry. *Improving the Performance of Construction Industries for Developing Countries: Programmes, Initiatives, Achievements and Challenges*.
- Amit, R. and Shoemaker, P. (1993) Specialized assets and organizational rent. *Strategic management journal*, **14**(1), 33-47.
- Amit, R. and Zott, C. (2001) Value creation in e-business. *Strategic management journal*, **22**(6-7), 493-520.
- Amit, R. and Zott, C. (2012) Creating value through business model innovation. *MIT Sloan management review*.
- Amit, R. and Zott, C. (2020) *Business model innovation strategy: Transformational concepts and tools for entrepreneurial leaders*. John Wiley & Sons.
- Anderson, E.W., Fornell, C. and Lehmann, D.R. (1994) Customer satisfaction, market share, and profitability: Findings from Sweden. *Journal of marketing*, **58**(3), 53-66.
- Anvuur, A. and Kumaraswamy, M. (2008) Better collaboration through cooperation. *Collaborative relationships in construction: developing frameworks and networks*, 107-128.
- Ashton, T.S. (1997) *The industrial revolution 1760-1830*. Oxford University Press.
- Baden-Fuller, C. and Morgan, M.S. (2010) Business Models as Models. *Long range planning*, **43**(2-3), 156-171.

- Bajari, P., McMillan, R. and Tadelis, S. (2009) Auctions versus negotiations in procurement: an empirical analysis. *The Journal of Law, Economics, & Organization*, **25**(2), 372-399.
- Bala, K., Bello, A., Kolo, B. and Bustani, S. (2009) Factors inhibiting the growth of local construction firms in Nigeria. In, *Procs 25th ARCOM Conference*, 351-359.
- Ball, L. (2014) Long-term damage from the Great Recession in OECD countries. *European Journal of Economics and Economic Policies*, **11**(2), 149-160.
- Barney, J. (1991) Competitive advantage. *Journal of management*, **17**(1), 99-120.
- Barney, J.B. (1986) Strategic factor markets: Expectations, luck, and business strategy. *Management science*, **32**(10), 1231-1241.
- Bhattacharjee, A. (2012) *Social science research: Principles, methods, and practices*. USA.
- Bijker, W.E. (1987) *The social construction of Bakelite: Toward a theory of invention*. MIT press Cambridge, MA.
- Bondinuba, F. (2012) Exploring the challenges and barriers in accessing financial facilities by small and medium construction firms in Ghana. *Civil and Environmental Research*, **2**(6).
- Bowen, G.A. (2005) Preparing a qualitative research-based dissertation: Lessons learned. *The qualitative report*, **10**(2), 208-222.
- Breiby, E. and Wanberg, M.H. (2011) *Successful business model innovation*. Institutt for industriell økonomi og teknologiledelse.
- Bruijl, D.G.H.T. (2018) The relevance of Porter's five forces in today's innovative and changing business environment. Available at SSRN 3192207.
- Bryman, A. (2004) Qualitative research on leadership: A critical but appreciative review. *The Leadership Quarterly*, **15**(6), 729-769.
- Cadle, J., Paul, D. and Turner, P. (2010) *Business analysis techniques: 72 essential tools for success*. BCS, The Chartered Institute.
- Calandra, D., Secinaro, S., Massaro, M., Dal Mas, F. and Bagnoli, C. (2023) The link between sustainable business models and Blockchain: A multiple case study approach. *Business Strategy and the Environment*, **32**(4), 1403-1417.
- Cao, L. (2014) Business model transformation in moving to a cross-channel retail strategy: A case study. *International Journal of Electronic Commerce*, **18**(4), 69-96.
- Casadesus-Masanell, R. and Ricart, J.E. (2010) From strategy to business models and onto tactics. *Long range planning*, **43**(2-3), 195-215.
- Chandler, A.D. (1962) *Strategy and structure: Chapters in the history of the industrial empire*. Cambridge Mass.
- Chesbrough, H. (2006) *Open business models: How to thrive in the new innovation landscape*. Harvard Business Press.
- Chesbrough, H. (2010) Business model innovation: opportunities and barriers. *Long range planning*, **43**(2-3), 354-363.
- Chesbrough, H. and Rosenbloom, R.S. (2002) The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and corporate change*, **11**(3), 529-555.
- Chew, L.D., Griffin, J.M., Partin, M.R., Noorbaloochi, S., Grill, J.P., Snyder, A., Bradley, K.A., Nugent, S.M., Baines, A.D. and Vanryn, M. (2008) Validation of screening questions for limited health literacy in a large VA outpatient population. *Journal of general internal medicine*, **23**, 561-566.
- Cusumano, M.A., Yoffe, D.B. and Gawer, A. (2021) The future of platforms.
- Dälken, F. (2014) *Are porter's five competitive forces still applicable? a critical examination concerning the relevance for today's business*. University of Twente.

- Darling-Hammond, L. (1990) Instructional policy into practice: "The power of the bottom over the top". *Educational evaluation and policy analysis*, **12**(3), 339-347.
- Das, P., Perera, S., Senaratne, S. and Osei-Kyei, R. (2021) Developing a construction business model transformation canvas. *Engineering, Construction and Architectural Management*, **28**(5), 1423-1439.
- Dave, B. and Koskela, L. (2009) Collaborative knowledge management—A construction case study. *Automation in Construction*, **18**(7), 894-902.
- De Vroey, M. (2004) The history of macroeconomics viewed against the background of the Marshall-Walras divide. *History of Political Economy*, **36**(5), 57-91.
- Demil, B. and Lecocq, X. (2010) Business model evolution: In search of dynamic consistency. *Long range planning*, **43**(2-3), 227-246.
- Deng, F. and Smyth, H. (2013) Contingency-based approach to firm performance in construction: Critical review of empirical research. *Journal of construction engineering and management*, **139**(10), 04013004.
- Dierickx, I. and Cool, K. (1989) Asset stock accumulation and sustainability of competitive advantage. *Management science*, **35**(12), 1504-1511.
- Doganova, L. and Eyquem-Renault, M. (2009) What do business models do?: Innovation devices in technology entrepreneurship. *Research policy*, **38**(10), 1559-1570.
- Dooley, D. and Catalano, R. (1984) Why the economy predicts help-seeking: a test of competing explanations. *Journal of Health and Social Behavior*, 160-176.
- Doz, Y.L. and Kosonen, M. (2010) Embedding strategic agility: A leadership agenda for accelerating business model renewal. *Long range planning*, **43**(2-3), 370-382.
- Druker, J., White, G., Hegewisch, A. and Mayne, L. (1996) Between hard and soft HRM: human resource management in the construction industry. *Construction Management & Economics*, **14**(5), 405-416.
- Dubois, A. and Gadde, L.-E. (2002) The construction industry as a loosely coupled system: implications for productivity and innovation. *Construction Management & Economics*, **20**(7), 621-631.
- Durdyev, S., Ihtiyar, A., Banaitis, A. and Thurnell, D. (2018) The construction client satisfaction model: a PLS-SEM approach. *Journal of Civil Engineering and Management*, **24**(1), 31-42.
- Ebben, J.J. and Johnson, A.C. (2005) Efficiency, flexibility, or both? Evidence linking strategy to performance in small firms. *Strategic management journal*, **26**(13), 1249-1259.
- Edelman, L.F., Brush, C.G. and Manolova, T. (2005) Co-alignment in the resource–performance relationship: strategy as mediator. *Journal of Business Venturing*, **20**(3), 359-383.
- Enshassi, A., Mohamed, S. and Abushaban, S. (2009) Factors affecting the performance of construction projects in the Gaza strip. *Journal of Civil Engineering and Management*, **15**(3), 269-280.
- Ericson, T. (2006) Model based specifications for design. In, *2006 IEEE Power Engineering Society General Meeting*. IEEE, 5 pp.
- Fainshmidt, S., Wenger, L., Pezeshkan, A. and Mallon, M.R. (2019) When do dynamic capabilities lead to competitive advantage? The importance of strategic fit. *Journal of Management Studies*, **56**(4), 758-787.
- Feagin, J.R., Orum, A.M. and Sjoberg, G. (2016) *A case for the case study*. UNC Press Books.
- Fellows, R. and Liu, A.M. (2012) Managing organizational interfaces in engineering construction projects: addressing fragmentation and boundary issues across multiple interfaces. *Construction Management and Economics*, **30**(8), 653-671.

- Foss, N.J. and Saebi, T. (2017) Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of management*, **43**(1), 200-227.
- Freeman, A.M. (1984) The sign and size of option value. *Land Economics*, **60**(1), 1-13.
- Frow, P. and Payne, A. (2019) Value cocreation: an ecosystem perspective. *The SAGE handbook of service-dominant logic*, 80-96.
- Frow, P., McColl-Kennedy, J.R. and Payne, A. (2016) Co-creation practices: Their role in shaping a health care ecosystem. *Industrial Marketing Management*, **56**, 24-39.
- Gawer, A. and Cusumano, M.A. (2002) *Platform leadership: How Intel, Microsoft, and Cisco drive industry innovation*. Vol. 5, Harvard Business School Press Boston.
- George, G. and Bock, A.J. (2011) The business model in practice and its implications for entrepreneurship research. *Entrepreneurship: Theory and Practice*, **35**(1), 83.
- Giesen, E., Berman, S.J., Bell, R. and Blitz, A. (2007) Three ways to successfully innovate your business model. *Strategy & leadership*, **35**(6), 27-33.
- Gimeno, J., Hoskinson, R.E., Beal, B. and Wan, W.P. (2001) *Explanation of Clustering in the International Expansion Moves of US Telecommunications Firms*. INSEAD.
- Giritli, H. and Oraz, G.T. (2004) Leadership styles: some evidence from the Turkish construction industry. *Construction Management and Economics*, **22**(3), 253-262.
- Golafshani, N. (2003) Understanding reliability and validity in qualitative research. *The qualitative report*, **8**(4), 597-607.
- Gomes, J. and Romão, M. (2018) Achieving dynamic capabilities through the benefits management approach. *International Journal of Information Systems in the Service Sector (IJISSS)*, **10**(2), 53-68.
- Grant, R.M. (1991a) Porter's 'competitive advantage of nations': an assessment. *Strategic management journal*, **12**(7), 535-548.
- Grant, R.M. (1991b) The resource-based theory of competitive advantage: implications for strategy formulation. *California management review*, **33**(3), 114-135.
- Grimes, D.A. and Schulz, K.F. (2002) Descriptive studies: what they can and cannot do. *The Lancet*, **359**(9301), 145-149.
- Guest, G., Namey, E. and McKenna, K. (2017) How many focus groups are enough? Building an evidence base for nonprobability sample sizes. *Field methods*, **29**(1), 3-22.
- Güven, G., Arceo, A., Bennett, A., Tham, M., Olanrewaju, B., McGrail, M., Isin, K., Olson, A.W. and Saxe, S. (2022) A construction classification system database for understanding resource use in building construction. *Scientific Data*, **9**(1), 42.
- Hacklin, F. and Wallnöfer, M. (2012) The business model in the practice of strategic decision making: insights from a case study. *Management decision*, **50**(2), 166-188.
- Hagiu, A. and Altman, E.J. (2017) Finding the platform in your product. *Harvard business review*, **95**(4), 94-100.
- Hair, J.F., Risher, J.J., Sarstedt, M. and Ringle, C.M. (2019) When to use and how to report the results of PLS-SEM. *European business review*, **31**(1), 2-24.
- Hamilton, R.T. and Shergill, G.S. (1992) The relationship between strategy-structure fit and financial performance in New Zealand: Evidence of generality and validity with enhanced controls. *Journal of Management Studies*, **29**(1), 95-113.
- Hart, S.L. (1995) A natural-resource-based view of the firm. *Academy of Management Review*, **20**(4), 986-1014.
- Hart, S.L. and Milstein, M.B. (2003) Creating sustainable value. *Academy of Management Perspectives*, **17**(2), 56-67.
- Heale, R. and Twycross, A. (2018) What is a case study? In: Royal College of Nursing, 7-8.

- Hedman, J. and Kalling, T. (2003) The business model concept: theoretical underpinnings and empirical illustrations. *European journal of information systems*, **12**(1), 49-59.
- Heimeriks, K.H., Duysters, G. and Vanhaverbeke, W. (2007) Learning mechanisms and differential performance in alliance portfolios. *Strategic organization*, **5**(4), 373-408.
- Helkkula, A., Kelleher, C. and Pihlström, M. (2012) Practices and experiences: challenges and opportunities for value research. *Journal of Service Management*, **23**(4), 554-570.
- Hill, C.W. and Jones, T.M. (1992) Stakeholder-agency theory. *Journal of Management Studies*, **29**(2), 131-154.
- Holt, G.D. (2013) Construction business failure: conceptual synthesis of causal agents. *Construction Innovation*, **13**(1), 50-76.
- Höök, M. and Stehn, L. (2014) Exploring the management of multiple business models in one company. In, *Proceedings 30th Annual Association of Researchers in Construction Management Conference, ARCOM 2014, September*, 1315-1324.
- Ikediashi, D.I. and Ogwueleka, A.C. (2016) Assessing the use of ICT systems and their impact on construction project performance in the Nigerian construction industry. *Journal of Engineering, Design and Technology*.
- Johnson, M.W. (2010a) A new framework for business models. *Harvard business review*(01).
- Johnson, M.W. (2010b) *Seizing the white space: Business model innovation for growth and renewal*. Harvard Business Press.
- Johnson, M.W. (2018) *Reinvent your business model: How to seize the white space for transformative growth*. Harvard Business Press.
- Johnson, M.W., Christensen, C.M. and Kagermann, H. (2008) Reinventing your business model. *Harvard business review*, **86**(12), 50-59.
- Joppe, I. (2000) Het geregistreerd partnerschap in het Nederlandse IPR (II). *Weekblad voor Privaatrecht, Notariaat en Registratie*, 391-395.
- Kabadayi, S., Eyuboglu, N. and Thomas, G.P. (2007) The performance implications of designing multiple channels to fit with strategy and environment. *Journal of marketing*, **71**(4), 195-211.
- Kajimo-Shakantu, K. (2007) An investigation into the responses of the construction industry to preferential procurement in South Africa.
- Kale, S. and Karaman, E.A. (2011) Evaluating the knowledge management practices of construction firms by using importance-comparative performance analysis maps. *Journal of construction engineering and management*, **137**(12), 1142-1152.
- Kaplan, S.N. and Strömberg, P.E. (2004) Characteristics, contracts, and actions: Evidence from venture capitalist analyses. *The journal of finance*, **59**(5), 2177-2210.
- Kärnä, S., Junnonen, J.-M. and Kankainen, J. (2004) Customer satisfaction in construction. In, *Proceedings of the 12th Annual Conference on Lean Construction*. Helsingø, 476-488.
- Kesting, P. (2020) The interaction between business models and business reality. *Journal of Business Models*, **9**(4), 13-35.
- Kopp, A. and Orlovskiy, D. (2020) Towards the method and information technology for evaluation of business process model quality. In, *International Conference on Information and Communication Technologies in Education, Research, and Industrial Applications*. Springer, 93-118.

- Koskela, L. (1999) Management of production in construction: a theoretical view. *In, Proceedings of the 7th Annual Conference of the International Group for Lean Construction*. Berkeley, California, USA.
- Kotrlik, J. and Higgins, C. (2001) Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal*, **19**(1), 43.
- Krejcie, R.V. and Morgan, D.W. (1970) Determining sample size for research activities. *Educational and psychological measurement*, **30**(3), 607-610.
- Kshetri, N. (2007) Barriers to e-commerce and competitive business models in developing countries: A case study. *Electronic commerce research and applications*, **6**(4), 443-452.
- Kujala, S., Roto, V., Väänänen-Vainio-Mattila, K., Karapanos, E. and Sinnelä, A. (2011) UX Curve: A method for evaluating long-term user experience. *Interacting with computers*, **23**(5), 473-483.
- Lambert, C. (2015) Basic concepts of quantum interference and electron transport in single-molecule electronics. *Chemical Society Reviews*, **44**(4), 875-888.
- Lambert, S.C. and Davidson, R.A. (2013) Applications of the business model in studies of enterprise success, innovation and classification: An analysis of empirical research from 1996 to 2010. *European management journal*, **31**(6), 668-681.
- Lansley, P. (1994) Analysing construction organizations. *Construction Management and Economics*, **12**(4), 337-348.
- Lansley, P.R. (1987) Corporate strategy and survival in the UK construction industry. *Construction Management and Economics*, **5**(2), 141-155.
- Lenox, M.J., Rockart, S.F. and Lewin, A.Y. (2006) Interdependency, competition, and the distribution of firm and industry profits. *Management science*, **52**(5), 757-772.
- Lepinoy, O., van der Heide, G. and Moore, C. (2022) Some Changes Are Invisible to the Eyes: Transformation of Business Models, Organizations, and Cultures, *Innovation in Construction: A Practical Guide to Transforming the Construction Industry*, pp. 355-408: Springer.
- Leviäkangas, P., Paik, S.M. and Moon, S. (2017) Keeping up with the pace of digitization: The case of the Australian construction industry. *Technology in Society*, **50**, 33-43.
- Levinthal, D. (1997) *10 Three faces of organizational learning: Wisdom, inertia, and discovery*. Cambridge Univ Pr.
- Limsila, K. and Ogunlana, S.O. (2008a) Performance and leadership outcome correlates of leadership styles and subordinate commitment. *Engineering, Construction and Architectural Management*, **15**(2), 164-184.
- Limsila, K. and Ogunlana, S.O. (2008b) Linking personal competencies with transformational leadership style evidence from the construction industry in Thailand. *Journal of Construction in Developing Countries*, **13**(1), 27-50.
- Lincoln, Y.S. and Guba, E.E. (1986) Research, evaluation, and policy analysis: Heuristics for disciplined inquiry. *Review of Policy Research*, **5**(3), 546-565.
- Lincoln, Y.S. and Guba, E.G. (2016) *The constructivist credo*. Routledge.
- Linder, J. and Cantrell, S. (2000a) So what is a business model anyway. *Accenture Institute for High Performance Business*.
- Linder, J. and Cantrell, S. (2000b) Carved in water: Changing business models fluidly. *Accenture Institute for Strategic Change Research Report*, **12**, 1-13.
- Lindgardt, Z., Reeves, M., Stalk, J., George and Deimler, M. (2012) Business model innovation: When the game gets tough, change the game. *Own the future: 50 ways to win from The Boston Consulting Group*, 291-298.

- Loosemore, M., Dainty, A. and Lingard, H. (2003) *Human resource management in construction projects: strategic and operational approaches*. Taylor & Francis.
- Love, P.E. and Holt, G.D. (2000) Construction business performance measurement: the SPM alternative. *Business process management journal*, **6**(5), 408-416.
- Magretta, J. (2002) Why business models matter. In: Harvard Business School Boston, MA.
- Mahamid, I. (2012) Factors affecting contractor's business failure: contractors' perspective. *Engineering, Construction and Architectural Management*, **19**(3), 269-285.
- Mahmood, S., Hassan, M.F., Hemdi, A.R., Kafuku, J.M. and Saman, M.Z.M. (2021) Sustainability Assessment for Small and Medium Enterprise (SMEs) by using Fuzzy Logic Approach: A Direction and Further Research. *International Journal of Integrated Engineering*, **13**(2), 10-15.
- Malhotra, N.K., Nunan, D. and Birks, D.F. (2017) *Marketing research: An applied approach*. Pearson.
- Malone, T.W., Weill, P., Lai, R.K., D'Urso, V.T., Herman, G., Apel, T.G. and Woerner, S. (2006) Do some business models perform better than others?
- Marichova, A. Influence of the Specific Characteristics of the Firm on the Building of Dynamic Capabilities Study of the Example of the Construction Firm.
- Markides, C. and Charitou, C.D. (2004) Competing with dual business models: A contingency approach. *Academy of Management Perspectives*, **18**(3), 22-36.
- Markides, C.C. (2013) Business model innovation: what can the ambidexterity literature teach us? *Academy of Management Perspectives*, **27**(4), 313-323.
- Marshall, A. (1890) "Some aspects of competition." The address of the president of section F-Economic Science and Statistics--of the British Association, at the Sixtieth Meeting, held at Leeds, in September, 1890. *Journal of the Royal Statistical Society*, **53**(4), 612-643.
- Matinheikki, J., Pesonen, T., Arto, K. and Peltokorpi, A. (2017) New value creation in business networks: The role of collective action in constructing system-level goals. *Industrial Marketing Management*, **67**, 122-133.
- Mcloughlin, S., Puvvala, A., Maccani, G. and Donnellan, B. (2019) A Framework for understanding & classifying Urban Data Business Models. In, *Proceedings of the 52nd Hawaii International Conference on System Sciences*.
- Menor, L.J., Kristal, M.M. and Rosenzweig, E.D. (2007) Examining the influence of operational intellectual capital on capabilities and performance. *Manufacturing & Service Operations Management*, **9**(4), 559-578.
- Miles, M.B. and Huberman, A.M. (1994) *Qualitative data analysis: An expanded sourcebook*. sage.
- Miller, A., Radcliffe, D. and Isokangas, E. (2009) A perception-influence model for the management of technology implementation in construction. *Construction Innovation*, **9**(2), 168-183.
- Mokhlesian, S. and Holmén, M. (2012) Business model changes and green construction processes. *Construction Management and Economics*, **30**(9), 761-775.
- Moore, G.A. (2007) Dealing with Darwin: How great companies innovate at every phase of their evolution. *Strategic Direction*.
- Morris, M., Schindehutte, M. and Allen, J. (2005) The entrepreneur's business model: toward a unified perspective. *Journal of Business Research*, **58**(6), 726-735.
- Morris, M.H., Shirokova, G. and Shatalov, A. (2013) The business model and firm performance: The case of Russian food service ventures. *Journal of small business management*, **51**(1), 46-65.

- Morse, J.M. (2000) Determining sample size. In: Sage Publications Sage CA: Thousand Oaks, CA, 3-5.
- Morton, L.P. (2002) Targeting generation Y. *Public relations quarterly*, **47**(2), 46.
- Mtya, A. (2019) *Evaluation of Building Information Modelling (BIM) adoption, capability and maturity within South African consulting and construction firms*. Faculty of Engineering and the Built Environment.
- Nailer, C. and Buttriss, G. (2020) Processes of business model evolution through the mechanism of anticipation and realisation of value. *Industrial Marketing Management*, **91**, 671-685.
- Nestle, V. (2021) *Creating Innovation Spaces: Impulses for Start-ups and Established Companies in Global Competition*. Springer Nature.
- Nguyen, L.H. (2019) Relationships between critical factors related to team behaviors and client satisfaction in construction project organizations. *Journal of construction engineering and management*, **145**(3), 04019002.
- Nonaka, I. and Takeuchi, H. (1998) A theory of the firm's knowledge-creation dynamics. *The Dynamic Firm, The Role of Technology, Strategy, Organization, and Regions*, **27**.
- Ofori, G. (1988) Construction industry and economic growth in Singapore. *Construction Management and Economics*, **6**(1), 57-70.
- Ofori, G. (2015) Nature of the construction industry, its needs and its development: A review of four decades of research. *Journal of Construction in Developing Countries*, **20**(2), 115.
- Olander, S. (2007) Stakeholder impact analysis in construction project management. *Construction Management and Economics*, **25**(3), 277-287.
- Olanipekun, A.O. and Bo, P.X. (2017) Examining the use of theories in construction management research: 2005 to 2014. *Built Environment Journal*, **14**(1), 27-38.
- Oppong, G.D., Chan, A.P. and Dansoh, A. (2017) A review of stakeholder management performance attributes in construction projects. *International journal of project management*, **35**(6), 1037-1051.
- Osterwalder, A. (2004) *The business model ontology a proposition in a design science approach*. Université de Lausanne, Faculté des hautes études commerciales.
- Osterwalder, A. and Pigneur, Y. (2010) *Business model generation: a handbook for visionaries, game changers, and challengers*. Vol. 1, John Wiley & Sons.
- Osterwalder, A., Pigneur, Y. and Tucci, C.L. (2005) Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, **16**(1), 1.
- Oyekunle Oyewobi, L., Olukemi Windapo, A. and Cattell, K.S. (2013) Impact of business diversification on South African construction companies' corporate performance. *Journal of Financial Management of Property and Construction*, **18**(2), 110-127.
- Oyewobi, L.O. (2014) Modeling performance differentials in large construction organisations in South Africa.
- Oyewobi, L.O., Windapo, A.O. and Rotimi, J.O. (2016) Environment, competitive strategy, and organizational characteristics: A path analytic model of construction organizations' performance in South Africa. *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration*, **33**(3), 213-226.

- Oyewobi, L.O., Windapo, A.O., Cattell, K. and Rotimi, J. (2013) The effects of business environments on corporate strategies and performance of construction organisations.
- Oyewobi, L.O., Windapo, A., Rotimi, J.O.B. and Jimoh, R. (2020) Analysis of the South African construction industry business environment. *Journal of Facilities Management*.
- Pan, W. and Goodier, C. (2012) House-building business models and off-site construction take-up. *Journal of architectural engineering*, **18**(2), 84-93.
- Parnell, J.A. (2013) *Strategic management*. Sage.
- Pekuri, A. (2015) *The role of business models in construction business management*. University of Olulu Graduate School, Faculty of Technology.
- Pekuri, A., Pekuri, L. and Haapasalo, H. (2013) The role of business models in Finnish construction companies. *Construction Economics and Building*, **13**(3), 13-23.
- Penrose, E.T. (1959) *The Theory of the Growth of the Firm*. New York: John Wiley.
- Peralta Abadia, P., Hein, S.S., Ludwig, H.M. and Smarsly, K. (2020) A BIM-based approach towards additive manufacturing of concrete structures. In, *Workshop on Intelligent Computing in Engineering, EG-ICE 2020*, 2020. Universitätsverlag der TU Berlin, 324-332.
- Peric, M., Durkin, J. and Vitezic, V. (2017) The constructs of a business model redefined: A half-century journey. *Sage Open*, **7**(3), 2158244017733516.
- Pertusa-Ortega, E.M., Molina-Azorín, J.F. and Claver-Cortés, E. (2010) Competitive strategy, structure and firm performance: A comparison of the resource-based view and the contingency approach. *Management decision*, **48**(8), 1282-1303.
- Peteraf, M.A. (1993) The cornerstones of competitive advantage: a resource-based view. *Strategic management journal*, **14**(3), 179-191.
- Phua, F.T. (2006) When is construction partnering likely to happen? An empirical examination of the role of institutional norms. *Construction Management and Economics*, **24**(6), 615-624.
- Popper, K.R. (1963) Science as falsification. *Conjectures and refutations*, **1**(1963), 33-39.
- Porter, M.E. (1985) Technology and competitive advantage. *Journal of business strategy*, **5**(3), 60-78.
- Porter, M.E. (1991) Towards a dynamic theory of strategy. *Strategic management journal*, **12**(S2), 95-117.
- Porter, M.E. (1996) What is strategy?
- Prescott, E.C. (1986) Theory ahead of business-cycle measurement. In, *Carnegie-Rochester conference series on public policy*. Elsevier, Vol. 25, 11-44.
- Proeller, I., Kroll, A., Krause, T. and Vogel, D. (2014) 11 How Dynamic Capabilities Mediate the Link between Strategy and Performance. *Strategic management in public organizations: European practices and perspectives*, 173.
- Radosavljevic, M. and Bennett, J. (2012) *Construction management strategies: A theory of construction management*. John Wiley & Sons.
- Raidén, A.B., Dainty, A.R. and Neale, R.H. (2006) Balancing employee needs, project requirements and organisational priorities in team deployment. *Construction Management and Economics*, **24**(8), 883-895.
- Ranta, V., Aarikka-Stenroos, L. and Väisänen, J.-M. (2021) Digital technologies catalyzing business model innovation for circular economy—Multiple case study. *Resources, Conservation and Recycling*, **164**, 105155.
- Rescher, N. (1969) Introduction to value theory.

- Ries, E. (2011) *The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses*. Currency.
- Ritter, T. and Lettl, C. (2018) The wider implications of business-model research. *Long range planning*, **51**(1), 1-8.
- Rooke, J.A. and Kagioglou, M. (2007) Criteria for evaluating research: the unique adequacy requirement of methods. *Construction Management and Economics*, **25**(9), 979-987.
- Rosa, P., Sassanelli, C. and Terzi, S. (2019) Towards Circular Business Models: A systematic literature review on classification frameworks and archetypes. *Journal of cleaner production*, **236**, 117696.
- Rumelt, R.P. (1982) Diversification strategy and profitability. *Strategic management journal*, **3**(4), 359-369.
- Rumelt, R.P. (2003) What in the world is competitive advantage. *Policy working paper*, **105**(3), 1-5.
- Runeson, G. (1997) The role of theory in construction management research: comment. *Construction Management & Economics*, **15**(3), 299-302.
- Russ, F.A. and McNeilly, K.M. (1995) Links among satisfaction, commitment, and turnover intentions: The moderating effect of experience, gender, and performance. *Journal of Business Research*, **34**(1), 57-65.
- Sarstedt, M., Ringle, C.M. and Hair, J.F. (2017) Treating unobserved heterogeneity in PLS-SEM: A multi-method approach. *Partial least squares path modeling: Basic concepts, methodological issues and applications*, 197-217.
- Saunders, M., Lewis, P. and Thornhill, A. (2009) *Research methods for business students*. Pearson education.
- Schulz, K.F. and Grimes, D.A. (2002) Sample size slippages in randomised trials: exclusions and the lost and wayward. *The Lancet*, **359**(9308), 781-785.
- Seddon, P. and Lewis, G. (2003) Strategy and business models: What's the difference?
- Seddon, P.B., Lewis, G.P., Freeman, P. and Shanks, G. (2004) The case for viewing business models as abstractions of strategy. *Communications of the association for Information Systems*, **13**(1), 25.
- Selberherr, J. (2015) Sustainable life cycle offers through cooperation. *Smart and Sustainable Built Environment*, **4**(1), 4-24.
- Seymour, D., Crook, D. and Rooke, J. (1997) The role of theory in construction management: a call for debate. *Construction Management & Economics*, **15**(1), 117-119.
- Sheng, Z. and Sheng (2018) *Fundamental theories of mega infrastructure construction management*. Springer.
- Shirazi, B., Langford, D. and Rowlinson, S. (1996) Organizational structures in the construction industry. *Construction Management & Economics*, **14**(3), 199-212.
- Sims, A. (2019) Blockchain and Decentralised Autonomous Organisations (DAOs): The Evolution of Companies? *Available at SSRN*.
- Slywotzky, A. and Linthicum, F. (1997) Capturing value in five moves or less: The new game of business. *Strategy & leadership*, **25**(1), 5-11.
- Spender, J.C. (1996) Making knowledge the basis of a dynamic theory of the firm. *Strategic management journal*, **17**(S2), 45-62.
- Spieth, P., Schneckenberg, D. and Matzler, K. (2016) Exploring the linkage between business model (&) innovation and the strategy of the firm. *R&D Management*, **46**(3), 403-413.
- Stake, R.E. (1995) *The art of case study research*. sage.

- Stalder, O. (2018) *An Exploration of the Business Model Concept's Meaning and Usage in Switzerland: Towards an Application Framework*. University of Gloucestershire.
- Suzuki, Y. (1980) The strategy and structure of top 100 Japanese industrial enterprises 1950–1970. *Strategic management journal*, **1**(3), 265-291.
- Swanborn, P. (2010) Case study research: What, why and how? *Case study research*, 1-192.
- Tapscott, D., Ticoll, D. and Lowy, A. (2000) Digital capital: Harnessing the power of business webs. *Ubiquity*, **2000**(May), 3-es.
- Tayeh, B.A., Alaloul, W.S. and Muhaisen, W.B. (2019) Challenges facing small-sized construction firms in the gaza strip. *The Open Civil Engineering Journal*, **13**(1).
- Teece, D.J. (2007) Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance. *Strategic management journal*, **28**(13), 1319-1350.
- Teece, D.J. (2010) Business models, business strategy and innovation. *Long range planning*, **43**(2-3), 172-194.
- Teece, D.J. (2018) Business models and dynamic capabilities. *Long range planning*, **51**(1), 40-49.
- Teece, D.J. and Linden, G. (2017) Business models, value capture, and the digital enterprise. *Journal of organization design*, **6**, 1-14.
- Teece, D.J., Pisano, G. and Shuen, A. (1997) Dynamic capabilities and strategic management. *Strategic management journal*, **18**(7), 509-533.
- Thompson, I., Cox, A. and Anderson, L. (1998) Contracting strategies for the project environment. *European Journal of Purchasing & Supply Management*, **4**(1), 31-41.
- Thomsen, P. (2019) Business Model Performance: Paving the road for comparable data on business models. *Journal of Business Models*, **7**(4), 45-52.
- Timmers, P. (1998) Business models for electronic markets. *Electronic markets*, **8**(2), 3-8.
- Tokarczyk, J., Hansen, E., Green, M. and Down, J. (2007) A resource-based view and market orientation theory examination of the role of “familiness” in family business success. *Family Business Review*, **20**(1), 17-31.
- Trochim, W.M., Cabrera, D.A., Milstein, B., Gallagher, R.S. and Leischow, S.J. (2006) Practical challenges of systems thinking and modeling in public health. *American journal of public health*, **96**(3), 538-546.
- Veit, D., Clemons, E., Benlian, A., Buxmann, P., Hess, T., Kundisch, D., Leimeister, J.M., Loos, P. and Spann, M. (2014) Business models. *Business & Information Systems Engineering*, **6**(1), 45-53.
- Voordijk, H. (2011) Construction management research at the interface of design and explanatory science. *Engineering, Construction and Architectural Management*.
- Wadongo, B. and Abdel-Kader, M. (2014) Contingency theory, performance management and organisational effectiveness in the third sector: A theoretical framework. *International Journal of Productivity and Performance Management*, **63**(6), 680-703.
- Walford*, G. (2005) Research ethical guidelines and anonymity. *International Journal of research & method in education*, **28**(1), 83-93.
- Walravens, N. (2015) Qualitative indicators for smart city business models: The case of mobile services and applications. *Telecommunications Policy*, **39**(3-4), 218-240.

- Weill, P., Malone, T.W., D'Urso, V.T., Herman, G. and Woerner, S. (2005) Do some business models perform better than others? A study of the 1000 largest US firms. *MIT Center for coordination science working paper*, **226**, 1-39.
- Wernerfelt, B. (1984) A resource-based view of the firm. *Strategic management journal*, **5**(2), 171-180.
- Wheelwright, S.C. (1985) Restoring the competitive edge in US manufacturing. *California management review*, **27**(3), 26-42.
- Williams, P.L. (1978) *The emergence of the theory of the firm: from Adam Smith to Alfred Marshall*. Springer.
- Windapo, A. (2013) Fundamentals of construction management. available at: www2.aku.edu.tr/~icaga/kitaplar/fundamentals-of-construction-management.pdf (accessed 07 February 2017).
- Windapo, A.O. (2016) Skilled labour supply in the South African construction industry: The nexus between certification, quality of work output and shortages. *SA Journal of Human Resource Management*, **14**(1), 1-8.
- Windapo, A.O. and Cattell, K. (2013) The South African construction industry: perceptions of key challenges facing its performance, development and growth. *Journal of Construction in Developing Countries*, **18**(2), 65.
- Wing, C.K., Raftery, J. and Walker, A. (1998) The baby and the bathwater: research methods in construction management. *Construction Management and Economics*, **16**(1), 99-104.
- Winter, S.G. and Szulanski, G. (2001) Replication as strategy. *Organization science*, **12**(6), 730-743.
- Wu, D. (2009) Supplier selection: A hybrid model using DEA, decision tree and neural network. *Expert systems with Applications*, **36**(5), 9105-9112.
- Zahara, S. and Bogner, W. (2000) Technology Strategy and Soft-ware New entures Performance-A study of coporate-spoon and Independent Biotechnology Ventures. *Journal of Business Venturing*, **15**(2), 135-173.
- Zott, C. (2003) Dynamic capabilities and the emergence of intraindustry differential firm performance: insights from a simulation study. *Strategic management journal*, **24**(2), 97-125.
- Zott, C. and Amit, R. (2007) Business model design and the performance of entrepreneurial firms. *Organization science*, **18**(2), 181-199.
- Zott, C. and Amit, R. (2010) Business model design: An activity system perspective. *Long range planning*, **43**(2-3), 216-226.
- Zott, C. and Amit, R. (2013) The business model: A theoretically anchored robust construct for strategic analysis. *Strategic organization*, **11**(4), 403-411.
- Zott, C., Amit, R. and Massa, L. (2010) The business model: Theoretical roots, recent developments, and future research. *IESE Research Papers*, **3**(4), 1-43.
- Zott, C., Amit, R. and Massa, L. (2011) The business model: recent developments and future research. *Journal of management*, **37**(4), 1019-1042.

APPENDICES

ETHICS APPLICATION FORM



Please Note:


Any person planning to undertake research in the Faculty of Engineering and the Built Environment (EBE) at the University of Cape Town is required to complete this form **before** collecting or analysing data. The objective of submitting this application *prior* to embarking on research is to ensure that the highest ethical standards in research, conducted under the auspices of the EBE Faculty, are met. Please ensure that you have read, and understood the **EBE Ethics in Research Handbook** (available from the UCT EBE, Research Ethics website) prior to completing this application form: <http://www.ebe.uct.ac.za/ebe/research/ethics1>

APPLICANT'S DETAILS		
Name of principal researcher, student or external applicant	Amanda Mtya	
Department	Construction Economics & Management	
Preferred email address of applicant:	fltama002@myuct.ac.za	
If Student	Your Degree: e.g., MSc, PhD, etc.	PhD
	Credit Value of Research: e.g., 60/120/180/360 etc.	360
	Name of Supervisor (if supervised):	Professor Abimbola
If this is a research contract, indicate the source of funding/sponsorship		
Project Title	MODELLING THE CONFIGURATION AND PERFORMANCE OF CONSTRUCTION BUSINESS MODELS AND VALUE LOGIC	

I hereby undertake to carry out my research in such a way that:

- there is no apparent legal objection to the nature or the method of research; and
- the research will not compromise staff or students or the other responsibilities of the University;
- the stated objective will be achieved, and the findings will have a high degree of validity;
- limitations and alternative interpretations will be considered;
- the findings could be subject to peer review and publicly available; and
- I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism.

APPLICATION BY	Full name	Signature	Date
Principal Researcher/ Student/External applicant	Amanda Mtya		18/08/2021
SUPPORTED BY	Full name	Signature	Date
Supervisor (where applicable)	Abimbola Windapo		19 Aug. 2021

APPROVED BY	Full name	Signature	Date
HOD (or delegated nominee) Final authority for all applicants who have answered NO to all questions in Section 1; and for all Undergraduate research (Including Honours).			
Chair: Faculty EIR Committee For applicants other than undergraduate students who have answered YES to any of the questions in Section 1.	Prof. H. von Blottnitz		15/10/2021

RESEARCH PARTICIPATION: INFORMATION SHEET



CANDIDATE: FLTAMA002; PhD – CONSTRUCTION MANAGEMENT
RESEARCH TITLE: **MODELLING THE CONFIGURATION AND PERFORMANCE OF CONSTRUCTION BUSINESS MODELS AND VALUE LOGIC**

1. **What is the purpose of this research?** You are being invited to participate in a survey and answer questions based on your experience and expertise. A few questions will ask demographics related questions whilst the majority of the study is on the company/firm/business. The questions seek to understand how the construction business create value for clients and all stakeholders involved in the delivery of construction services and products.
2. **What will the research involve for me?** This is a survey with multiple stages. Online/pdf/excel based survey, follow up interviews and possible reporting of company performance and strategic data.
3. **What are the possible benefits of taking part?** Any insights we can gain from your participation will be extremely useful in explaining the performance of the construction industry and how construction businesses are manage. To further seek for efficiencies and innovative Construction Business Management practices and theories.
4. **Am I eligible to participate in this survey?** This study is for practitioners managing construction businesses and members who are part of business value creation and value capture chain.
5. **Do I have to take part and can I withdraw my response from the research?** Participating in this study is entirely voluntary. You are free to not participate in this research at all. If you have successfully signed up to the survey but afterwards decide not to participate in the formal survey, or if you have already started with the formal survey but later on do not want to continue anymore regardless of the reason, you have the right to exit at any point of the survey and we will delete your response from the dataset. There will be no consequences for failing to complete the survey. This data collection and research work is totally independent from the university's employment/assessment. Once you have submitted your completed survey responses, it is not possible to withdraw your data.
6. **Will my taking part in the research be kept confidential and how will the data be processed?** Please bear in mind that no personally identifiable information will be required throughout the entire data collection. You will only be asked to leave your email address to sign up, allowing us to invite you for a follow-up interview. If you are willing to reveal your email address, this information will be irrevocably deleted after the entire data collection is finished. This data collection and research work is for our academic use only. Publication of research outputs or potential sharing of data with other research institutes will only take place after the thorough anonymisation and will not disclose any personally identifiable information.
7. **Ethical approval:** The research has been reviewed and approved by the University Research Ethics Committee of UCT, with the ethics reference number and permission to circulate this survey.
8. **What if I feel discomfort while taking part in this research?** We understand this is a difficult time which can be very distressing. If you feel particularly anxious or find it distressing to consider changes that the COVID situation has brought about to you, please do not hesitate to quit this survey, and if needed, the following organisations may offer mental health or practical support:
9. **What if I have any questions?** We very much appreciate your valuable input and we hope you stay well. If you have a complaint/concern, please contact: PhD candidate: Ms A. Mtya; FLTAMA002; 0216505358 OR E-mail: fltama002@myuct.ac.za; Matters can also be escalated to the research supervisor, Professor Abimbola Windapo: abimbola.windapo@uct.ac.za,
10. **Thank you** for your consideration to participate in this study.

CONSENT FORM



Introduction

My name is Amanda Mtya and I am conducting research towards a PhDs degree. I am investigating the **configuration and performance of construction business models and value logic in South African Construction firms** and would like to invite you to participate in the research.

Participation is voluntary

Please understand that you are not obligated and do not have to participate in this project. Your participation is entirely voluntary. The choice to participate is yours alone. If you choose not to participate, there will be no negative consequence. If you choose to participate, but wish to withdraw at any time, you will be free to do so without negative consequence. However, I would be grateful if you would assist me by allowing me to interview you.

Expectations from participations

I will only ask you a few questions regarding the management of Construction Businesses. This should take 30 to 45 minutes. There is no financial obligation from the project or you as the participant. Therefore, there is no payment/reimbursement available. With your permission, I would record this interview however you do not agree that is still acceptable. I also need your consent to refer to this recording and any notes I may have taken for academic purposes including my project, academic conferences and possibly journal publications.

Benefits to participants

There is no indirect or direct harm.

Risk of harm to participants

There is no direct risk of harm to participants, though confidential data such as business financial records may cause harm to reputations. This risk will be handled with the utmost sensitivity by coding company names and participants, so as to not allow for tracing when the data is analysed and reported.

Sharing and use of data

Data generated from the interview will be synthesised and used to answer the research questions set for this PhD research project, presented in conferences and may be published in journals.

Anonymity and confidentiality

Identity encoded

By signing the consent form you agree to the terms stipulated in this consent and information sheet regarding the interview. If you are not comfortable with the terms please make a note on the form.

Interviewee name:

Interviewee's signature:

Date:

Additional comments/notes: _____

Consent form for recording of interview – to accompany information sheet given to participant



MODELLING THE CONFIGURATION AND PERFORMANCE OF CONSTRUCTION BUSINESS MODELS AND VALUE LOGIC Name of interviewer

PhD – Construction Management

University of Cape Town

I confirm the following:

1.	I have read the information sheet provided by the researcher and thus understand the projects aims and objectives.	
2.	I am participating in this project voluntarily and understand that I may withdraw from the interview at any time if I so do wish.	
3.	I acknowledge and understand that confidentiality will be maintained.	
4.	I have been asked permission to record this interview and have given my permission.	
5.	I understand that this data is accessible to other researchers only if they honour the confidentiality agreement.	

Participant

Date: ; Signature of participant:

Organisation of participant:

Researcher:

Name: Ms Amanda Mtya

Signature:

Date:

Project Title	MODELLING THE CONFIGURATION AND PERFORMANCE OF CONSTRUCTION BUSINESS MODELS AND VALUE LOGIC	10/06/2021
	by Amanda Mtya in EBE EiRC Submissions	id. 21445369
	Cape Town 7764 Western Cape South Africa 0216505358 fltama002@myuct.ac.za	

Original Submission	10/06/2021
----------------------------	------------

Project Title	MODELLING THE CONFIGURATION AND PERFORMANCE OF CONSTRUCTION BUSINESS MODELS AND VALUE LOGIC
Project Aims	The aim of the research is to establish whether business model configurations significantly impact the performance of construction businesses.
Ethical Issues	The study seeks to understand the configuration of construction business models and value creation logic. In doing so, sensitive information such as company financial reports and strategic "recipes" for success are vital to this study. This study will ensure that all participation is kept confidential and anonymous. No identification of participants will be made in reporting the findings of this study. participants and company information will be reported using codes and representative language. All participants are informed of the study prior to all survey's and interviews and their consent is required before proceeding with any data collection. This study will also follow all required protocols in obtaining the required ethics clearance before conducting any field work and collecting data.
Application Checklist	Read the EBE Ethics in Research Handbook before completing this application Questionnaire to be used in the research (where applicable) Consent form where (where applicable see Addendum 2) If needed a letter motivating an expedited review. This letter should be included in the cover letter.
Researcher(s)	Amanda Mtya
Department	Construction Economics and Management

E-mail	fltama02@myuct.ac.za
Status of Applicant	Student
Student Number (For Students Only)	FLTAMA002
Degree Being Studied (For Students Only)	PhD
Name of Supervisor (For Students Only)	Prof. Abimbola Windapo
Review Track	Expedited
Motivation for an Expedited Review	<p>Good day: May you kindly consider to expedite my ethics application. First submission was made on the 24th August and was declined with minor yet material corrections on the 28th September with a note "A request for an expedited review will be considered".</p> <p>I will really appreciate a fast tracked review as this can assist greatly in ensuring that I can start scheduling for my fieldwork as soon as possible, so that I may meet my 2021 goals and objectives on my PhD project. I thank you</p>
Signed application form	<p>EBE_EiRC_signature_form_FLTAMA002_AOW._pdf.pdf</p>
SECTION 1: Overview of ethics issues in your research project	<i>n/a</i>
Question 1: Harm to Third Parties	No
Question 2: Human Subjects as Sources of Data	Yes
Question 3: Participation or Provision of Services To Communities	No
Question 4: Conflicts of Interest	No

If you have answered YES to any of the above questions, please ensure that you append a copy of your Research Proposal (Addendum 1), as well as any interview schedules or questionnaires and consent documentation (Addendum 2) and complete further addenda as appropriate. I hereby undertake to carry out my research in such a way that: 1. there is no apparent legal objection to the nature or the method of research; and 2. the research will not compromise staff or students or the other responsibilities of the University; 3. the stated objective will be achieved, and the findings will have a high degree of validity; 4. limitations and alternative interpretations will be considered; 5. the findings could be subject to peer review and publicly available; and 6. I will comply with the conventions of copyright and avoid any practice that would constitute plagiarism

ADDENDUM 1 n/a
Supporting
documents

Research Proposal

[Amanda_Mtya_-_PhD_Proposa_WITH_Signed_Cover_page.pdf](#)

Please provide a n/a
copy of the research
proposal. If you are
unable to do so,
explain why in the
comments section
below.

ADDENDUM 2 To be **It is required that you read the UCT Code for Research involving
completed if you Human Subjects in order to be able to answer the questions in this
answered YES to addendum. Ethical research should safeguard the interests of
question 2 in section society and the welfare of all who participate in the research, be they
1 individuals or groups. In this section the researcher is asked to
consider the implications of their research on participants in the
research. The researcher should outline risks that participants will
face by being involved in the research. When a research involves
vulnerable people, a researcher is expected to obtain informed
consent from participants. This informed consent should be signed
by the participants. Informed consent is intended to protect the
interest of both participants and the researcher should something go
wrong or should conflict arise between the researcher and the
participant.**

Question 2.1: **No**
Discrimination

Question 2.2: **No**
Participation of
socially or physically
vulnerable people

Question 2.3: Informed consent	Yes
Question 2.4: Confidentiality	Yes
Question 2.5: Anonymity	Yes
Question 2.6: Risks of physical, psychological or social harm	No
Question 2.7: Payments and giving of gifts	No
Interview Schedule	n/a
Consent Form	
PhD_FLTAMA002_Information_sheet_and_consent_form_V2.docx	
Additional Comments	n/a
ADDENDUM 3 To be completed if you answered YES to question 3 in section 1	Research may sometimes interfere with the organization, progress or advancement of communities. In this section the researcher is asked to consider the effect of their research on a community or communities involved in the research. Attention should be paid to whether the research will disrupt or interrupt the normal activities of the community and how the research will influence communities in the long term.
Question 3.1: Community participation	No
Question 3.2: Termination of economic or social support	No
Question 3.3: Provision of sub standard services	No
Additional Comments	n/a

ADDENDUM 4 To be completed if you answered YES to question 4 in section 1

A conflict of interest may compromise the conduct or outcome of a research project. It may also infringe on the interests of other researchers. In this section the researcher is asked to consider if their research may be compromised by the inclusion of certain individuals or groups in the research. The researcher is also asked to consider whether the inclusion of certain individuals or groups in the research will compromise the research of others at the university. For example, if any participants in the proposed research project are also involved in other projects at the university, have you considered if this participation will negatively affect their work?

Question 4.1:
Conflicts of interest

No

Question 4.2:
Sharing of
information

No

Question 4.3:
Conflict of interest
with other research

No

Additional Comments n/a

Survey on Construction Business Models

This survey is towards a PhD study on modelling the configuration and performance of construction business models and value logic.

PLEASE NOTE THAT ALL ANSWERS TO QUESTIONNAIRE ARE CONFIDENTIAL.

Any personal information provided during the study will be kept confidential and will not be included in the reporting of the results. No direct reference to any information that can be traceable to participants will be made.

Your participation in the study is voluntary and can be withdrawn at any point during the study and will not result in any penalty, legal action or loss of any nature.

Absolute confidentiality cannot be however guaranteed in instances where this might be required under the laws of the country or required by the University for quality assurance in the assessment of the data reported and analyzed.

For further information, or any queries related to the study, you may contact the researcher on the details below.

Contact: 0216505358

PhD candidate: Ms A. Mtya; FLTAMA002

E-mail: fltama002@myuct.ac.za (<mailto:fltama002@myuct.ac.za>)

This research is supervised by Professor Abimbola Windapo: abimbola.windapo@uct.ac.za (<mailto:abimbola.windapo@uct.ac.za>)

[insert line of ethics approval once obtained]

Thank you for your consideration to participate in this research.

* Required

* This form will record your name, please fill your name.

1

Consent to participate

*

- I agree to participate in this reseach
- I do not agree to participate in this research (end of survey)

2

Kindly confirm if your organisation has an active cidb 9GB status? (Qualification criteria)

- Yes
- No (end of survey)

A. DEMOGRAPHICS

3

Gender

- Female
- Male
- Non-binary
- Prefer not to say

4

Highest qualification

*

- NQF 10 (PhD)
- NQF 9 (Master's degree)
- NQF 8 (Honours degree, Post Graduate diploma and Professional Qualification)
- NQF 7 (Bachelor's degree, B-Tech, Advanced Diplomas, Post Graduate Certificate)
- NQF 6 (National Diploma and Advanced certificates)
- NQF 5 (Higher Certificates and Advanced National vocational Cert.)
- NQF 4 (Matric)

5

How would you rate your involvement in decision making and general business management within the organisation you work in

*

- Entry level management
- Middle management
- Senior management
- Executive management

Other

6

How would you rate your involvement in decision making and general business management within the organisation you work in

*

Entry level management

Middle management

Senior management

Executive management

Other

7

Which of the following professions best describes your expertise and/or practice (*you may select more than one*)

*

Construction Project Management

Quantity Surveying

Architecture

Engineering

Town Planning

Property Valuation

Law

Commerce

Other

FIRMOGRAPHICS - ABOUT THE CONSTRUCTION BUSINESS

8

How long has the business been in operation (no. of years)?

9

Kindly indicate your firms construction offerings by cidb grade or capability of upper limit tender value: from the below class of works: (Tick all that is applicable)

	6 (R20mil)	7 (R60mil)	8 (R200mil)	9 (no limit)
GB - General Building Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
CE - Civil Engineering Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EB - Electrical Engineering Building	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
EP - Electrical Engineering Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ME - Mechanical Engineering Works	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10

Estimation of total number of permanent employees within the firm

*



Continental presence: kindly select all regions where your firm either has branch offices or projects completed within the past 5 years

*

- Africa
 - Australia
 - Asia
 - Europe
 - North America
 - South America
 - Antarctica
 -
- Other

Sectors of operation: Kindly indicate the sectors in which the construction business operates (by estimation of project pool contribution to total revenue)

	0 - 25%	26 -50%	51 - 75%	76 - 100%	N/A
Building Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Civil Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consulting Services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant & Machinery Solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Major Clients: Kindly indicate the major clients under each sector of operation (by estimation of project pool contribution to total revenue)

*

	Private Clients (ZA)	Public Clients	PPP	International	N/A
Building Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consulting Services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant & Machinery Solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Main procurement method by sector: Kindly indicate the main method of procurement under each sector of operation (*main = most projects procured under this type)

*

	Traditional	Design & Build	Management oriented	PPP oriented	Other
Building Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consulting Services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Main procurement method by client type: Kindly indicate the main method of procurement under each sector of operation (*main = most projects procured under this type)

*

	Traditional	Design & Build	Management oriented	PPP oriented	Other
Private clients (ZA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PPP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
International clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the impact of the following macro factors in the functioning of the construction organisation

	Very important	Important	Moderately important	Slightly important	Not important	Not sure
Political factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Economical factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Technological factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Environmental factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Legal factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ethical factors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rank the impact of the following macro factors in the functioning of the construction organisation

(drag and drop from highest impact factor (at the top) to the least/less impact factor)

- Political factors
- Economical factors
- Social factors
- Technological factors
- Environmental factors
- Legal factors
- Ethical factors

CONSTRUCTION BUSINESS MODELS

The following questions make us of business model concepts and the insert below will assist as a guide to the type of information required from you.

Business models:

A business model consists of a set of choices (policies, assets, and governance) and a set of consequences derived from those choices (flexible or rigid). These set of choices and consequences can be presented using a business model canvas, which groups business model elements into three interlinked dimensions, namely value creation, value delivery and value capture.

The value creation proposition (customer segment) has elements such as key customers, key products and or services, communication channels and revenue streams.

The second dimension is value delivery, with key elements such as key resources, key activities, key partners and cost structures.

The third (performance) dimension is value capture, with performance (typically revenue) and cost models as priorities

18

Prior to this questionnaire, how would you rate your knowledge and understanding of the term "business models"

*

where 1 star = not much understanding and 5 stars = excellent understanding



19

Have you used the concept of business models in your line of work

*

- Yes
- No
- Not sure

Understanding construction business models

The following questions make us of business model concepts and the insert below will assist as a guide to the type of information required from you.

Business models:

A business model consists of a set of choices (policies, assets, and governance) and a set of consequences derived from those choices (flexible or rigid). These set of choices and consequences can be presented using a business model canvas, which groups business model elements into three interlinked dimensions, namely value creation, value delivery and value capture.

The value creation proposition (customer segment) has elements such as key customers, key products and or services, communication channels and revenue streams.

The second dimension is value delivery, with key elements such as key resources, key activities, key partners and cost structures.

The third (performance) dimension is value capture, with performance (typically revenue) and cost models as priorities

Period of reporting: *unless otherwise stated, the following questions relate to the last five years of the companies operation (2016 - 2020)

20

Number of total contracts awarded to your firm in the last five years (2016 – 2020) by sector

*

	0 - 10	11 - 20	21 - 30	31 and above	N/A
Building Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure Construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consulting Services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant & Machinery Solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

21

Number of total contracts awarded to your firm in the last five years (2016 – 2020) by client type

*

	0 - 10	11 - 20	21 - 30	31 and above	N/A
Private sector (ZA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public Sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PPP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
International clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate your firm's annual turnover over the past 5 years by client types (2016 - 2020)

	2016	2017	2018	2019	2020
Private sector (ZA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public Sector	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
PPP	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
International clients	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please indicate your firm's annual turnover over the past 5 years by sector (2016 - 2020)

	2016	2017	2018	2019	2020
Building construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Infrastructure construction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consulting services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Plant and machinery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Kindly match what rights to the asset are being sold by the firm (A - C) with how much the firm transforms the asset it sells (1 -2)

	1. Significant transformation	2. Limited transformation
A. Ownership of asset	<input type="radio"/>	<input type="radio"/>
B. Use of asset	<input type="radio"/>	<input type="radio"/>
C. Matching of buyer and seller	<input type="radio"/>	<input type="radio"/>

Kindly match what classification you would consider your firm to represent from the following (A - B) and the asset type(s) involved

	1. Financial	2. Physical	3. Intangible	4. Human
A. Creator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B. Distributor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C. Landlord	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D. Broker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Determining key partners: How would you rate the importance of the following elements in the performance of your business

	Very important	Important	Moderately important	Slightly important	Not important
Domestic sub-contractors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Domestic suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nominated sub-contractors	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nominated suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Off-shore suppliers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
General supply chain	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
General Stakeholders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Determining key activities: How would you rate the importance of the following elements in the performance of your business

	Very important	Important	Moderately important	Slightly important	Not important
Quantity Surveying and Estimation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Project Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Construction Management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Support services	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organisational processes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organisational governance	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Organisational culture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
General management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Financial management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the importance of the following elements in the performance of your business

	Very important	Important	Moderately important	Slightly important	Not important
Key partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Key activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Key resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer relations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer segments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Channels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Revenue streams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How would you rate the importance of the following elements in the performance of your business

	Very important	Important	Moderately important	Slightly important	Not important
Key partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Key activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Key resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer relations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customer segments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Channels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost structure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Revenue streams	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please use the following indicators to rate the performance of your firm in the last five years (2016 -2020) comparative to similar firms in the industry based on the following variables. Kindly indicate by selecting the box for each of the variables appropriately.

	Very significant improvement	Significant improvement	Moderate improvement	insignificant improvement	Very insignificant improvement
Profitability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Adaptability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turnover of the employer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Managerial efficiency	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Productivity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Return on investment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cash flow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Growth in contract award	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
client and employee satisfaction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

RESP NO	Consent to	Highest	How long	Please
	Response	Response	Open-Ended Response	Main contractor

1	I agree to	NQF 6		Main
2	I do not agree to			
3	I do not agree to			
4	I do not agree to			
5	I do not agree to			
6	I agree to	NQF 4	5	Main
7	I do not agree to			
8	I agree to	NQF 7 (16	
9	I agree to	NQF 8	19	Main
10	I agree to	NQF 8	12	Main
11	I agree to	NQF 9	10	
12	I agree to	NQF 7 (7	Main
13	I agree to	NQF 8	16	Main
14	I agree to	NQF 6	15	Main
15	I agree to	NQF 8	9	Main
16	I do not agree to			
17	I agree to	NQF 9	9	
18	I do not agree to			
19	I do not agree to			
20	I agree to	NQF 6	10	Main
21	I agree to	NQF 6	21	Main
22	I agree to	Certificate-	Less than 5	Main
23	I agree to	Certificate-	21 years and	Main
24	I agree to	Grade 12	Less than 5	Main
25	I agree to	Certificate-	11 - 15 years	Main
26	I agree to	Grade 12	Less than 5	Main
27	I agree to	N4-6/NTC4-	Less than 5	Main
28	I agree to	Certificate-	11 - 15 years	Main
29	I agree to	Standard 8	6 - 10 years	Main
30	I agree to	Masters	6 - 10 years	Main
31	I agree to	Higher	6 - 10 years	Main
32	I agree to	Certificate-	6 - 10 years	Main
33	I agree to	N4-6/NTC4-	11 - 15 years	Main
34	I agree to	grade12	Less than 5	Main
35	I agree to	Certificate-	6 - 10 years	Main
36	I agree to	Matric	11 - 15 years	Main
37	I agree to	Masters	Less than 5	Main
38	I agree to	Higher	6 - 10 years	Main
39	I agree to	Higher	16 - 20 years	Main
40	I agree to	Higher	11 - 15 years	Main
41	I agree to	Grade11 n	11 - 15 years	Main
42	I agree to	Matric	6 - 10 years	Main
43	I agree to	Bachelor's	6 - 10 years	Main

44	I agree to	Grade	6 - 10 years	Main
45	I agree to	Certificate-	16 - 20 years	Main
46	I agree to	Certificate-	11 - 15 years	Main
47	I agree to	Higher	Less than 5	Main
48	I agree to	Grade	Less than 5	Main
49	I agree to	N4-6/NTC4-	6 - 10 years	Main
50	I agree to	N4-6/NTC4-	Less than 5	Main
51	I agree to	Higher	11 - 15 years	Main
52	I agree to	Certificate-	6 - 10 years	Main
53	I agree to	Bachelor's	6 - 10 years	Main
54	I agree to	Certificate-	11 - 15 years	Main
55	I agree to	Higher	6 - 10 years	Main
56	I agree to	Certificate-	6 - 10 years	Main
57	I agree to	Bachelor's	6 - 10 years	Main
58	I agree to	Masters	6 - 10 years	Main
59	I agree to	Certificate-	11 - 15 years	Main
60	I agree to	Higher	Less than 5	Main
61	I agree to	N4-6/NTC4-	Less than 5	Main
62	I agree to	N4-6/NTC4-	6 - 10 years	Main
63	I agree to	Bachelor's	11 - 15 years	Main
64	I agree to	Bachelor's	Less than 5	Main
65	I agree to	Btech	6 - 10 years	Main
66	I agree to	N4-6/NTC4-	Less than 5	Main
67	I agree to	Certificate-	16 - 20 years	Main
68	I agree to	Certificate-	6 - 10 years	Main
69	I agree to	Certificate-	11 - 15 years	Main
70	I agree to	Certificate-	11 - 15 years	Main
71	I agree to	N4-6/NTC4-	11 - 15 years	Main
72	I agree to	Bachelor's	6 - 10 years	Main
73	I agree to	Masters	6 - 10 years	Main
74	I agree to	Certificate-	11 - 15 years	Main
75	I agree to	Certificate-	Less than 5	Main
76	I agree to	Certificate-	6 - 10 years	Main
77	I agree to	Higher	6 - 10 years	Main
78	I agree to	Certificate-	6 - 10 years	Main
79	I agree to		11 - 15 years	Main
80	I agree to	Certificate-	6 - 10 years	Main
81	I agree to	Certificate-	Less than 5	Main
82	I agree to	Higher	6 - 10 years	Main
83	I agree to	Certificate-	6 - 10 years	Main
84	I agree to	Certificate-	21 years and	Main
85	I agree to	Higher	Less than 5	Main
86	I agree to	Bachelor's	6 - 10 years	Main
87	I agree to	Higher	6 - 10 years	Main
88	I agree to	Grade	6 - 10 years	Main
89	I agree to	Higher	6 - 10 years	Main
90	I agree to	Bachelor's	6 - 10 years	Main
91	I agree to	N4-6/NTC4-	16 - 20 years	Main
92	I agree to	Advanced	11 - 15 years	Main
93	I agree to	Higher	Less than 5	Main
94	I agree to	N4-6/NTC4-	16 - 20 years	Main

95	I agree to	Certificate-	6 - 10 years	Main
96	I agree to	Masters	11 - 15 years	Main
97	I agree to	None of	11 - 15 years	Main
98	I agree to	Certificate-	6 - 10 years	Main
99	I agree to	Higher	11 - 15 years	Main
100	I agree to	Bachelor's	Less than 5	Main
101	I agree to	N4-6/NTC4-	6 - 10 years	Main
102	I agree to	Higher	6 - 10 years	Main
103	I agree to	MATRIC2M	Less than 5	Main
104	I agree to	Certificate-	6 - 10 years	Main
105	I agree to	Higher	6 - 10 years	Main
106	I agree to	Higher	6 - 10 years	Main
107	I agree to	Certificate-	6 - 10 years	Main
108	I agree to	N4-6/NTC4-	11 - 15 years	Main
109	I agree to	Higher	Less than 5	Main
110	I agree to	N4-6/NTC4-	11 - 15 years	Main
111	I agree to	Higher	6 - 10 years	Main
112	I agree to	Grade	6 - 10 years	Main
113	I agree to	Certificate-	6 - 10 years	Main
114	I agree to	Higher	6 - 10 years	Main
115	I agree to	3838	Less than 5	Main
116	I agree to	NQF LEVEL	Less than 5	Main
117	I agree to		6 - 10 years	Main
118	I agree to	Bachelor's	Less than 5	Main
119	I agree to	Bachelor's	6 - 10 years	Main
120	I agree to	Certificate-	Less than 5	Main
121	I agree to	Higher	6 - 10 years	Main
122	I agree to	Certificate-	6 - 10 years	Main
123	I agree to	Higher	Less than 5	Main
124	I agree to	Certificate-	6 - 10 years	Main
125	I agree to	Certificate-	11 - 15 years	Main
126	I agree to	Certificate-	11 - 15 years	Main
127	I agree to	Phd	6 - 10 years	Main
128	I agree to	Certificate-	Less than 5	Main
129	I agree to	Certificate-	Less than 5	Main
130	I agree to	Bachelor's	Less than 5	Main
131	I agree to	Certificate-	6 - 10 years	Main
132	I agree to	Bachelor's	16 - 20 years	Main
133	I agree to	Bachelor's	Less than 5	Main
134	I agree to	Certificate-	Less than 5	Main
135	I agree to	Bachelor's	6 - 10 years	Main
136	I agree to	Certificate-	6 - 10 years	Main
137	I agree to	Bachelor's	6 - 10 years	Main
138	I agree to	Higher	6 - 10 years	Main
139	I agree to	General	Less than 5	Main
140	I agree to	N4-6/NTC4-	Less than 5	Main
141	I agree to	Certificate-	11 - 15 years	Main
142	I agree to	Grade 12	Less than 5	Main
143	I agree to	Certificate-	21 years and	Main
144	I agree to	Certificate-	6 - 10 years	Main
145	I agree to	Higher	11 - 15 years	Main

146	I agree to	Certificate-	Less than 5	Main
147	I agree to	Masters	6 - 10 years	Main
148	I agree to	Certificate-	6 - 10 years	Main
149	I agree to	N4-6/NTC4-	6 - 10 years	Main
150	I agree to	Certificate-	Less than 5	Main
151	I agree to	Bachelor's	Less than 5	Main
152	I agree to	N4-6/NTC4-	6 - 10 years	Main
153	I agree to	Masters	11 - 15 years	Main
154	I agree to	Higher	21 years and	Main
155	I agree to	Higher	21 years and	Main
156	I agree to	Certificate-	21 years and	Main
157	I agree to	standard 8	11 - 15 years	Main
158	I agree to	Bachelor's	6 - 10 years	Main
159	I agree to	Higher	16 - 20 years	Main
160	I agree to	Certificate-	16 - 20 years	Main
161	I agree to	Certificate-	11 - 15 years	Main
162	I agree to	Higher	6 - 10 years	Main
163	I agree to	Bachelor's	16 - 20 years	Main
164	I agree to	Higher	6 - 10 years	Main
165	I agree to	Higher	6 - 10 years	Main
166	I agree to	Bachelor's	Less than 5	Main
167	I agree to	N4-6/NTC4-	11 - 15 years	Main
168	I agree to	Higher	16 - 20 years	Main
169	I agree to	N4-6/NTC4-	16 - 20 years	Main
170	I agree to	Higher	11 - 15 years	Main
171	I agree to	Certificate-	21 years and	Main
172	I agree to	Bachelor's	6 - 10 years	Main
173	I agree to	Bachelor's	11 - 15 years	Main
174	I agree to	none	16 - 20 years	Main
175	I agree to	Masters	6 - 10 years	Main
176	I agree to	Certificate-	11 - 15 years	Main
177	I agree to	Masters	16 - 20 years	Main
178	I agree to	Certificate-	11 - 15 years	Main
179	I agree to	Masters	16 - 20 years	Main
180	I agree to	N4-6/NTC4-	21 years and	Main
181	I agree to	Higher	16 - 20 years	Main
182	I agree to	Certificate-	21 years and	Main
183	I agree to	Higher	Less than 5	Main
184	I agree to	Higher	6 - 10 years	Main
185	I agree to	Certificate-	11 - 15 years	Main
186	I agree to	Higher	11 - 15 years	Main
187	I agree to	Bachelor's	11 - 15 years	Main
188	I agree to	N4-6/NTC4-	16 - 20 years	Main
189	I agree to	Masters	11 - 15 years	Main
190	I agree to	Grade	11 - 15 years	Main
191	I agree to	Masters	21 years and	Main
192	I agree to	Higher	6 - 10 years	Main
193	I agree to	Masters	Less than 5	Main
194	I agree to	Masters	6 - 10 years	Main
195	I agree to	Higher	11 - 15 years	Main
196	I agree to	Bachelor's	16 - 20 years	Main

197	I agree to	Higher	6 - 10 years	Main
198	I agree to	Certificate-	21 years and	Main
199	I agree to	Higher	11 - 15 years	Main
200	I agree to	N4-6/NTC4-	11 - 15 years	Main
201	I agree to	Bachelor's	6 - 10 years	Main
202	I agree to	Higher	16 - 20 years	Main
203	I agree to	N4-6/NTC4-	11 - 15 years	Main
204	I agree to	Bachelor's	6 - 10 years	Main
205	I agree to	Bachelor's	11 - 15 years	Main
206	I agree to	Certificate-	21 years and	Main
207	I agree to	Certificate-	21 years and	Main
208	I agree to	Certificate-	6 - 10 years	Main
209	I agree to	N4-6/NTC4-	6 - 10 years	Main
210	I agree to	N4-6/NTC4-	16 - 20 years	Main
211	I agree to	Higher	11 - 15 years	Main
212	I agree to	sales and	11 - 15 years	Main
213	I agree to	Masters	16 - 20 years	Main
214	I agree to	N4-6/NTC4-	16 - 20 years	Main
215	I agree to		11 - 15 years	Main
216	I agree to	Certificate-	6 - 10 years	Main
217	I agree to	Higher	21 years and	Main
218	I agree to	Grade 12	11 - 15 years	Main
219	I agree to	Bachelor's	21 years and	Main
220	I agree to	Certificate-	Less than 5	Main
221	I agree to	Higher	11 - 15 years	Main
222	I agree to	Grade 11	21 years and	Main
223	I agree to	Certificate-	11 - 15 years	Main
224	I agree to	Bachelor's	6 - 10 years	Main
225	I agree to	N4-6/NTC4-	11 - 15 years	Main
226	I agree to	Higher	11 - 15 years	Main
227	I agree to	Certificate-	6 - 10 years	Main
228	I agree to	Masters	21 years and	Main
229	I agree to	Certificate-	11 - 15 years	Main
230	I agree to	Masters	11 - 15 years	Main
231	I agree to	Masters	16 - 20 years	Main
232	I agree to	Bachelor's	6 - 10 years	Main
233	I agree to	Certificate-	6 - 10 years	Main
234	I agree to	Higher	16 - 20 years	Main

FLTAMA002 PhD Project Diversification and performance of construction business models																						
Business	FinancialYe	DIV1_ID	DIV2_CW	DIV3_ITD	RES1_PHYS	RES2_HUM	RES3_FIN	RES_Employees	RES_ASSETS	RES_LIABILITIES	RES4_CAPEX	PERF1_REV	PERF1_OPM	PERF3_REVgrowt	PERF_MARKET_c	PERF_DEratio	PERF2_NAV	PERF_REVrank	EQUITY	ROA	ROE	ROCE
CB001	2016	0,030	0,413	68,225	0,413	15,010	169,601	9286,000	15,391	9,645	0,127	30,700	0,033	#NULL!	0,000	#NULL!	5,746	0,750	5,687	0,013	#NULL!	0,229
CB001	2017	0,028	0,417	64,102	0,969	15,067	198,395	9131,000	16,234	10,794	0,309	31,900	0,031	0,041	8,846	0,020	5,440	0,800	5,440	0,015	#NULL!	0,223
CB001	2018	0,063	0,428	69,597	0,902	14,972	209,410	11018,000	18,624	12,605	0,316	35,000	0,030	0,098	8,970	0,029	6,019	0,850	6,019	0,010	#NULL!	0,198
CB001	2019	0,024	0,391	73,271	0,921	15,025	222,226	12121,000	19,765	13,631	0,374	41,000	0,014	0,159	6,578	0,027	6,134	0,950	6,134	0,010	#NULL!	0,124
CB001	2020	0,017	0,361	77,844	0,588	15,330	255,517	9470,000	20,910	15,029	0,253	43,000	-0,013	0,061	6,049	0,120	5,882	1,000	5,882	0,008	#NULL!	-0,044
CB001	2021	0,027	0,409	71,563	0,602	14,699	228,433	8049,000	18,475	12,850	0,117	38,300	0,012	-0,548	6,780	0,099	5,625	0,900	5,625	0,003	#NULL!	0,118
CB001	2022	0,045	0,493	55,897	1,400	14,751	304,147	6765,000	11,867	8,931	0,241	25,400	0,047	-0,114	4,844	0,112	2,936	0,700	2,936	0,006	#NULL!	-0,310
CB002	2016	29,422	0,507	15,100	6,933	13,533	75,502	10516,000	6,727	2,894	0,550	7,926	0,090	0,094	3,028	0,285	3,833	0,000	3,833	#NULL!	0,122	0,133
CB002	2017	27,082	0,548	13,500	4,891	13,724	77,063	9871,000	6,994	3,044	0,441	9,006	0,073	0,136	4,455	0,241	3,950	0,350	3,950	#NULL!	0,104	0,122
CB002	2018	30,247	0,540	13,018	5,166	13,848	70,081	8271,000	7,140	2,942	0,441	8,542	0,079	-0,052	4,129	0,185	4,198	0,100	4,198	#NULL!	0,108	0,128
CB002	2019	32,290	0,659	17,948	4,941	13,967	67,922	7321,000	7,266	2,939	0,421	8,519	0,024	-0,003	3,381	0,153	4,327	0,050	4,327	#NULL!	0,027	0,038
CB002	2020	31,598	0,690	18,943	6,658	13,979	76,811	7418,000	7,982	3,468	0,582	8,700	0,055	0,025	3,816	0,177	4,514	0,200	4,515	#NULL!	0,067	0,077
CB002	2021	27,866	0,687	18,898	4,716	14,027	81,579	7161,000	8,847	3,813	0,417	8,800	0,041	0,013	4,163	0,170	5,034	0,250	4,674	#NULL!	0,043	0,058
CB002	2022	21,483	0,669	27,379	6,011	14,253	95,008	7473,000	10,000	4,872	0,696	11,600	0,082	0,309	7,285	0,184	5,128	0,600	5,128	#NULL!	0,120	0,135
CB003	2016	#NULL!	#NULL!	29,758	1,628	13,735	168,919	10476,000	6,567	4,125	0,157	9,669	0,040	#NULL!	0,649	#NULL!	2,442	0,450	2,442	0,040	0,073	#NULL!
CB003	2017	0,000	0,739	23,707	3,005	13,676	149,636	10412,000	6,512	3,904	0,272	9,058	#NULL!	0,063	0,826	#NULL!	2,608	0,400	2,609	-2,300	-0,054	#NULL!
CB003	2018	0,000	0,945	28,570	3,300	13,804	254,469	10485,000	6,435	4,555	0,342	10,364	#NULL!	-0,144	0,342	#NULL!	1,880	0,550	1,790	-0,085	-0,260	#NULL!
CB003	2019	0,000	0,957	23,450	4,952	13,731	272,344	10746,000	6,448	4,717	0,489	9,875	#NULL!	0,047	0,489	#NULL!	1,731	0,500	1,732	-0,017	-0,063	#NULL!
CB003	2020	0,000	0,924	24,396	5,590	13,514	833,287	9768,000	6,645	5,933	0,404	8,586	#NULL!	0,268	0,041	#NULL!	0,712	0,150	0,712	-0,164	-0,865	#NULL!
CB003	2021	0,000	0,718	17,120	9,939	13,199	1433,428	8693,000	5,413	5,060	0,466	8,846	0,030	0,351	0,047	4,406	0,353	0,300	0,353	-0,048	-0,530	#NULL!
CB003	2022	0,000	0,830	15,776	10,195	13,877	-5207,778	5611,000	4,597	4,687	0,608	11,758	0,030	-0,272	0,090	16,119	-0,090	0,650	-0,090	-0,001	-4,612	#NULL!

Classification, initial recognition and subsequent measurement

IFRS 9 introduces new measurement categories for financial assets. The measurement categories of IFRS 9 and IAS 39 are illustrated in the table below:

IAS 39*	IFRS 9*
Loans and receivables	Financial assets at amortised cost

* Only those categories of financial assets applicable to the group have been disclosed above.

Effective 1 March 2018, the group classifies its financial assets in each of the IFRS 9 measurement categories according to the group's **business model** for managing the financial asset together with the cash flow characteristics of the financial asset. The reclassification into the new measurement categories of IFRS 9 did not have a significant impact on the group.

Financial liabilities are measured at amortised cost except for those designated as at fair value through profit and loss, which are measured at fair value.

Impairment

Prior to the adoption of IFRS 9 the group's methodology for calculating the allowance for credit losses was based on an incurred loss model in terms of IAS 39, where at the end of each reporting period the group assessed whether any objective evidence of impairment existed. Had any evidence existed at the time of consideration, an allowance for credit losses was calculated on the financial asset at amortised cost as the difference between the financial asset's carrying value and the present value of the estimated future cash flows discounted at the original effective interest rate (its recoverable amount).

IFRS 9	<p>FINANCIAL INSTRUMENTS</p> <p>CLASSIFICATION AND MEASUREMENT OF FINANCIAL ASSETS</p> <ul style="list-style-type: none"> › all financial assets are initially measured at fair value; › debt instruments are subsequently measured at fair value through profit or loss; › amortised cost or fair value through other comprehensive income; › equity instruments are measured at fair value through profit or loss. 	New	1 January 2018	The group's business model is to hold and collect and the group only collects capital and interest, therefore our financial instruments are unlikely to change.
IFRS 15	<p>REVENUE FROM CONTRACTS WITH CUSTOMERS</p> <p>New standard that requires entities to recognise revenue to depict the transfer of promised goods or services to customers in an amount that reflects the consideration to which the entity expects to be entitled in exchange for those goods or services. This core principle is achieved through a five step methodology that is required to be applied to all contracts with customers.</p>	New	1 January 2018	The group has embarked on a process to identify all contracts and assess the impact thereof on the group.

NEW ACCOUNTING PRONOUNCEMENTS ADOPTED

STANDARDS AND INTERPRETATIONS ISSUED AND NOT YET EFFECTIVE

The group has chosen not to early adopt the following Standards and Interpretations, which have been published and are mandatory for the group's accounting periods beginning on or after 1 March 2018 or later periods.

	ACCOUNTING STANDARD/INTERPRETATION	TYPE	EFFECTIVE DATE	IMPACT ON THE ANNUAL FINANCIAL STATEMENTS
IFRS 9	<p>FINANCIAL INSTRUMENTS</p> <p>The new standard requires financial assets to be measured initially at its fair value. Except for certain trade receivables.</p> <p>Debt instruments are subsequently measured at fair value through profit or loss, amortised cost, or fair value through other comprehensive income, on the basis of their contractual cash flows and the business model under which the debt instruments are held.</p> <p>The new impairment requirements are based on an Expected Credit Loss (ECL) model and replace the IAS 39 incurred loss model. It is no longer required for a credit event to have occurred before credit losses are recognised. An entity always accounts for ECLs, and updates loss allowance for changes in these ECLs at each reporting date to reflect changes in credit risk since initial recognition.</p> <p>The ECL model applies to debt instruments accounted for at amortised cost or at fair value through other comprehensive income, lease receivables and contract assets. Loan commitments and financial guarantee contracts that are not measured at fair value through profit or loss are also included in the scope of the new ECL model.</p>	New	1 January 2018	The group's business model is to hold and collect and the group only collects capital and interest, therefore its financial instruments are unlikely to change. The impairment requirements might result in earlier recognition of credit losses.

NEW ACCOUNTING PRONOUNCEMENTS ADOPTED

STANDARDS AND INTERPRETATIONS ISSUED AND NOT YET EFFECTIVE

The group has chosen not to early adopt the following Standards and Interpretations, which have been published and are mandatory for the group's accounting periods beginning on or after 1 March 2018 or later periods.

	ACCOUNTING STANDARD/INTERPRETATION	TYPE	EFFECTIVE DATE	IMPACT ON THE ANNUAL FINANCIAL STATEMENTS
IFRS 9	<p>FINANCIAL INSTRUMENTS</p> <p>The new standard requires financial assets to be measured initially at its fair value. Except for certain trade receivables.</p> <p>Debt instruments are subsequently measured at fair value through profit or loss, amortised cost, or fair value through other comprehensive income, on the basis of their contractual cash flows and the business model under which the debt instruments are held.</p> <p>The new impairment requirements are based on an Expected Credit Loss (ECL) model and replace the IAS 39 incurred loss model. It is no longer required for a credit event to have occurred before credit losses are recognised. An entity always accounts for ECLs, and updates loss allowance for changes in these ECLs at each reporting date to reflect changes in credit risk since initial recognition.</p> <p>The ECL model applies to debt instruments accounted for at amortised cost or at fair value through other comprehensive income, lease receivables and contract assets. Loan commitments and financial guarantee contracts that are not measured at fair value through profit or loss are also included in the scope of the new ECL model.</p>	New	1 January 2018	The group's business model is to hold and collect and the group only collects capital and interest, therefore its financial instruments are unlikely to change. The impairment requirements might result in earlier recognition of credit losses.

The directors have pleasure in presenting their report which forms part of the annual financial statements of the group for the year ended 29 February 2020.

NATURE OF BUSINESS

[REDACTED] is a public company incorporated and domiciled in the Republic of South Africa and is listed on the JSE Main Board in the "Construction and Materials – Construction" sector.

[REDACTED] construction company operates throughout South Africa, sub-Saharan Africa and the United Arab Emirates with multidisciplinary expertise including concrete structures, marine construction, piling and geotechnical services, roads and earthworks, bulk pipelines, open-pit contract mining and surface mining related services, all forms of building works including affordable housing,

Shareholders are advised that the Restructuring Plan has been fully developed, including having regard to the potential impact of the Coronavirus ("COVID-19") on the group and its business. The Plan has been approved by both the company's board of directors and the Lenders and envisages, inter alia:

- › the sale of non-core assets;
- › the sale of underutilised plant and equipment;
- › the sale of certain divisions/subsidiaries;
- › internal restructuring initiatives required to restore optimal operational and financial performance;
- › the securing of additional short-term funding of R430 million, of which R270 million relates to the negative effects of the national lockdown due to the COVID-19;
- › a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- › the restructuring of the short-term funding received to date from the Lenders into a term loan; and
- › evaluation of an optimum **business model** and associated capital structure analysis including the potential of raising new equity.

The purpose of the Plan is to put in place the optimal capital structure and access to liquidity to position the group for long-term

The Restructuring Plan is anticipated to be implemented over the financial years ending February 2021 and February 2022 and, to the extent required, shareholder approval will be sought for relevant aspects of the Plan. The previous short-term funding agreement was converted into a term loan on 1 July 2020, which loan terminates on 28 February 2022, and in addition, the Lenders have agreed to provide continued guarantee support for current and future projects being undertaken by the group.

Stefanutti Stocks will continue to update all shareholders on progress on various aspects of the Restructuring Plan.

GOING CONCERN

The funding provided by the Lenders has assisted in relieving the group's liquidity pressures even though current liabilities exceed current assets by R998 million at 29 February 2020. In addition thereto, uncertainties surrounding the COVID-19 pandemic and contingent liabilities as noted in note 25 of the consolidated annual financial statements, indicate that a material uncertainty exists that may cast doubt on the group's ability to continue as a going concern in the short term. However, having converted the short-term funding agreement with the Lenders to a term loan on 1 July 2020 and on

2. GOING CONCERN

FUNDING AND RESTRUCTURING PLAN

A strategic restructuring team has been appointed, including the appointment of a Chief Restructuring Officer, to advise on and assist with the development and implementation of a detailed turnaround programme for the group, including the securing of requisite additional short-term funding from the company's primary banker and guarantee providers (the "Lenders") and the subsequent restructuring of all such short-term funding into appropriate longer-term funding (the "Restructuring Plan" or "Plan").

Shareholders are advised that the Restructuring Plan has been fully developed, including having regard to the potential impact of the Coronavirus ("COVID-19") on the group and its business. The Plan has been approved by both the company's board of directors and the Lenders and envisages, inter alia:

- › the sale of non-core assets;
- › the sale of underutilised plant and equipment;
- › the sale of certain divisions/subsidiaries;
- › internal restructuring initiatives required to restore optimal operational and financial performance;
- › the securing of additional short-term funding of R430 million, of which R270 million relates to the negative effects of the national lockdown due to the COVID-19;
- › a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- › the restructuring of the short-term funding received to date from the Lenders into a term loan; and
- › evaluation of an optimum **business model** and associated capital structure analysis including the potential of raising new equity.

The purpose of the Plan is to put in place the optimal capital structure and access to liquidity to position the group for longterm growth in this dynamic environment.

Nature of business

[REDACTED] is a public company incorporated and domiciled in the Republic of South Africa and is listed on the JSE Main Board in the "Construction and Materials – Construction" sector.

[REDACTED] a construction company operates throughout South Africa, Sub-Saharan Africa and the United Arab Emirates with multidisciplinary expertise including concrete structures, marine construction, piling and geotechnical services, roads and earthworks, bulk pipelines, surface mining related services, all forms of building works including affordable housing, mechanical and electrical installation and construction.

A simplified group organogram has been provided, additional information on the group's operating entities is available on request. Please refer to page 1.

COVID-19

- › the securing of additional short-term funding of R430 million, of which R270 million related to the negative effects of the national lockdown in March/April 2020;
- › a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- › the restructuring of the short-term funding received to date from the Lenders into a term loan; and
- › evaluation of an optimal **business model** going forward and associated capital structure analysis including the potential of raising new equity.

In accordance with the Restructuring Plan, the Lenders had provided the requisite funding and converted the short-term funding agreement into a term loan on 1 July 2020, which loan terminates on 28 February 2022. The loan bears interest at prime plus 5,4%, including arranging and facility fees, and is secured by special and general notarial bonds over movable assets, continuous covering mortgage bonds over immovable assets and various cessions.

Going concern

The funding provided by the Lenders has assisted in relieving the group's liquidity pressures even though current liabilities exceed current assets at 28 February 2021. In addition thereto, uncertainties surrounding the COVID-19 pandemic and contingent liabilities as noted in note 26 of these Consolidated Annual Financial Statements for the year ended 28 February 2021, continue to indicate that a material uncertainty exists that may cast doubt on the group's ability to continue as a going concern in the short term. However, having converted the short-term funding agreement with the Lenders to a term loan and on the basis of successfully implementing the Restructuring Plan, the directors consider it appropriate that the group's results for the reporting period be prepared on the going-concern basis.

Eskom – Kusile Power Projects

As previously highlighted to shareholders in various announcements and updates since late 2018, the group continues to pursue a number of contractual claims and compensation

As previously reported, the Restructuring Plan has been approved by both the company's board of directors and the Lenders and envisages, inter alia:

- › the sale of non-core assets;
- › the sale of underutilised plant and equipment;
- › the sale of certain operations;
- › internal restructuring initiatives required to restore optimal operational and financial performance;
- › the securing of additional short-term funding of R430 million, of which R270 million related to the negative effects of the national lockdown in March/April 2020;
- › a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- › the restructuring of the short-term funding received to date from the Lenders into a term loan; and
- › evaluation of an optimal **business model** going forward and associated capital structure analysis including the potential of raising new equity.

In accordance with the Restructuring Plan, the Lenders had provided the requisite funding and converted the short-term funding agreement into a term loan on 1 July 2020, which loan terminates on 28 February 2022. The loan bears interest at prime plus 5,4%, including arranging and facility fees, and is secured by special and general notarial bonds over movable assets, continuous covering mortgage bonds over immovable assets and various cessions. Shareholders are further advised that the group, on 25 May 2021, reached an agreement with the Lenders to extend the current capital repayment profile of the loan. The capital portion of the loan repayments are envisaged to commence in July 2021 with a residual loan balance at 28 February 2022 of approximately R420 million. The resolution of contractual claims and compensation events on the Kusile power project is taking longer than anticipated due to the complex nature thereof.

As previously reported, the Restructuring Plan has been approved by both the company's board of directors and the Lenders and envisages, inter alia:

- the sale of non-core assets;
- the sale of underutilised plant and equipment;
- the sale of certain operations;
- internal restructuring initiatives required to restore optimal operational and financial performance;
- the securing of additional short-term funding of R430 million, of which R270 million related to the negative effects of the national lockdown in March/April 2020;
- a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- the restructuring of the short-term funding received to date from the Lenders into a loan; and
- evaluation of an optimal **business model** going forward and associated capital structure analysis including the potential of raising new equity.

In accordance with the Restructuring Plan, the Lenders had provided the requisite funding and converted the short-term funding agreement into a short-term loan on 1 July 2020. The group, on 21 February 2022, reached an agreement with the Lenders to extend the current capital repayment profile of the loan as well as its duration to 28 February 2023.

The loan bears interest at prime plus 5,4%, including arranging and facility fees, and is secured by special and general notarial bonds over movable assets, continuous covering mortgage bonds over immovable assets and various cessions. The short-term and funding loans do not contain any financial covenants but rather impose certain information and general undertakings.

The Restructuring Plan is anticipated to be implemented over the financial year ending February 2023 and, to the extent required, shareholder approval will be sought for certain aspects of the Restructuring Plan. The group will continue to update shareholders on the progress of the various aspects of the Restructuring Plan.

GOING CONCERN

The directors consider it appropriate that the group's results for the reporting period be prepared on the going-concern basis, taking into consideration:

- the current order book;
- imminent project awards;
- continuing operations executing the group's order book profitably;
- the availability of short- and mid-term projects;
- reaching favourable outcomes on contractual claims and compensation events on certain projects;
- having converted the short-term funding agreement with the Lenders to a loan terminating on 28 February 2023;
- the assumption of a successful completion of current negotiations with the Lenders relating to the extension of capital repayments of the loan to January and February 2023;
- continued support from the Lenders; and
- successfully implementing the Restructuring Plan.

The funding provided by the Lenders has assisted with the group's liquidity, even though total liabilities continue to exceed total assets at 28 February 2022. The group believes it remains commercially solvent based on the cashflow projections included in the Restructuring Plan.

2. GOING CONCERN

RESTRUCTURING PLAN UPDATE

The group hereby provides shareholders with an update on the Restructuring Plan as reported in the Reviewed Condensed Consolidated Results of Stefanutti Stocks for the 12 months ended 28 February 2022 issued on 26 May 2022.

As previously reported, the Restructuring Plan has been approved by both the company's board of directors and the Lenders and envisages, inter alia:

- the sale of non-core assets;
- the sale of underutilised plant and equipment;
- the sale of certain operations;
- internal restructuring initiatives required to restore optimal operational and financial performance;
- the securing of additional short-term funding of R430 million, of which R270 million related to the negative effects of the national lockdown in March/April 2020;
- a favourable outcome from the processes relating to the contractual claims and compensation events on the Kusile power project;
- the restructuring of the short-term funding received to date from the Lenders into a loan; and
- evaluation of an optimal **business model** going forward and associated capital structure analysis including the potential of raising new equity.

In accordance with the Restructuring Plan, the Lenders had provided the requisite funding and converted the short-term funding agreement into a short-term loan on 1 July 2020. The group, on 21 February 2022, reached an agreement with the Lenders to extend the current capital repayment profile of the loan as well as its duration to 28 February 2023.

The loan bears interest at prime plus 5,4%, including arranging and facility fees, and is secured by special and general notarial bonds over movable assets, continuous covering mortgage bonds over immovable assets and various cessions. The short-term and funding loans do not contain any financial covenants but rather impose certain information and general undertakings.

IFRS 9: *Financial instruments*
(2009 and 2010)

1 January 2018

This IFRS is part of the IASB's project to replace IAS 39. IFRS 9 addresses classification and measurement, impairment hedge accounting and derecognition of financial assets.

A new approach to the classification of financial assets, which is driven by the **business model** has been introduced. A new business model was introduced which does not allow certain financial assets to be categorised as "fair value through other comprehensive income" in certain circumstances. A single impairment model is introduced and applied to all financial instruments as well as an "expected credit loss" model for the measurement of financial assets.

For hedge accounting a new model is introduced. The model aligns the accounting treatment with risk management activities of an entity, in addition to enhanced disclosures about risk management and the effect of hedge accounting on the financial statements.

Disclosure impact only.

This IFRS is part of the IASB's project to replace IAS 39. IFRS 9 addresses classification and measurement, impairment hedge accounting and derecognition of financial assets.

A new approach to the classification of financial assets, which is driven by the business model has been introduced. A new **business model** was introduced which does not allow certain financial assets to be categorised as "fair value through other comprehensive income" in certain circumstances. A single impairment model is introduced and applied to all financial instruments as well as an "expected credit loss" model for the measurement of financial assets.

For hedge accounting a new model is introduced. The model aligns the accounting treatment with risk management activities of an entity, in addition to enhanced disclosures about risk management and the effect of hedge accounting on the financial statements.

Disclosure impact only.

FINANCIAL INSTRUMENTS AND FINANCIAL RISK MANAGEMENT

ACCOUNTING POLICY

Recognition and initial measurement

Trade receivables and debt securities issued are initially recognised when they are originated. All other financial assets and financial liabilities are initially recognised when the Group becomes a party to the contractual provisions of the instrument.

A financial asset (unless it is a contract or trade receivable without a significant financing component) or financial liability is initially measured at fair value plus, for an item not at fair value through profit or loss, transaction costs that are directly attributable to its acquisition or issue. A trade receivable without a significant financing component is initially measured at the transaction price.

Classification and subsequent measurement

Financial assets

Financial assets that meet the following conditions are classified and subsequently measured at amortised cost:

- the financial asset is held within a **business model** where the objective is to hold the financial assets in order to collect contractual cash flows; and
- the contractual terms of the financial asset give rise on specified dates to cash flows that are solely payments of principal and interest on the principal amount outstanding.

In assessing whether the contractual cash flows are solely payments of principal and interest, the Group considers the contractual terms of the instrument. This includes assessing whether the financial asset contains a contractual term that could change the timing or amount of contractual cash flows such that it would not meet this condition. In making this assessment, the Group considers contingent events that would change the amount or timing of cash flows and terms that may adjust the amount to be repaid.

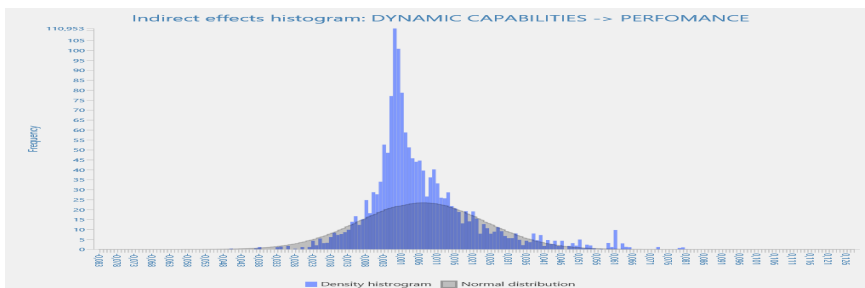
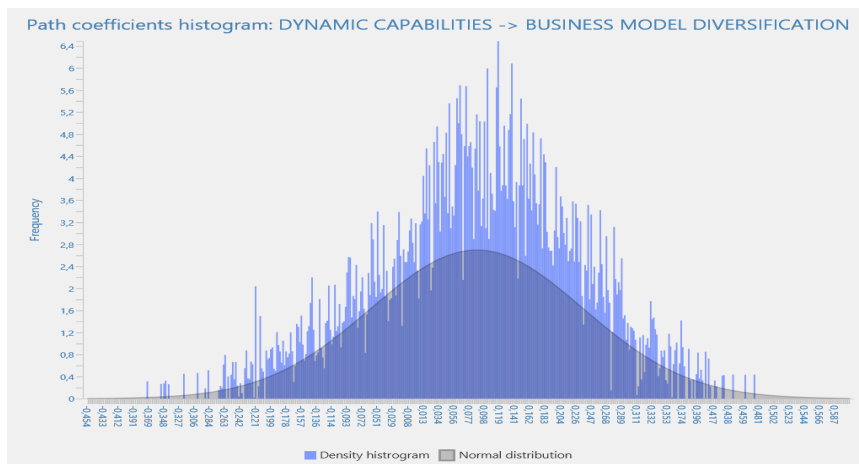
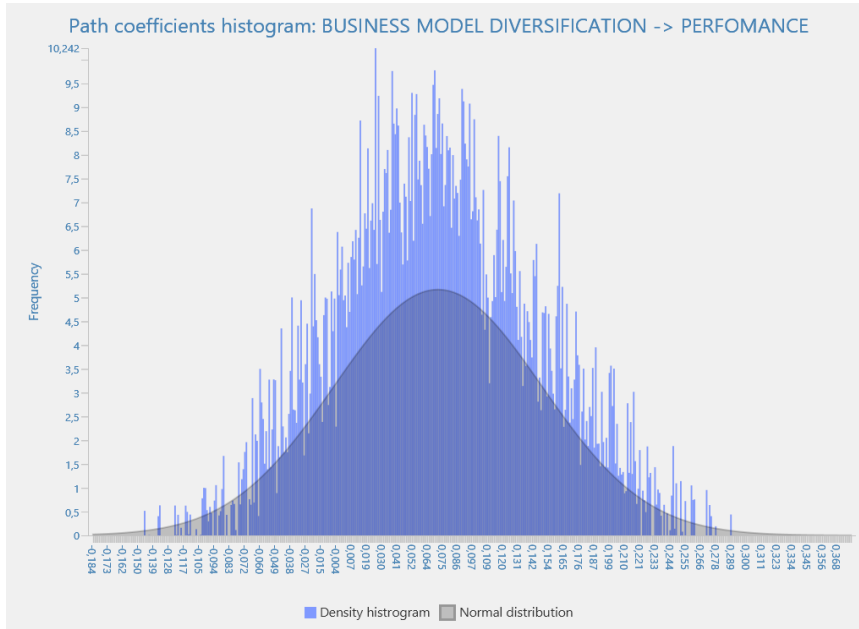
All financial assets of the Group are classified as measured at amortised cost.

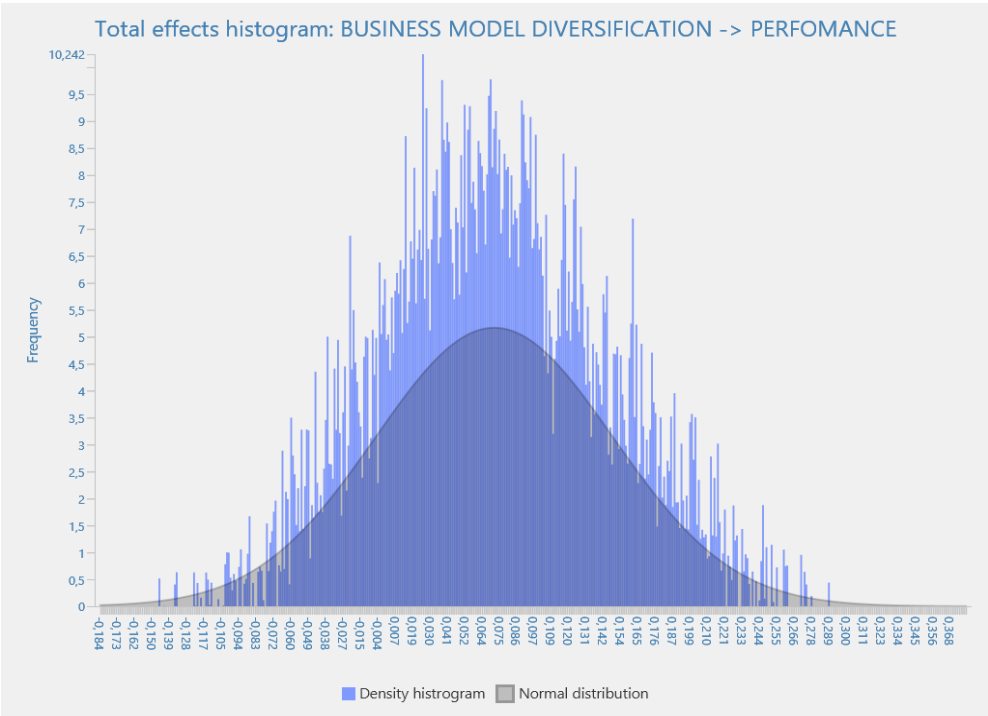
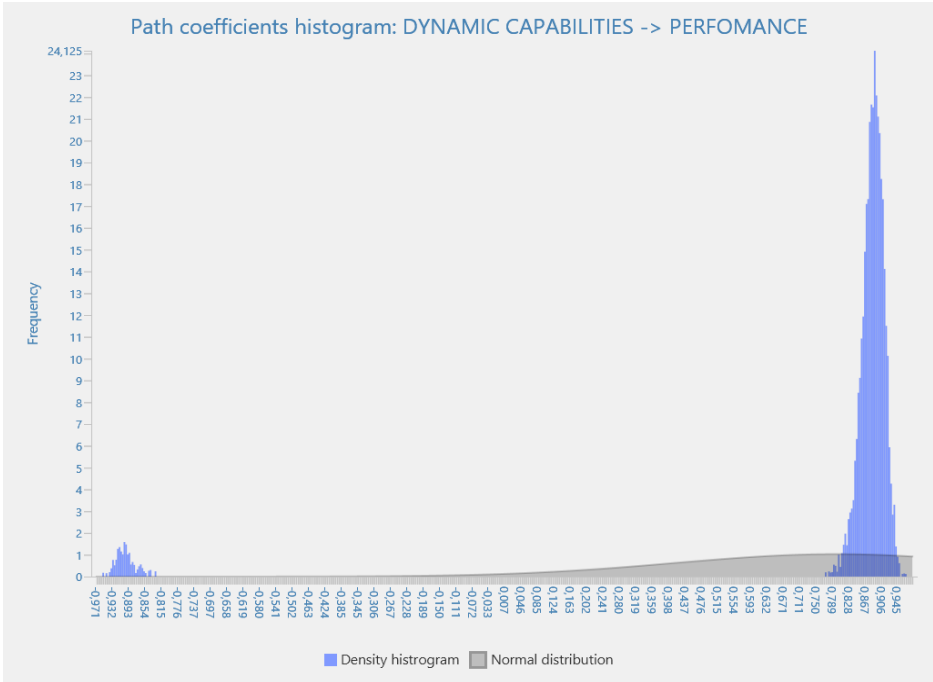
Financial assets at amortised cost are subsequently measured at amortised cost using the effective interest method. The amortised cost is reduced by impairment losses. Interest income, foreign exchange gains and losses and impairment are recognised in profit or loss. Any gain or loss on derecognition is recognised in profit or loss.

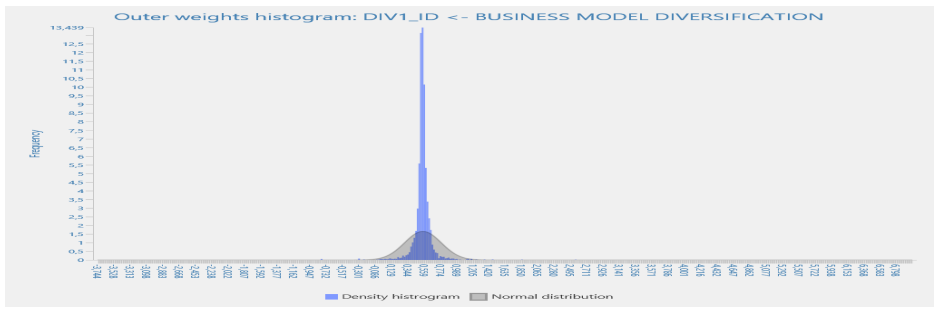
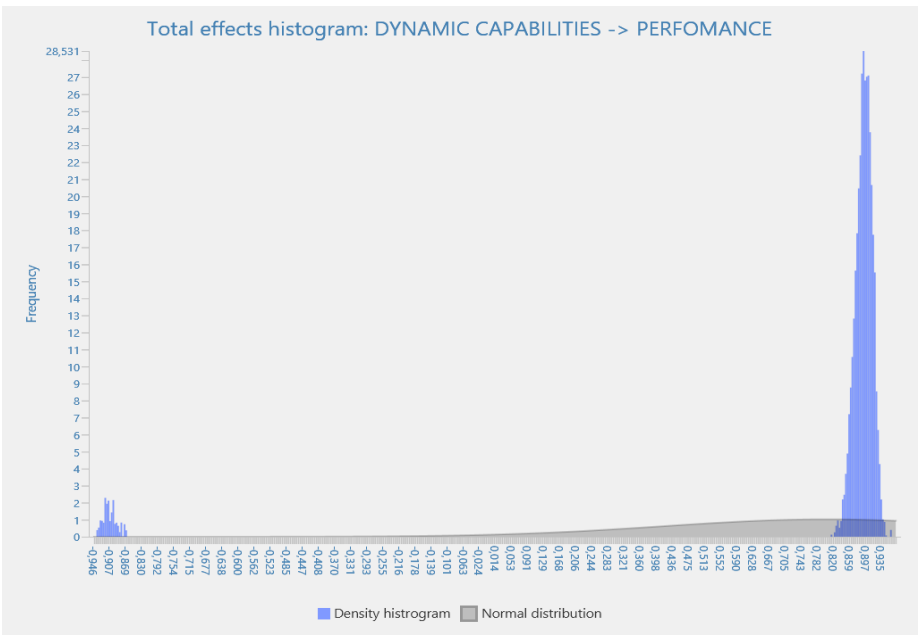
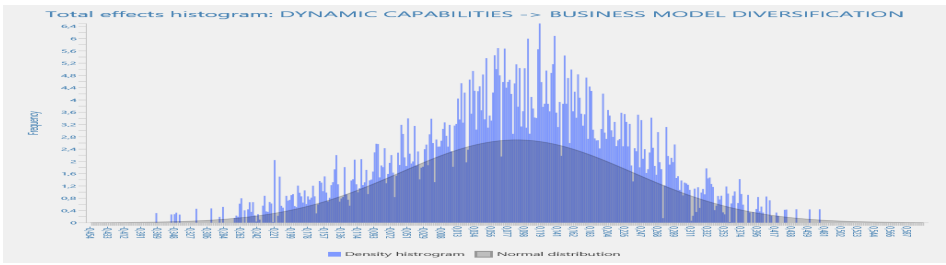
The “effective interest rate” is the rate that exactly discounts estimated future cash receipts through the expected life of the financial instrument to the gross carrying amount of the financial asset. In calculating interest income, the effective interest rate is applied to the gross carrying amount of the asset (when the asset is not credit-impaired).

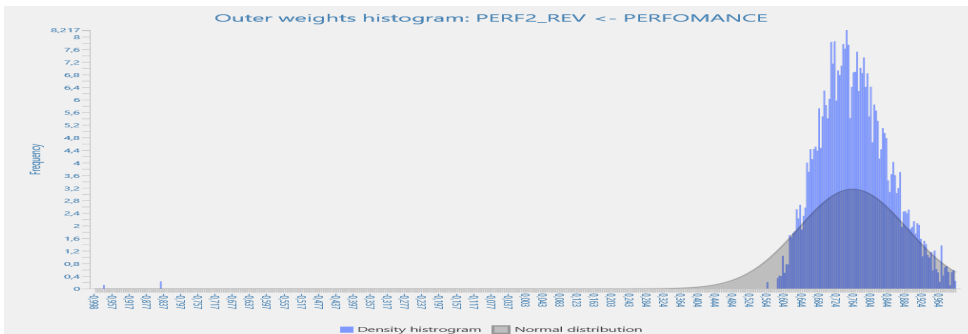
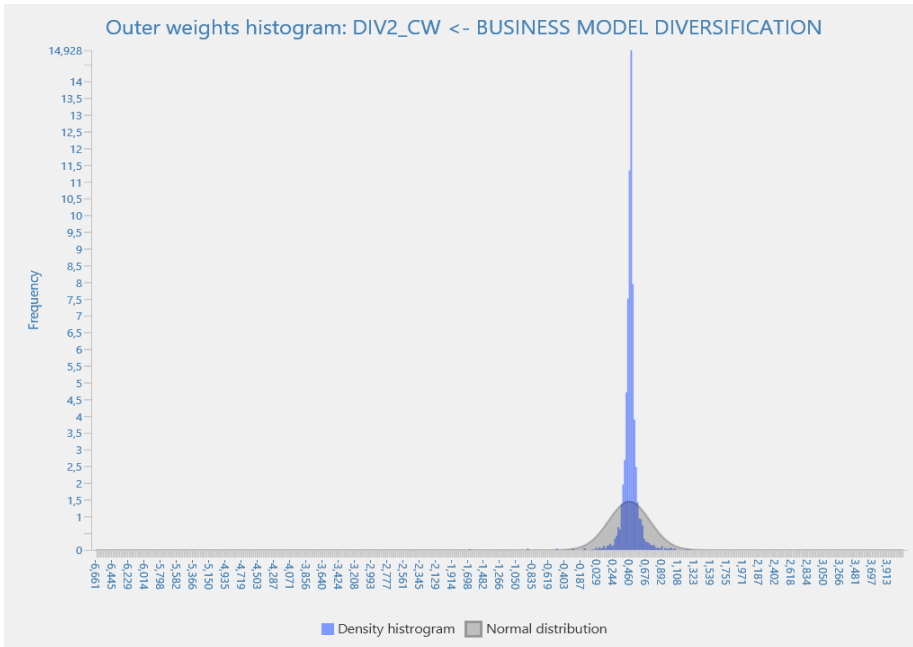
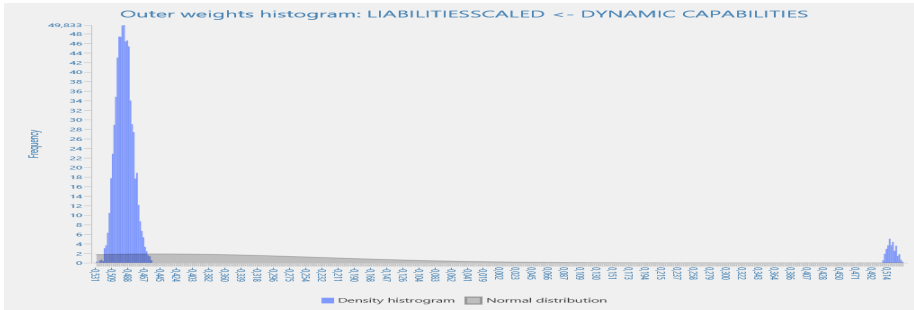
SmartPLS report

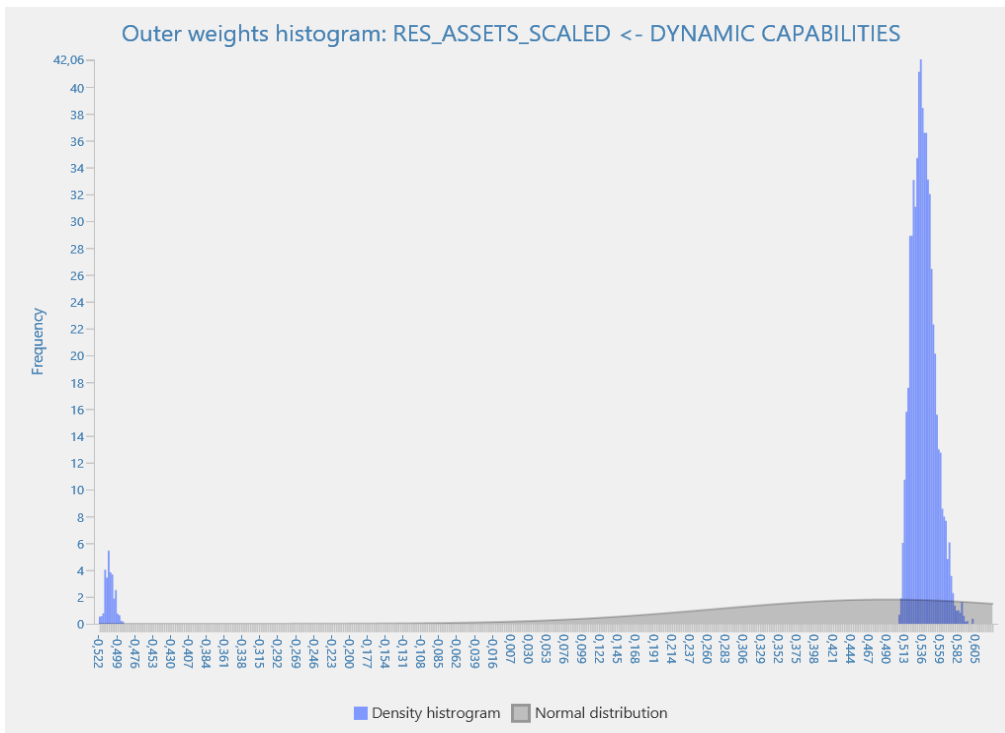
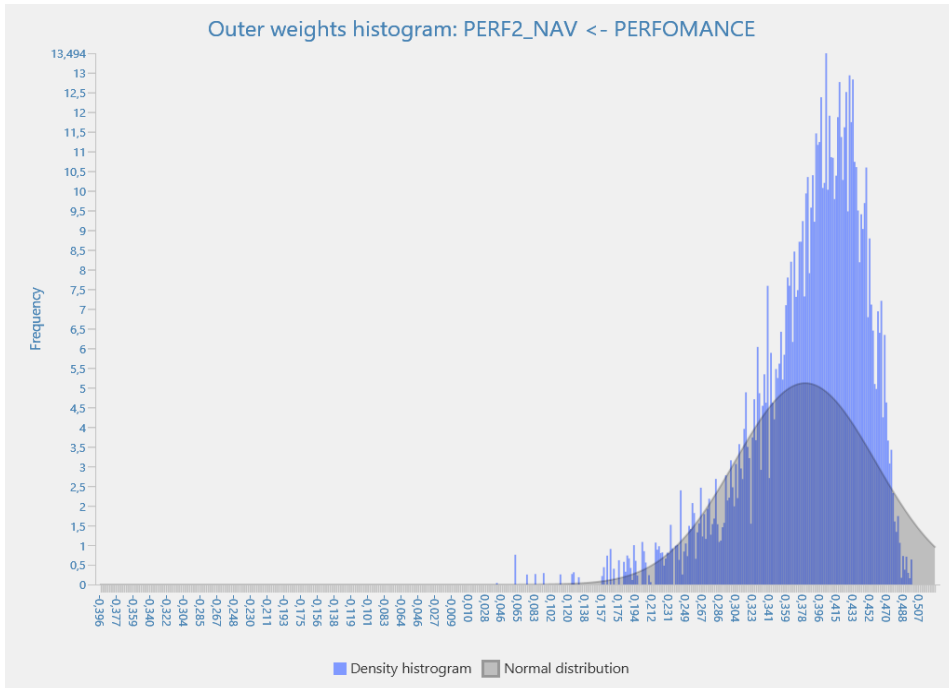
Please cite the use of SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2022. "SmartPLS 4." Oststeinbek: SmartPLS GmbH, <http://www.smartpls.com>.











SmartPLS report

Please cite the use of SmartPLS: Ringle, C. M., Wende, S., and Becker, J.-M. 2022. "SmartPLS 4." Oststeinbek: SmartPLS GmbH, <http://www.smartpls.com>.

[back to navigation](#)

Final results

Path coefficients

Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM				
PERF		0,0833		
RES_ASSETS_SCALED			0,8822	
RES_ASSETS_SCALED x DIV_CBM			0,0614	

List

	Path coefficients
DIV_CBM → PERF	0,0833
RES_ASSETS_SCALED → PERF	0,8822
RES_ASSETS_SCALED x DIV_CBM → PERF	0,0614

Indirect effects

Total effects

Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM		0,0833		
PERF				
RES_ASSETS_SCALED		0,8822		
RES_ASSETS_SCALED x DIV_CBM		0,0614		

List

	Total effects
DIV_CBM → PERF	0,0833
RES_ASSETS_SCALED → PERF	0,8822
RES_ASSETS_SCALED x DIV_CBM → PERF	0,0614

Outer loadings

Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV1_ID	0,9940			
DIV2_CW	0,9905			
PERF_NAV_SCALE		0,7387		
PERF_REV_SCALE		0,9256		
RES_ASSETS_SCALED			1,0000	
RES_ASSETS_SCALED x DIV_CBM				1,0000

List

	Outer loadings
DIV1_ID ← DIV_CBM	0,9940
DIV2_CW ← DIV_CBM	0,9905
PERF_NAV_SCALE ← PERF	0,7387
PERF_REV_SCALE ← PERF	0,9256
RES_ASSETS_SCALED ← RES_ASSETS_SCALED	1,0000
RES_ASSETS_SCALED x DIV_CBM → RES_ASSETS_SCALED x DIV_CBM	1,0000

Outer weights

Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV1_ID	0.5613			
DIV2_CW	0.4463			
PERF_NAV_SCALE		0.4189		
PERF_REV_SCALE		0.7460		
RES_ASSETS_SCALED			1.0000	
RES_ASSETS_SCALED x DIV_CBM				1.0000

List

	Outer weights
DIV1_ID <- DIV_CBM	0.5613
DIV2_CW <- DIV_CBM	0.4463
PERF_NAV_SCALE <- PERF	0.4189
PERF_REV_SCALE <- PERF	0.7460
RES_ASSETS_SCALED <- RES_ASSETS_SCP	1.0000
RES_ASSETS_SCALED x DIV_CBM -> RES	1.0000

Latent variables

Scores

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
0	-0.4864	-0.7998	-1.3189	0.6415
1	0.3828	-0.5122	-1.3189	-0.5049
2	1.3030	-0.1438	-1.3189	-1.7185
3	0.5429	1.1681	1.3189	0.7161
4	-0.5373	1.5365	1.3189	-0.7087
5	-0.6518	-0.5122	-0.4396	0.2865
6	-0.9442	-1.5365	-1.3189	1.2453
7	-0.5373	1.5365	1.3189	-0.7087
8	1.4174	-0.8805	0.4396	0.6232
9	-1.5719	-0.2246	0.4396	-0.6911
10	-0.6009	-0.2246	0.4396	-0.2642
11	-0.6518	-0.8805	-0.4396	0.2865
12	-0.4229	-1.5365	-1.3189	0.5577
13	-0.6518	0.1438	0.4396	-0.2865
14	-0.1357	1.5365	1.3189	-0.1798
15	0.4337	-0.4314	-0.4396	-0.1907
16	-0.5373	0.4314	1.3189	-0.7087
17	2.4647	0.1438	0.4396	1.0836
18	0.5112	0.5122	0.4396	0.2247
19	0.5429	0.5122	0.4396	0.2367
20	-0.5373	-1.5365	-1.3189	0.7087
21	1.4174	-1.1681	-0.4396	-0.6232
22	-0.2224	-0.7998	-1.3189	0.2933
23	0.9477	-1.5365	-1.3189	-1.2499
24	-0.1681	1.5365	1.3189	-0.2156
25	-0.5389	0.2246	-0.4396	0.2369
26	-1.5580	0.5122	0.4396	-0.6850
27	-1.5719	0.5122	0.4396	-0.6911
28	1.3156	-0.5122	-0.4396	-0.5784
29	0.3828	0.2246	0.4396	0.1663
30	2.1571	1.5365	1.3189	2.8450
31	1.0223	0.7998	0.4396	0.4495
32	-0.5234	-1.5365	-1.3189	0.6904
33	1.6768	-1.5365	-1.3189	-2.2116
34	-0.5281	-1.1681	-0.4396	0.2301
35	-0.6379	-0.1438	-0.4396	0.2804
36	-0.6379	-0.5122	-1.3189	0.8413
37	-0.7523	-0.8805	-0.4396	0.3307
38	-0.5234	0.8805	1.3189	-0.6904
39	-1.5580	0.4314	1.3189	-2.0549
40	-0.5373	-0.5122	-0.4396	0.2362
41	-0.1801	0.5122	-0.4396	0.0792
42	0.5429	1.5365	1.3189	0.7161
43	0.8532	1.5365	1.3189	1.1253
44	1.5319	1.1681	1.3189	2.0204
45	-1.2517	-1.1681	-1.3189	1.6509

Correlations

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM	1.0000	0.1681	0.0836	0.1889
PERF	0.1681	1.0000	0.8911	0.1028
RES_ASSETS_SCALED	0.0836	0.8911	1.0000	0.0325
RES_ASSETS_SCALED x DIV_CBM	0.1889	0.1028	0.0325	1.0000

Covariances

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM	1.0000	0.1681	0.0836	0.1797
PERF	0.1681	1.0000	0.8911	0.0978
RES_ASSETS_SCALED	0.0836	0.8911	1.0000	0.0309
RES_ASSETS_SCALED x DIV_CBM	0.1797	0.0978	0.0309	0.9048

Descriptives

	Mean	Median	Observed min	Observed max	Standard deviation	Excess kurtosis
DIV_CBM	0.0000	-0.4546	-1.5719	2.4647	1.0000	-0.3399
PERF	0.0000	0.0000	-1.5365	1.5365	1.0000	-1.1160
RES_ASSETS_SCALED	0.0000	0.0000	-1.3189	1.3189	1.0000	-1.4281

Residuals

Outer model scores

Case index	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
0	-0.0628	0.0790	1.0304	-0.5786	0.0000	0.0000
1	-0.0213	0.0267	-0.0613	0.0344	0.0000	0.0000
2	-0.0303	0.0381	0.5459	-0.3065	0.0000	0.0000
3	-0.0106	0.0133	-0.4232	0.2377	0.0000	0.0000
4	-0.0322	0.0154	0.1839	-0.1033	0.0000	0.0000
5	-0.0117	0.0147	-0.0613	0.0344	0.0000	0.0000
6	-0.0606	0.0762	-0.1839	0.1033	0.0000	0.0000
7	-0.0122	0.0154	0.1839	-0.1033	0.0000	0.0000
8	-0.0308	0.0388	0.6685	-0.3754	0.0000	0.0000
9	-0.0027	0.0033	-1.1530	0.6475	0.0000	0.0000
10	-0.0623	0.0788	-1.1530	0.6475	0.0000	0.0000
11	-0.0117	0.0147	-0.6685	0.3754	0.0000	0.0000
12	-0.0128	0.0161	-0.1839	0.1033	0.0000	0.0000
13	-0.0117	0.0147	-0.5459	0.3065	0.0000	0.0000
14	0.0980	-0.1232	0.1839	-0.1033	0.0000	0.0000
15	-0.0719	0.0904	1.6376	-0.9196	0.0000	0.0000
16	-0.0122	0.0154	-1.6376	0.9196	0.0000	0.0000
17	0.0602	-0.0757	-0.5459	0.3065	0.0000	0.0000
18	-0.0356	0.0448	0.0613	-0.0344	0.0000	0.0000
19	-0.0106	0.0133	0.0613	-0.0344	0.0000	0.0000
20	-0.0322	0.0154	-0.1839	0.1033	0.0000	0.0000
21	-0.0308	0.0388	0.4232	-0.2377	0.0000	0.0000
22	0.0709	-0.0892	1.0304	-0.5786	0.0000	0.0000
23	-0.1865	0.2345	-0.1839	0.1033	0.0000	0.0000
24	0.1296	-0.1579	0.1839	-0.1033	0.0000	0.0000
25	0.3554	-0.6984	1.1530	-0.6475	0.0000	0.0000
26	-0.0165	0.0207	0.0613	-0.0344	0.0000	0.0000
27	-0.0027	0.0033	0.0613	-0.0344	0.0000	0.0000
28	0.0704	-0.0885	-0.0613	0.0344	0.0000	0.0000
29	-0.0213	0.0267	1.1530	-0.6475	0.0000	0.0000
30	0.1395	-0.1755	0.1839	-0.1033	0.0000	0.0000
31	-0.3173	0.3990	-1.0304	0.5786	0.0000	0.0000
32	-0.0260	0.0327	-0.1839	0.1033	0.0000	0.0000
33	0.1075	-0.1352	-0.1839	0.1033	0.0000	0.0000
34	-0.0260	0.0327	0.4232	-0.2377	0.0000	0.0000
35	-0.0255	0.0320	0.5459	-0.3065	0.0000	0.0000
36	-0.0255	0.0320	-0.0613	0.0344	0.0000	0.0000
37	-0.0249	0.0313	-0.6685	0.3754	0.0000	0.0000
38	-0.0260	0.0327	0.6685	-0.3754	0.0000	0.0000
39	-0.0165	0.0207	-1.6376	0.9196	0.0000	0.0000
40	-0.0322	0.0154	-0.0613	0.0344	0.0000	0.0000
41	-0.0277	0.0348	0.0613	-0.0344	0.0000	0.0000
42	-0.0106	0.0133	0.1839	-0.1033	0.0000	0.0000
43	0.0772	-0.0971	0.1839	-0.1033	0.0000	0.0000
44	-0.0314	0.0395	-0.4232	0.2377	0.0000	0.0000
45	0.0187	-0.0235	0.4232	-0.2377	0.0000	0.0000

Outer model correlations

	DIV1_ID	DIV2_CW	PERF_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
DIV1_ID	1.0000	-1.0000	0.2922	-0.2922	-0.0711	0.0819
DIV2_CW	-1.0000	1.0000	-0.2922	0.2922	0.0711	-0.0819
PERF_NAV_SCALE	0.2922	-0.2922	1.0000	-1.0000	0.2409	0.1521
PERF_REV_SCALE	-0.2922	0.2922	-1.0000	1.0000	-0.2409	-0.1521
RES_ASSETS_SCALED	-0.0711	0.0711	0.2409	-0.2409	1.0000	-0.0325
RES_ASSETS_SCALED x DIV_CBM	0.0819	-0.0819	0.1521	-0.1521	-0.0325	1.0000

Outer model descriptives

	Mean	Median	Observed min	Observed max	Standard deviation	Excess kurtosis
DIV1_ID	0.0000	-0.0125	-0.3173	0.5554	0.1093	15.0801
DIV2_CW	0.0000	0.0157	-0.6984	0.3990	0.1375	15.0801
PERF_NAV_SCALE	0.0000	0.0613	-1.6376	1.6376	0.6741	0.7156
PERF_REV_SCALE	0.0000	-0.0344	-0.9196	0.9196	0.3785	0.7156
RES_ASSETS_SCALED	0.0000	0.0000	0.0000	0.0000	0.0000	-1.4261

Inner model scores

	PERF
0	0.3640
1	0.6505
2	1.0166
3	-0.0846
4	0.4612
5	-0.0876
6	-0.3707
7	0.4612
8	0.3363
9	-0.4390
10	-0.5461
11	-0.4560
12	-0.3720
13	-0.1721
14	0.3953
15	-0.0680
16	-0.6439
17	-0.5159
18	0.0679
19	0.0644
20	-0.3713
21	-0.8602
22	0.3643
23	-0.3752
24	0.2998
25	0.6428
26	0.2962
27	0.2977
28	-0.1985
29	-0.2055
30	0.0188
31	0.2991
32	-0.3717
33	-0.3770
34	-0.7508
35	0.2800
36	0.6529
37	-0.4503
38	-0.1970
39	-0.4762
40	-0.0948
41	0.9102
42	0.2838
43	0.2328
44	-0.2471
45	-0.0016

Inner model correlation

	PERF_
PERF_	1,0000

Inner model descriptives

	Mean	Median	Observed min	Observed max	Standard deviation	Excess kurtosis
PERF_	-0,0052	-0,0763	-0,8602	1,0166	0,4403	-0,6070

Simple slope analysis

Quality criteria

R-square

Overview

	R-square	R-square adjusted
PERF_	0,8061	0,7923

f-square

Matrix

	DIV_CBM	PERF_	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM	1	0,0343		
PERF_		1		
RES_ASSETS_SCALED			3,9847	
RES_ASSETS_SCALED x DIV_CBM			0,0169	1

List

	f-square
DIV_CBM -> PERF_	0,0343
RES_ASSETS_SCALED -> PERF_	3,9847
RES_ASSETS_SCALED x DIV_CBM -> PERF_	0,0169

Overview

Construct reliability and validity	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DIV_CBM	0,9845	1,0234	0,9922	0,9846
PERF_	0,6000	0,7345	0,8225	0,7012

Discriminant validity

Heterotrait-monotrait ratio (HTMT) - Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM	0.2469			
PERF	0.2469	1.0783		
RES_ASSETS_SCALED	0.0832	1.0783	1.0000	
RES_ASSETS_SCALED x DIV_CBM	0.1892	0.1650	0.0325	1.0000

Heterotrait-monotrait ratio (HTMT) - List

	ait-monotrait ratio (HTMT)
PERF <=> DIV_CBM	0.2469
RES_ASSETS_SCALED <=> DIV_CBM	0.0832
RES_ASSETS_SCALED <=> PERF	1.0783

Fornell-Larcker criterion

	DIV_CBM	PERF	SETS_SCALED
DIV_CBM	0.9923		
PERF	0.1681	0.8374	
RES_ASSETS_SCALED	0.0836	0.8911	1.0000

Cross loadings

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV1_ID	0.9940	0.1835	0.0909	0.1967
DIV2_CW	0.9905	0.1459	0.0730	0.1758
PERF_NAV_SCALE	0.2295	0.7387	0.4958	0.1785
PERF_REV_SCALE	0.0970	0.9256	0.9160	0.0376
RES_ASSETS_SCALED	0.0836	0.8911	1.0000	0.0325
RES_ASSETS_SCALED x DIV_CBM	0.1889	0.1028	0.0325	1.0000

Collinearity statistics (VIF)

Outer model - List

	VIF
DIV1_ID	16.6670
DIV2_CW	16.6670
PERF_NAV_SCALE	1.2250
PERF_REV_SCALE	1.2250
RES_ASSETS_SCALED	1.0000
RES_ASSETS_SCALED x DIV_CBM	1.0000

Inner model - Matrix

	DIV_CBM	PERF	SETS_SCALED	ASSETS_SCALED x DIV_CBM
DIV_CBM	1.0435			
PERF		1.0073		
RES_ASSETS_SCALED		1.0073	1.0000	
RES_ASSETS_SCALED x DIV_CBM		1.0373		1.0000

Inner model - List

	VIF
DIV_CBM -> PERF	1.0435
RES_ASSETS_SCALED -> PERF	1.0073
RES_ASSETS_SCALED x DIV_CBM -> PERF	1.0373

Fit summary

Model fit	Saturated model	Estimated model
SRMR	0.0930	0.0930
d_ULS	0.1296	0.1298
d_G	0.1616	0.1617
Chi-square	42.5841	42.6209
NFI	0.8147	0.8145

Model selection criteria

Matrix

	Mean information criterion
PERF	-61.1572

Algorithm

Setting

Data file

	Setting
Data file	46 firms 1406

Data setup

	Setting
Algorithm to handle missing data	None
Weighting vector	

PLS-SEM algorithm

	Setting
Initial weights	1.0
Max. number of iterations	3000
Stop criterion	10 ⁻⁷
Type of results	Standardized
Use Lohmöller settings?	No
Weighting scheme	Path

Construct outer weighting mode

	Setting
DIV_CBM	AUTOMATIC
PERF	AUTOMATIC
RES_ASSETS_SCALED	AUTOMATIC

Stop criterion changes

Matrix

	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
Iteration 0	0.5039	0.5039	0.5916	0.5916	1.0000	1.0000
Iteration 1	0.5613	0.4463	0.4189	0.7460	1.0000	1.0000
Iteration 2	0.5613	0.4463	0.4189	0.7460	1.0000	1.0000

Posthoc minimum sample size

List

	Path coefficients	1%, power 80%	1%, power 80%	Alpha 1%, power 90%	Alpha 5%, power 90%
DIV_CBM -> PERF	0.0833	1446,0000	891,0000	1875,0000	1234,0000
RES_ASSETS_SCALED -> PERF	0.8822	13,0000	8,0000	17,0000	12,0000
RES_ASSETS_SCALED x DIV_CBM -> PERF	0.0614	2664,0000	1642,0000	3456,0000	2274,0000

Execution log

Reading score matrix of complete data set

Calculating full data set.

Model contains generic indicators. We are using an PLS algorithm that accounts for moderating and nonlinear effects.

Running first stage.

Running PLS-SEM iterations, at most 3000.

Running second stage.

Running PLS-SEM iterations, at most 3000.

Calculating report matrices and charts.

All calculations done.

Model and data

Inner model

	DIV_CBM	PERF_SETS_SCALED
DIV_CBM	1,0000	
PERF		1,0000
RES_ASSETS_SCALED		1,0000

Outer model

	DIV_CBM	PERF_SETS_SCALED
DIV1_ID	-1,0000	
DIV2_CW	-1,0000	
PERF_NAV_SCALE		-1,0000
PERF_REV_SCALE		-1,0000
RES_ASSETS_SCALED		-1,0000

Indicator data (original)

Matrix

Case index	DIV1_ID	DIV2_CW	PERF_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED
0	0.1600	0.2344	3.0000	1.0000	1.0000
1	0.2311	0.3211	2.0000	2.0000	1.0000
2	0.3022	0.4200	3.0000	2.0000	1.0000
3	0.2444	0.3367	3.0000	4.0000	4.0000
4	0.1600	0.2222	4.0000	4.0000	4.0000
5	0.1511	0.2100	2.0000	2.0000	2.0000
6	0.1244	0.1856	1.0000	1.0000	1.0000
7	0.1600	0.2222	4.0000	4.0000	4.0000
8	0.3111	0.4322	4.0000	3.0000	3.0000
9	0.0800	0.1111	1.0000	3.0000	3.0000
10	0.1511	0.2222	1.0000	3.0000	3.0000
11	0.1511	0.2100	1.0000	2.0000	2.0000
12	0.1689	0.2344	1.0000	1.0000	1.0000
13	0.1511	0.2100	2.0000	3.0000	3.0000
14	0.2000	0.2500	4.0000	4.0000	4.0000
15	0.2311	0.3333	4.0000	1.0000	2.0000
16	0.1600	0.2222	1.0000	4.0000	4.0000
17	0.4000	0.5311	2.0000	3.0000	3.0000
18	0.2400	0.3367	3.0000	3.0000	3.0000
19	0.2444	0.3367	3.0000	3.0000	3.0000
20	0.1500	0.2222	1.0000	1.0000	1.0000
21	0.3111	0.4322	2.0000	3.0000	2.0000
22	0.1911	0.2444	3.0000	1.0000	1.0000
23	0.2622	0.4033	1.0000	1.0000	1.0000
24	0.2000	0.2433	4.0000	4.0000	4.0000
25	0.2944	0.1456	4.0000	2.0000	2.0000
26	0.0800	0.1144	3.0000	3.0000	3.0000
27	0.0800	0.1111	3.0000	3.0000	3.0000
28	0.3111	0.4078	2.0000	2.0000	2.0000
29	0.2311	0.3211	4.0000	2.0000	3.0000
30	0.3322	0.4878	4.0000	4.0000	4.0000
31	0.2578	0.4289	2.0000	4.0000	3.0000
32	0.1600	0.2256	1.0000	1.0000	1.0000
33	0.3422	0.4411	1.0000	1.0000	1.0000
34	0.1600	0.2256	2.0000	1.0000	2.0000
35	0.1511	0.2133	3.0000	2.0000	2.0000
36	0.1511	0.2133	2.0000	2.0000	1.0000
37	0.1422	0.2011	1.0000	2.0000	2.0000
38	0.1600	0.2256	4.0000	3.0000	4.0000
39	0.0800	0.1144	1.0000	4.0000	4.0000
40	0.1600	0.2222	2.0000	2.0000	2.0000
41	0.1867	0.2622	3.0000	3.0000	2.0000
42	0.2444	0.3367	4.0000	4.0000	4.0000
43	0.2756	0.3578	4.0000	4.0000	4.0000
44	0.3200	0.4444	3.0000	4.0000	4.0000
45	0.1067	0.1422	2.0000	1.0000	1.0000

MV descriptives

	Mean	Median	Observed min	Observed max	Standard deviation	Excess kurtosis
DIV1_ID	0.2026	0.1778	0.0800	0.4000	0.0783	-0.1462
DIV2_CW	0.2776	0.2344	0.1111	0.5311	0.1072	-0.5986
PERF_NAV_SCALE	2.5000	2.5000	1.0000	4.0000	1.1373	-1.4261
PERF_REV_SCALE	2.5000	2.5000	1.0000	4.0000	1.1373	-1.4261
RES_ASSETS_SCALED	2.5000	2.5000	1.0000	4.0000	1.1373	-1.4261

Indicator data (standardized)

Matrix

Case index	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
0	-0.5463	-0.4028	0.4396	-1.3189	-1.3189	0.5865
1	0.3593	0.4059	-0.4396	-0.4396	-1.3189	-0.6187
2	1.2849	1.3287	0.4396	-0.4396	-1.3189	-1.8995
3	0.5291	0.5511	0.4396	1.3189	1.3189	0.6649
4	-0.5463	-0.5168	1.3189	1.3189	1.3189	-0.8329
5	-0.6595	-0.6309	-0.4396	-0.4396	-0.4396	0.2133
6	-0.9991	-0.8590	-1.3189	-1.3189	-1.3189	1.2212
7	-0.5463	-0.5168	1.3189	1.3189	1.3189	-0.8329
8	1.3781	1.4428	1.3189	0.4396	0.4396	0.5672
9	-1.5651	-1.5536	-1.3189	0.4396	0.4396	-0.8144
10	-0.6595	-0.5168	-1.3189	0.4396	0.4396	-0.3656
11	-0.6595	-0.6309	-1.3189	-0.4396	-0.4396	0.2133
12	-0.4331	-0.4028	-1.3189	-1.3189	-1.3189	0.4984
13	-0.6595	-0.6309	-0.4396	0.4396	0.4396	-0.3891
14	-0.0369	-0.2576	1.3189	1.3189	1.3189	-0.2760
15	0.3593	0.5200	1.3189	1.3189	-0.4396	-0.2884
16	-0.5463	-0.5168	-1.3189	1.3189	1.3189	-0.8329
17	2.5101	2.3655	-0.4396	0.4396	0.4396	1.0512
18	0.4725	0.5511	0.4396	0.4396	0.4396	0.1464
19	0.5291	0.5511	0.4396	0.4396	0.4396	0.1630
20	-0.5463	-0.5168	-1.3189	-1.3189	-1.3189	0.6571
21	1.3781	1.4428	-0.4396	-1.3189	-0.4396	-0.7430
22	-0.1501	-0.3095	0.4396	-1.3189	-1.3189	0.2204
23	0.7555	1.1732	-1.3189	-1.3189	-1.3189	-1.4010
24	-0.0369	-0.3138	1.3189	1.3189	1.3189	-0.3145
25	0.0197	-1.2322	1.3189	-0.4396	-0.4396	0.1612
26	-1.5651	-1.5225	0.4396	0.4396	0.4396	-0.8080
27	-1.5651	-1.5536	0.4396	0.4396	0.4396	-0.8144
28	1.3781	1.2147	-0.4396	-0.4396	-0.4396	-0.8998
29	0.3593	0.4059	1.3189	-0.4396	0.4396	0.0890
30	2.2837	1.9612	1.3189	1.3189	1.3189	2.9030
31	0.6989	1.4117	-0.4396	1.3189	0.4396	0.3846
32	-0.5463	-0.4857	-1.3189	-1.3189	-1.3189	0.6379
33	1.7745	1.5257	-1.3189	-1.3189	-1.3189	-2.4129
34	-0.5463	-0.4857	-0.4396	-1.3189	-0.4396	0.1540
35	-0.6595	-0.5998	0.4396	-0.4396	-0.4396	0.2069
36	-0.6595	-0.5998	-0.4396	-0.4396	-1.3189	0.7965
37	-0.7727	-0.7138	-1.3189	-0.4396	-0.4396	0.2598
38	-0.5463	-0.4857	1.3189	0.4396	1.3189	-0.8138
39	-1.5651	-1.5225	-1.3189	1.3189	1.3189	-2.2461
40	-0.5463	-0.5168	-0.4396	-0.4396	-0.4396	0.1604
41	-0.2067	-0.1436	0.4396	0.4396	-0.4396	-0.0046
42	0.5291	0.5511	1.3189	1.3189	1.3189	0.6649
43	0.9253	0.7481	1.3189	1.3189	1.3189	1.0951
44	1.0913	1.5568	0.4396	0.4396	1.3189	2.0983
45	-1.2255	-1.2633	-0.4396	-1.3189	-1.3189	1.6476

Indicator data (correlations)

Empirical correlation matrix

	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED	RES_ASSETS_SCALED x DIV_CBM
DIV1_ID	1.0000	0.9695	0.2607	0.0995	0.0909	0.1967
DIV2_CW	0.9695	1.0000	0.1840	0.0923	0.0730	0.1758
PERF_NAV_SCALE	0.2607	0.1840	1.0000	0.4286	0.4958	0.1785
PERF_REV_SCALE	0.0995	0.0923	0.4286	1.0000	0.9160	0.0316
RES_ASSETS_SCALED	0.0909	0.0730	0.4958	0.9160	1.0000	0.0325
RES_ASSETS_SCALED x DIV_CBM	0.1967	0.1758	0.1785	0.0316	0.0325	1.0000

Model implied saturated correlation matrix

	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED
DIV1_ID	1.0000	0.9846	0.1234	0.1547	0.0831
DIV2_CW	0.9846	1.0000	0.1230	0.1541	0.0828
PERF_NAV_SCALE	0.1234	0.1230	1.0000	0.6887	0.6582
PERF_REV_SCALE	0.1547	0.1541	0.6887	1.0000	0.8248
RES_ASSETS_SCALED	0.0831	0.0828	0.6582	0.8248	1.0000

Model implied estimated correlation matrix

	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED
DIV1_ID	1.0000	0.9846	0.1239	0.1552	0.0831
DIV2_CW	0.9846	1.0000	0.1234	0.1546	0.0828
PERF_NAV_SCALE	0.1239	0.1234	1.0000	0.6841	0.6583
PERF_REV_SCALE	0.1552	0.1546	0.6841	1.0000	0.8249
RES_ASSETS_SCALED	0.0831	0.0828	0.6583	0.8249	1.0000

Empirical covariance matrix

	DIV1_ID	DIV2_CW	F_NAV_SCALE	PERF_REV_SCALE	RES_ASSETS_SCALED
DIV1_ID	1.0000	0.9695	0.2607	0.0995	0.0909
DIV2_CW	0.9695	1.0000	0.1840	0.0923	0.0730
PERF_NAV_SCALE	0.2607	0.1840	1.0000	0.4286	0.4958
PERF_REV_SCALE	0.0995	0.0923	0.4286	1.0000	0.9160
RES_ASSETS_SCALED	0.0909	0.0730	0.4958	0.9160	1.0000