DEVELOPING A PROJECT MANAGEMENT FRAMEWORK FOR SUPPORTING THE SUSTAINABILITY OF EMERGING CONTRACTORS IN THE FREE STATE

by

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DECLARATION

I, Julius Akaba, Passport Number _____ and Student Number _____, do hereby declare that this research project submitted to the Central University of Technology, Free State, for the Degree Doctor of Philosophy in Management Sciences (Project Management) is my own independent work; and complies with the Code of Academic Integrity, as well as other relevant policies, procedures, rules and regulations of the Central University of Technology, Free State; and has not been submitted before to any institution by myself or any other person in fulfilment (or partial fulfilment) of the requirements for the attainment of any qualification.

Signature of Student:  Date: 23 May 2022

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PUBLICATIONS

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DEDICATION

This thesis is dedicated to the Akaba and Dzansi family.

ABSTRACT

The purpose of this study was to develop a project management framework that could be used to support the sustainability of emerging contractors in the Free State. Emerging contractors are a key vehicle within the construction industry used by the African National Congress Government to redress the economic marginalisation of previously disadvantaged population groups during the apartheid era. While not sparing resources and policy to assist emerging contractors' businesses to survive and grow, government efforts do not seem to be yielding the desired results as the sustainability of emerging contractors remains threatened by early and high business failure rates. A major concern is that emerging contractors continue to deliver projects in the construction industry that do not conform to cost, time, scope and quality specifications which are considered generally to be the key measures of project success. Therefore, this shortfall places the sustainability of emerging contractors in question since their inability to deliver successful projects hampers their chances of obtaining further business in the construction industry. Moreover, the construction business by nature is project based and, therefore, requires the use of a project management approach. However, it is often reported that emerging contractors lack knowledge and skills in project management and construction and are thus not using a project management approach in their construction businesses which are constrained further by the limited resources available to emerging contractors. Drawing on pragmatism, an explanatory, sequential, mixed-methods research design was adopted for the study. The quantitative data were analysed statistically, while the qualitative data were transcribed and analysed thematically. In the study, the key components required to develop a project management framework that would be useful for emerging contractors in establishing the sustainability of their construction businesses were identified and emphasised. The findings of the study showed that the project management framework developed could support the sustainability of emerging contractors. The findings showed further that there was a statistically significant relationship between components of the project framework (i.e., project life-cycle, project control cycle, tools, and templates) measured and the components of sustainability (i.e. social, economic, and environmental). It was discovered that the project management framework included sufficient elements to prompt some change

in how emerging contractors use project management processes in the construction industry. It is recommended in the study that emerging contractors adopt and use the developed project management framework to ensure their sustainability in the construction industry.

Keywords: Construction industry, emerging contractors, project management, project management framework, South Africa, sustainability

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LIST OF ABBREVIATIONS

ANC:	African National Congress
AVE:	Average Variance Extracted
BBBEE:	Broad Based Black Economic Empowerment
CFA:	Confirmatory Factor Analysis
CFI:	Comparative Fit Index
CIDB:	Construction Industry Development Board
CRs:	Composite Reliability
DTI:	Department of Trade and Industry
ECs:	Emerging Contractors
EFA:	Exploratory Factory Analysis
EU:	European Union
FS:	Free State
GDP:	Gross Domestic Product
KMO:	Kaiser Meyer Olkin
MSA:	Measure of Sampling Adequacy
MS:	Mean Score
NCDP:	National Construction Development Programme
NSB:	National Small Business
PDCA:	Plan Do Check and Act.
PMF:	Project Management Framework
PMI:	Project Management Institute
PPPF:	Preferential Procurement Policy Framework
RMSEA:	Root Mean Square Error of Approximation.
SBA:	Small Business Administration
SD:	Standard Deviation
SEM:	Structural Equation Modelling
SPSS:	Statistical Package for Social Science
SRMR:	Standardised Root Means Square
Stats SA:	Statistics South Africa
SUCP:	Standard Uniformity for Construction Procurement
TLI:	Tucker Lewis Index

UK:	United Kingdom
USA:	United State of America
WBS:	Work Breakdown Structure
WCED:	World Commission on Environment and Development

DEFINITION OF KEY TERMS

Emerging contractors are individuals from the previously disadvantaged population groups who own and operate businesses in the construction industry of South Africa (BBBEE Act 53 of 2003).

Project is a temporary endeavour undertaken to create a unique product, service, or result (PMI, 2017: 4)

Project control cycle can be considered as a repeated, project control approach used by an organisation to ensure that each stage of the project life-cycle is performed as planned (Pierce, 2013)

Project life-cycle is defined as a series of phases that a project goes through from its initiation to its closure (Larson and Gray, 2018)

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirement (PMI, 2017: 10)

Project management framework is a basic structure of understanding project management (PMI, 2013)

Sustainability is providing for the needs of the present generation while not compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). At the basic level, sustainability can be defined as the ability of a business to last in time, both in terms of profitability, productivity, and financial performance, as well as in terms of managing environmental, and social assets that compose its capitals (Giovannoni and Fabietti, 2013).

Sustainability pillars refer to the relationship between environmental, social, and economic dimensions of sustainability (Elkington, 1998)

Templates can be defined as partially complete documents in a predefined format that provide a defined structure for collecting, organising, and presenting information and data (Bissonette, 2016)

Tools can be defined as something tangible, such as a template or software programme, that is used in performing an activity to produce a product or result (Bissonette, 2016).

1. CHAPTER ONE: OVERVIEW OF THE STUDY

1.1. INTRODUCTION

In South Africa, “emerging contractors” (ECs) is a term that is commonly used to refer to small-scale construction businesses owned and operated by individuals from the previously disadvantaged population groups (BBBEE Act 53 of 2003). The EC Programme was instituted by the African National Congress (ANC) Government to redress the economic marginalisation of certain population groups from the South African economy because of apartheid (BBBEE Act 53 of 2003; CIDB, 2011). As a result, the sustainability of the EC Programme is regarded as being an indication of the realisation of this national objective. The business activities of ECs are carried out mainly in the construction industry and are mainly project-oriented (Larson and Gray, 2018). Thus, EC businesses require a project management process to support their successful operation. To be able to achieve successful project outcomes, ECs require the use of a structured project management approach, which takes their resource constraints into consideration. Thus, this study developed a project management framework (PMF) that would support the sustainability of ECs in the Free State (FS) Province of South Africa.

The South African Government’s effort to empower individuals from the previously disadvantaged population groups economically through the construction industry has led to a growing number of small construction firms in the construction industry that lack the necessary financial, managerial, and technical resources to operate in the industry (CIDB, 2012). These small construction firms are often referred to as ECs and are characterised as small businesses that undertake their business activities mainly in the construction industry under the stewardship of the Construction Industry Development Board (CIDB) which is the national body mandated to regulate and promote transformation in the construction industry (National Small Business Act 102 of 1996; CIDB Act 38 of 2000). In addition, ECs consist mainly of individuals from the previously disadvantaged population groups who own, operate, and manage their businesses in the construction industry (CIDB Act 38 of 2000; BBBEE Act 53 of 2003).

To enable the government to achieve the objective of the EC Programme to empower individuals economically from the previously disadvantaged population groups, which include Blacks, women, Coloured, Indians and the disabled (BBBEE Act 53 of 2003), regulatory frameworks such as the BBBEE Act and the Preferential Procurement Policy Framework Act (PPPF Act) were legislated (BBBEE Act 53 of 2003; PPPF Act 2000 of 2017). The goal of these frameworks is to give preference to the previously disadvantaged individuals when awarding government contracts mainly in the construction industry. The government believes that these preferences will help to create, grow and manage small businesses successfully (BBBEE Act 53 of 2003; PPPF Act 2000 of 2017).

The activities of ECs in construction, apart from being supported by the BBBEE Act and PPPF Act, are overseen by the CIDB which is mandated to develop, grow and promote advancements in the construction industry in the country. This responsibility covers all businesses in the construction industry no matter the size of the enterprise (CIDB Act 38 of 2000). The CIDB uses the BBBEE and PPPF frameworks to classify and categorise ECs to enable them to qualify for government support and assistance. Primarily, ECs are classified according to CIDB standards, which include grade and class of work, which are normally used to determine the level of skills and the level of work ECs can perform in the execution and delivery of projects in the construction industry. ECs are normally graded and registered from Grade 1 to Grade 9, where Grade 1 is the lowest level and Grade 9 is the highest. Furthermore, ECs are classified according to their class of work being either general building (GB) or civil engineering (CE) (CIDB, 2004).

Since their project activities are either at the local or regional levels, most of the ECs fall within Grades 2 to 6, based on the CIDB's classification standards, which allows them to undertake projects at the local or regional level only and within a certain project value. Consequently, ECs who fall within these grades can undertake projects in the GB or CE class of work (CIDB, 2004). However, for the purpose of this study, ECs in Grades 1 to 6 have been considered. This decision was made because ECs in Grade 1 normally move to higher grades, depending on their performance, and also should be aware of the proposed PMF to support the sustainability of their businesses in the future.

This chapter contains a general overview of the study, including the background to the problem, problem statement, motivation for the study, research questions, aim and objectives of the study, the conceptual framework, the assumptions underpinning the study, the delimitation of the study, limitations of the study, the significance of the study, the scope of the study and, finally, the structure of the thesis.

1.2. PROBLEM BACKGROUND

As part of the ANC Government's attempt to ensure that maximum benefits are derived from the EC Programme for the construction industry at large, the Construction Industry Development Board (CIDB) was established to lead stakeholders, including ECs, in revamping and deriving value from the construction industry to benefit the economy of the country (CIDB Act 38 of 2000). A major part of the CIDB's mandate is to ensure the sustainability of ECs. The sustainability of ECs is important to the ANC-led Government because it is regarded as a means to empower individuals economically from the previously disadvantaged population groups of the country.

It is self-evident that ECs can only fulfil their expected role when they undertake their construction activities successfully and in a manner that makes them sustainable. To achieve this sustainability, their business undertakings must also meet all the dimensions of sustainability within the construction industry and society at large. Generally, projects are delivered successfully with the use of project management skills, techniques, and tools (Larson and Gray, 2018; Newton, 2016). In addition, for a project to be considered successful, those involved must ensure that the project is delivered to meet the constraints of time, cost and scope, and consider the effects on the stakeholders and the environment (Daugherty, 2021). These dimensions for measuring project success can be linked to the economy, society, and environment, which are considered to be the pillars of sustainability (Caradonna, 2020; World Economic Forum, 2016; Adetunji et al., 2003).

Based on the above background, there is a strong case to promote the use of a project management approach by ECs to ensure successful project outcomes to maintain

their sustainability. Effective project management by ECs is imperative because virtually all ECs' activities are in the construction industry which, by nature, is project oriented (Larson and Gray, 2018). Furthermore, Ledwith, Kelly and Turner (2010) recognised a strong link between the use of project management in small businesses and their sustainability. Thus, it is safe to suggest that ECs should be using a project management approach in their construction activities. However, research has shown that most ECs lack project management knowledge and skills and are not using any project management approach in their construction activities (Thwala and Mofokeng, 2012). This assertion raises concern about how sustainable ECs are. It is argued in this study that an appropriate PMF, based on existing and well established project management methodology, taking into consideration the constrained nature of ECs' resources, could support ECs in becoming sustainable (Ledwith, Kelly and Turner, 2010). This argument is based on the belief that, with such a framework in place, it would be easier for ECs to follow a project management approach consistently when executing their activities, thereby increasing their chances of delivering their projects successfully, which could lead to their eventual, long-term sustainability (Maley, 2012; Ledwith, Kelly and Turner, 2010). Therefore, there is a need to develop a PMF to support the construction activities of ECs in South Africa to enhance their chances of being sustainable.

The argument above was reinforced by the numerous complaints directed at the project activities of ECs in the construction industry. As evident in a number of research studies, ECs' project activities are often unsuccessful as a result of poor project management capability, cost overruns, untimely delivery, and poor workmanship, among other factors (CIDB, 2011a; Thwala and Mofokeng, 2012). For instance, based on a study conducted by Zunguzane, Smallwood and Emuze (2012), it was found that several low-income houses built by ECs in South Africa failed to conform to quality specifications and were generally of poor workmanship. The inability of ECs to deliver successful projects is often attributed to many factors but mainly to inadequate knowledge of project management, and lack of knowledge and experience in construction (Mavetera et al., 2015). Yet, business in construction, by nature, is project oriented (Larson and Gray, 2018), making the application of a project management approach essential (Maley, 2012; Larson and Gray, 2018; Meredith and Mantel, 2012; Ledwith, Kelly and Turner, 2010). Consequently, not using project

management methodology in undertaking construction projects could be detrimental to ECs' project success which could affect their chances of being able to operate a sustainable business. Furthermore, research findings have indicated that the sustainability of ECs remains doubtful, with most ECs' businesses closing down within less than three years of their establishment (Department of Trade and Industry, 2008). In addition, many stakeholders and construction clients continue to complain about the poor quality of project activities undertaken and delivered by ECs in the construction industry (CIDB, 2011a; Zunguzane, Smallwood and Emuze, 2012). These findings reinforce the argument that the use of a project management approach is essential to ECs' businesses to support their sustainability.

1.3. PROBLEM STATEMENT

The importance of the application of a project management approach in achieving successful project outcomes is undoubted (Daud Alam and Guhl, 2016) and the failure of ECs to use a project management approach in their activities has been highlighted. This situation means that the sustainability of ECs is at risk. While not sparing resources to help ECs to survive and grow, the government's efforts do not seem to be yielding the desired results because the sustainability of these entities continues to be threatened by the early failure rates of their businesses (Department of Trade and Industry, 2008). ECs are also considered to be infamous for delivering products and services that do not conform to cost, time and scope specifications that are key to project success (Larson and Gray, 2018; CIDB 2011a; Zunguzane, Smallwood and Emuze, 2012). This deficiency indicates a lack of project management within these entities. Therefore, the development of a PMF that takes the circumstances of ECs into consideration will assist in ensuring that these entities apply an effective project management approach when executing the projects they undertake. Therefore, the outcome of this study was to develop a PMF that would support the sustainability of ECs in the Free State Province of South Africa.

1.4. MOTIVATION FOR THIS STUDY

ECs are key to the government's programme of economically empowering individuals from the previously disadvantaged population groups in South Africa. Thus, their business sustainability is a critical concern to government and all other stakeholders who are driving the economic empowerment of individuals from the previously disadvantaged population groups. The government's continuing support to ensure that a successful outcome to the EC Programme is achieved is evident nationwide through the establishment of the CIDB as well as the BBBEE and PPPF regulations. However, the performance of ECs in achieving the government's objective continues to face a negative response from stakeholders as a result of their unsatisfactory project outcomes (CIDB, 2011; Thwala and Mofokeng, 2012; Zunguzane, Smallwood and Emuze, 2012). Moreover, ECs undertake their business activities in the construction industry where such activities are project oriented and require the use of project management methodology to ensure successful outcomes (Larson and Gray, 2018). However, ECs are unable to deliver successful projects because of their inability to use a project management approach as well as their lack of knowledge and experience in construction (Mavetera et al., 2015).

It has been affirmed in research literature that the use of a project management approach enhances the success of project delivery outcomes of organisations that undertake projects as their way of business (Maley, 2012; Larson and Gray, 2018; Meredith and Mantel, 2012; Ledwith, Kelly and Turner, 2010). In addition, Ledwith, Kelly and Turner (2010) argued that there is a strong link between the use of project management methodology and the sustainability of small businesses such as ECs. However, Philips (2012) suggested that the use of a project management approach by small businesses, such as ECs, should be modified to take their resource needs into consideration so that they are able to benefit from the application of a project management approach in their project endeavours.

While acknowledging the numerous studies that have been devoted to sustainability and the use of project management among small businesses, few of these studies have been devoted to the relationship between the application of project management and its effect on sustainability (Martens and Carvalho, 2016). This knowledge gap presented an opportunity for research to be undertaken in the field of the application of project management by small businesses, such as ECs, and the effect on their

sustainability. Thus, this study was conducted to add to the knowledge base of the relationship between the use of project management in small construction firms, such as ECs, to support their sustainability.

1.5. RESEARCH QUESTIONS

The primary research question of the study was: How could a PMF support the sustainability of ECs in the Free State Province of South Africa?

The central research question gave rise to the following secondary questions:

1. What would be the essential components of a PMF that is responsive to the availability of resources to ECs?
2. To what extent does the developed PMF support the development and replication of accepted project management practices among ECs?
3. To what extent does the developed PMF assist effective communication within the project teams and other stakeholders of ECs?
4. To what extent does the developed PMF streamline the use of tools and templates for key project management processes?
5. To what extent does the developed PMF establish a consistent approach to facilitate customers' understanding of the project management processes?
6. To what extent could the PMF ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle?
7. To what extent do the components of the developed PMF ensure adequate monitoring, of, and reporting on, project deliverables?

1.6. THE AIM AND OBJECTIVES OF THE STUDY

The main aim and the objectives of the study are presented in this section.

1.6.1. Main Aim

The aim of the study was to develop a PMF that supports the sustainability of ECs in the Free State.

1.6.2. Objectives

The main aim of the study was achieved by determining:

1. the essential components of a PMF that would be responsive to availability of resources to ECs.
2. the extent to which a PMF would support the development and replication of accepted project management practices among ECs.
3. the extent to which a PMF would assist effective communication within the project teams and other stakeholders of ECs.
4. the extent to which a PMF would streamline the use of tools and templates for key project management processes.
5. the extent to which a PMF facilitates customers' understanding of the project management processes.
6. the extent to which a PMF would ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle, and
7. the extent to which the components of a PMF would ensure adequate monitoring of, and reporting on, project deliverables.

1.6.3. Relationship between research objectives and questions

Table 1.1 shows the relationship between the documented research questions and research objectives of the current study. This shows the research questions, and the objectives were linked how they were used to guide the achievement of the overall aim of the study.

Table 1.1: Relationship between research questions and research objectives

Research question	Research objectives
What would be the essential components of a PMF that is responsive to the availability of resources to ECs?	Determine the essential components of a PMF that would be responsive to the availability of resources to ECs.
To what extent does the developed PMF support the development and replication of accepted project management practices among ECs?	Determine the extent to which a PMF would support the development and replication of accepted project management practices among ECs.
To what extent does the developed PMF assist effective communication within the project teams and other stakeholders of ECs?	Determine the extent to which a PMF would assist effective communication within the project teams and other stakeholders of ECs.
To what extent does the developed PMF streamline the use of methods and techniques for key project management processes?	Determine the extent that a PMF would streamline the use of methods and techniques for key project management processes.
To what extent does the developed PMF establish a consistent approach to facilitate customers' understanding of the project management processes?	Determine the extent to which a PMF facilitates customers' understanding of the project management processes.
To what extent could the PMF ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle?	Determine the extent to which a PMF would ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle.
To what extent do the metrics of the developed PMF ensure adequate monitoring of, and reporting on, project deliverables?	Determine the extent to which the metrics of a PMF would ensure adequate monitoring of, and reporting on, project deliverables.

1.7. THE CONCEPTUAL FRAMEWORK

Conceptually, this study is framed in terms of ECs, a PMF and sustainability. Figure 1.1 shows the respective inter-connections between these variables. Figure 1.1 shows also the desirable outcome as being ECs that run a sustainable business that will empower individuals economically while ensuring good environmental and social practices. The enabler in this relationship is an appropriate PMF. The illustration is based on the contention that the development and use of an appropriate PMF could lead to the overall sustainability of ECs. Consequently, the framework provides the conceptual structure of the entire study as well as the relationship between the PMF and how it supports the sustainability of ECs.

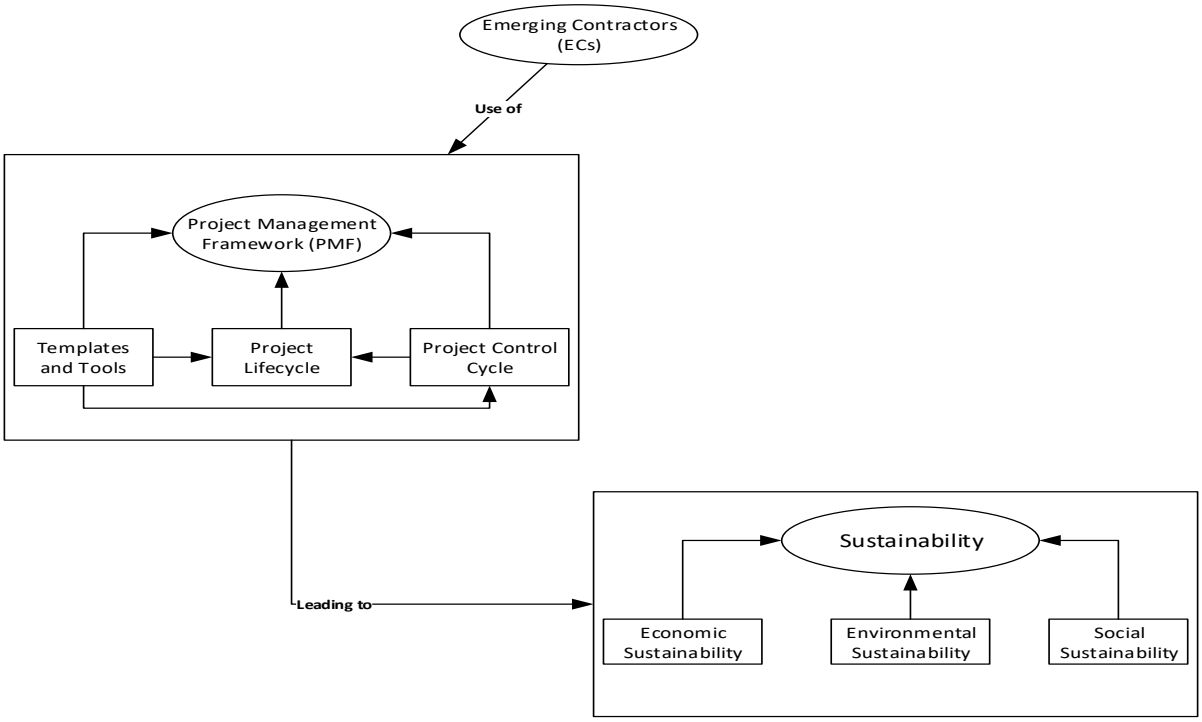

Figure 1.1: Sustainability of ECS using a dedicated PMF (Researcher's own construction)

Projects are generally defined to be unique and temporary endeavours which have a specified beginning and an end, undertaken by individuals or project teams to meet established goals within the parameters of cost, schedule and scope (Pinto, 2016; Gido and Clements, 2015). This definition confirms the nature of activities in the construction industry, which generally start and end within specified parameters in order for a product or service to be achieved. Furthermore, the parameters of time, cost and scope emphasise the framework within which projects must be delivered to achieve unique products or services. Kerzner (2013) argued that there is a link between project success and the quality of the project management approach used. For instance, Clements and Gido (2015), Maley (2012) and Kerzner (2013) all considered project management to involve the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements successfully. Thus, it could be deduced from this definition that, to achieve the required project objectives, it is necessary to apply project management knowledge, skills, tools, and techniques (project management framework) effectively. These definitions warrant paying attention briefly to the typical PMF that could be used to support successful project delivery among ECs.

From the literature, it is evident that “PMF” refers to the combination of processes, tasks and methods used to manage a project from start to finish. This typical definition could also be assumed to refer to the project management approach used to manage a project from beginning to end successfully. Alternately, a “PMF” could be regarded as the structured approach of using project management knowledge, skills, tools, and techniques to enable the attainment of project outcomes successfully. For example, McConnell (2010) defined a “PMF” as the sub-set of tasks, processes, tools, and templates used in combination by the project management team to get an insight into the major structural elements of the project to initiate, plan, execute, control, monitor and terminate the project activities throughout the management cycle. On the other hand, Naybour (2010) identified a “PMF” as consisting of three key parts which include project life-cycle, project control cycle, and tools and templates. According to Naybour (2010), these three parts are used to facilitate the execution of the project from beginning to end to achieve the desired project outcomes. In addition, Naybour (2010) contended that the main idea behind the PMF is to create a clear understanding of the basis of the project and share this understanding among all stakeholders including the project team. Consequently, this helps to accomplish the project according to the chosen methodology and subsequently deliver the expected results (McConnell, 2010). Naybour (2013) mentioned effective decision-making, controlled project scope, better problem resolution, controlled project cost, clients knowing what to expect, struggling projects being identified more quickly, and project teams being more motivated and happy as being some of the benefits of having a PMF in place. In the current study, it is argued that these benefits are paramount to the sustainability of any organisation which needs to be resilient over the long term and conduct its activities in such a way that it continues as a going concern. Thus, the sustainability of ECs could depend on the use of a sound PMF (see Figure 1.1). For a PMF that is used by ECs to be sound, it is necessary to take into consideration the resource constraints of ECs when developing the PMF. As a result, the three-part PMF identified by Naybour (2010) was considered to be the appropriate PMF to be used in this study, taking into consideration the nature of the business and project operations of ECs (see Chapter Three for full discussion of the PMF).

1.8. IMPORTANCE OF THE STUDY

ECs play a role that is just as important as all other small businesses in terms of their general contribution to the economy of South Africa (Wentzel, Smallwood and Emuze, 2016). ECs represent 13% of the total small businesses in South Africa, third only to trade and accommodation (43%) and community service (14%) (Small Enterprise Development Agency, 2016). This proportion makes ECs a critical contributor to the small business industry in the country. As a result, the government considers ECs not only to be key to the economic empowerment of individuals from the previously disadvantaged population groups but also to be a vehicle for employment creation as well as a means for economic growth and national development (CIDB Act 38, 2000; BBBEE Act 53, 2003; Shakantu, 2012). Furthermore, the EC Programme provides avenues for individuals from the previously disadvantaged population groups, who lack the required financial resources and skills to gain access to economic opportunities in the country (Wentzel, Smallwood and Emuze, 2016).

Shankantu (2012) was of the opinion that ECs have the potential for job creation, value orientation, wealth creation and poverty eradication. Wentzel, Smallwood and Emuze (2016) believed that this is crucial for a country like South Africa which is characterised by unequal distribution of economic opportunities and wealth. Another important contribution of ECs is their role in housing delivery as well as being responsible for the employment of general and semi-skilled labour in the country (KZN Human Settlement, 2011). There is growing consensus that small businesses contribute an estimated 41%-47% to GDP, and an estimated 55% of all employment in South Africa (Small Business Development, 2014). Based on this information, it could be concluded that ECs, as part of small businesses in South Africa, are critical in the drive towards employment creation, economic growth, and development. Thus, it is necessary to support the sustainability of ECs for the benefit of the South African Government, society, as well as the ECs themselves. In addition, ECs undertake their business activities in the construction industry where a project management approach is necessary to ensure successful project outcomes (Larson and Gray, 2018; Maley, 2012). However, research has shown that ECs currently use a project management approach haphazardly, which affects their project outcomes. Consequently, it is

argued in this thesis that the development of an appropriate PMF, which takes into consideration the limited resource capabilities of ECs, can support their sustainability. It is argued that this can enable the ECs to continue to contribute to the economic development of the country through the economic empowerment of individuals from the previously disadvantaged population groups.

1.9. ASSUMPTIONS

The following assumptions underpin the current study:

- The survey questionnaire and the semi-structured interview questions were comprehensive enough to investigate the construct under consideration for the study.
- ECs responded honestly to the questions in both sets of questionnaires because of the ethical considerations to guarantee the ECs' freedom of participation.
- The data collection period did not affect the validity of the results.
- A project has a start and end date.
- Projects are managed to realise the outcomes desired by clients.
- Contractors deliver projects through project management process.

1.10. RESEARCH DESIGN AND METHODOLOGY SUMMARY

This study used mixed methods research designed drawn from the pragmatic philosophical view in order to achieve its objectives as stated in Section 1.6. the explanatory sequential mixed methods research design was employed for this study. This research design involves the collection and analysis of quantitative data followed by the collection and analysis of qualitative data to help explain the results of the quantitative data. An explanatory sequential research design was appropriate for this study because the statistical data that underpins the PMF requires additional explanation.

Consistent with explanatory sequential research design, data collection was conducted in two phases, that is quantitative data was collected in the first phase and analysed. The outcome of the quantitative results was used to collect the qualitative phase data for the study.

The target population for the study consisted only of ECs (Grade 1 to Grade 6) who were registered and active on the CIDB register of contractors in the Free State Province of South Africa. A random sampling technique was utilised to select 450 samples of ECs from the total population of 5884 for the quantitative phase data collection after which a sample size of 25 ECs was purposively selected from the participants who have previously responded to the quantitative data collection process. The quantitative data collection was performed using a closed ended questionnaire whiles the qualitative data collection was undertaken through interviews using a semi-structured questionnaire.

Quantitative data analysis was performed using both descriptive (frequency, mean, standard deviation, and percentages) and inferential analysis (Kruskal Wallis H Test, correlation analysis, linear regression, exploratory factor analysis, confirmatory factor analysis, and structural equation modelling) using R Software version 4.0.0. the qualitative data analysis was performed thematically through a manual approach owning to the small number of ECs that were selected purposively and interviewed. The final aspect of the data analysis was the triangulation process which was performed using the qualitative results to further explain the quantitative results.

1.11. DELIMITATION OF THE STUDY

From the standpoint of conducting a scientific study, the purpose of delimiting a study is to focus the research on the essential facets of the study, thereby making it manageable (Novikov and Novikov, 2013; Kothari, 2004). This study was delimited to ECs registered with the CIDB in Grades 1 to 6 and was focused on the use of a PMF and how it could support their sustainability. The study was further delimited to only the three-essential components of a PMF, which are: project life-cycle, project control cycle, and tools and templates. In addition, the study was delimited to the three pillars of sustainability which apply to the dynamics of ECs in their business activities in the

construction industry. The omission of any similar or other dimensions does not mean they are not significant or researchable. The decision to omit them was to provide a focus for the study and make it manageable as a single study.

1.12. EXPECTED CONTRIBUTIONS OF THE STUDY

This study is expected to contribute to the project management domain in the following manner:

- This study contributes theoretically to the body of knowledge in the project management environment in terms of the use of PMF by small construction firms.
- The study provides guidelines on the proposed PMF based on sound research conducted to guide ECs on how to use a project management approach in undertaking their project activities.
- The research method used in conducting this study will provide guidelines and a framework for future research in the project management field relating to small construction firms such as ECs.

1.13. THE SIGNIFICANCE OF THE STUDY

Theoretically, this study contributes to the body of knowledge about the application of project management by small construction firms and its impact on their business sustainability. While acknowledging the existence of the application of project management to a certain degree, this empirical research provides added information that enhances its contribution to the body of knowledge.

Practically, the outcome of this study can contribute to the training and development of the human capital in ECs in the South African construction industry, in line with the demand for business and project management activities that enhance the success of project outcomes. This will be valuable to the construction industry and all stakeholders since the business performance of ECs is fraught with irregularities which tend to have a negative impact on project outcomes in the country. In addition, the business sustainability of ECs is critical to economic empowerment, job creation and

the delivery of projects, which could lead to the achievement of the objective of the government's EC Programme. Finally, the outcome of the study can benefit communities in which ECs undertake projects or their business activities because the use of a PMF to achieve sustainability could add social, environmental, and economic value to such communities since their activities could contribute to the improvement of the standard of living of people in such communities (Shibia and Barako, 2017).

1.14. SCOPE OF THE STUDY

The outcome of this research study was to provide a PMF that supports the sustainability of ECs in the Free State Province of South Africa. The study was focused only on CIDB registered ECs within Grades 1 to 6 in the Free State Province of South Africa. Furthermore, the key construct for the study was a PMF which includes the three components of: project life-cycle, project control cycle, and tools and templates, as well as the three pillars of economic, social, and environmental sustainability which are considered only in terms of their contribution to the sustainability of EC businesses in the construction industry of South Africa. The study was conducted only among ECs who run and manage their businesses in the construction industry of South Africa and are registered with CIDB.

1.15. STRUCTURE OF THE THESIS

This thesis is divided into six chapters as shown in Figure 1.2 which contains an outline of the content of each chapter. In Chapter One, the general overview and the background to the problem of the study were presented. The chapter included also the problem statement, motivation for the study, research questions, objectives, the conceptual framework, assumptions, delimitation, limitations, the scope of the study and the significance of the study.

The second chapter contains a systematic review of relevant literature about ECs and sustainability. The chapter includes narratives on the nature of EC businesses in the

construction industry and the challenges they face while operating in the construction industry (See Figure 1.2).

In Chapter Three, the PMF adopted for the study is examined. Furthermore, the chapter contains a review of relevant literature about projects, project management, and the conceptual framework used for the study (See Figure 1.2).

Chapter Four contains an explanation of how the research was designed and conducted. This includes the research tools and their designs, the methods used for data collection, the analysis of the data, the research technique used, the population and the sampling design used.

Chapter Five contains a presentation of the quantitative and qualitative data collected through a survey questionnaire, face-to-face interviews as well as phone interviews. The results of the framework validation process are also presented in the chapter.

In Chapter Six, the research conclusions, recommendations, and contributions to knowledge are presented.

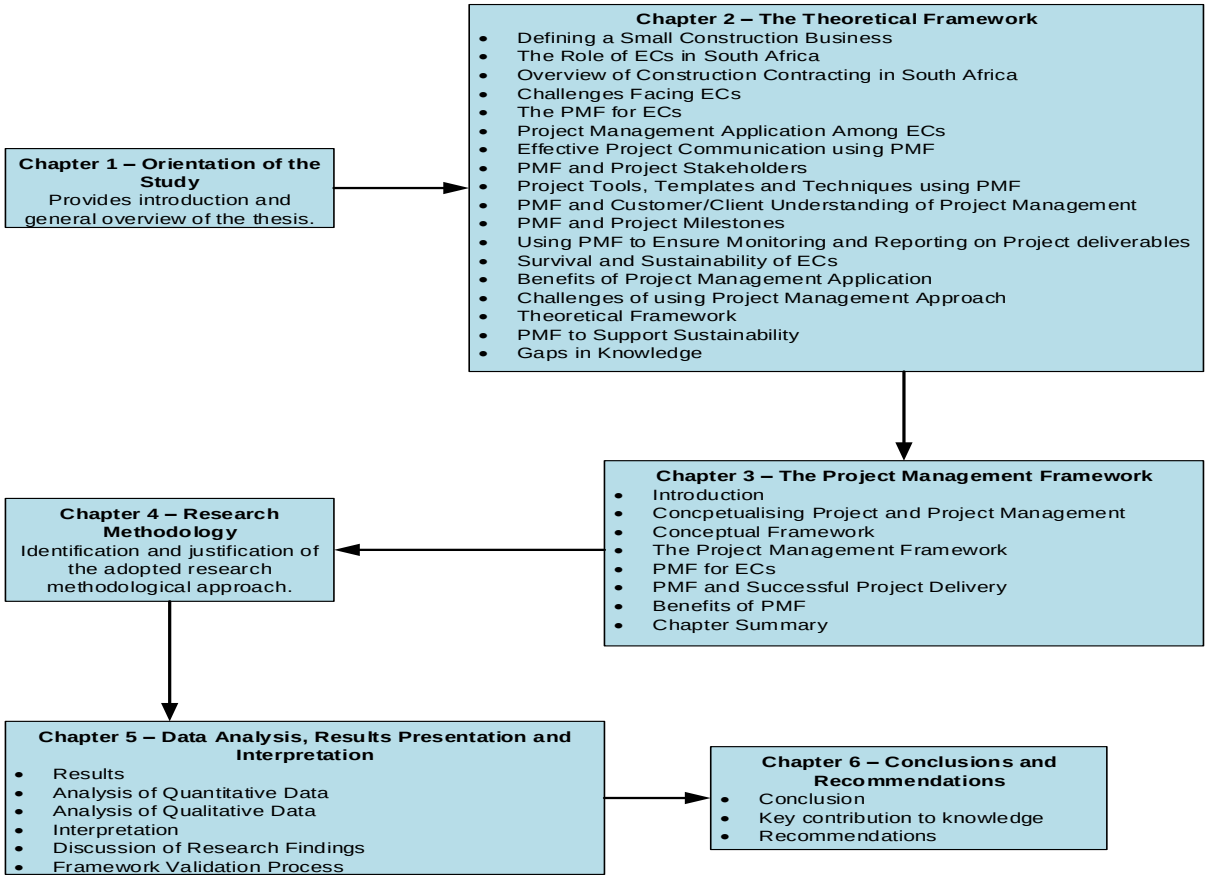

Figure 1.2: Structure of the thesis

1.16. CHAPTER SUMMARY

In this chapter a general overview of the thesis was presented with a focus on the context of the investigation. The chapter contained an outline of the structure of the thesis, including the background, significance, and the scope of the study and a brief overview of the adopted conceptual framework. Furthermore, the chapter contained information on the research questions, the research objectives, and the importance of the study. The next chapter is dedicated to the review of literature relevant to the objectives of the thesis.

2. CHAPTER TWO: THEORETICAL FRAMEWORK

2.1. INTRODUCTION

The focus of this chapter is on the theoretical framework of the study. The outcome of the study was to develop a PMF that will support the sustainability of ECs in the Free State Province of South Africa. Therefore, ECs, a PMF and sustainability constituted the foundation of the study which included research into theory about resource constraints and sustainability. Resource constraints and a balanced concern for the economic well-being of owners, the environment and the communities define how businesses conduct themselves. Resource constraints and sustainability are key to the performance of ECs in their business activities in the construction industry.

The chapter includes: a definition of small construction businesses, the role of ECs in South Africa, an overview of construction contracting in South Africa, the challenges facing ECs, the PMF for ECs, application of project management among ECs, and effective communication using a PMF. Also discussed in the chapter are: a PMF and project stakeholders, project templates, tools for using a PMF, a PMF and customers'/clients' understanding of project management, a PMF and project milestones, using a PMF to ensure monitoring of, and reporting on, project deliverables, and the survival and sustainability of ECs. In addition, the benefits of applying project management, the challenges of using project management, and the theoretical framework of the study are considered in this chapter. The chapter concludes with a review of: the need to develop a PMF for ECs, project management and sustainability, project management and resource constraint issues, the knowledge gap, and a chapter summary.

2.2. OVERVIEW OF CONSTRUCTION CONTRACTING IN SOUTH AFRICA

Generally, construction activities are undertaken after a process of construction contracting which provides the basis on which construction is completed. In South Africa, the construction contracting process is controlled and managed by the CIDB, a body mandated by the government to implement an integrated strategy for the reconstruction, growth, and development of the construction industry (CIDB Act 38 of 2000). In order to provide standardised and uniform construction contracting processes, documentation and procedures, the CIDB published the Standard Uniformity for Construction Procurement (SUCP) in accordance with the requirements of the CIDB Act 38 of 2000 (CIDB, 2015a). The CIDB believes that the SUCP will help to promote cost efficiencies, provide transparent, fair, and equitable contracting methods, and make it possible to identify risks, responsibilities, and obligations clearly at all stages of construction contracting (CIDB, 2015a).

Although the SUCP is supposed to guide construction contracting in the country, the guidelines of the SUCP and other CIDB related regulations do not apply equally to public and private clients in the construction industry. While public sector clients are required by law to abide by all the requirements of the CIDB regulations in the SUCP in the construction contracting process, private sector clients are not legally required to do so (CIDB, n.d). However, it has been reported often that many private sector clients tend to apply the construction contracting regulations in the belief that they help in managing construction contracting effectively and efficiently (CIDB, n.d). Thus, it can be said that the construction contracting process in the construction industry generally provides the beginning of the framework for all construction activities.

The construction contracting process involves the client and the contractor who serve as the major operators. These two operators lead the contracting process in which the client offers the contractor the opportunity to perform work for the client. The South African construction industry does rely heavily on the contracting process between a client and the contractor which enables the commencement of construction activities which the contractor performs for a fee based on the agreements of the contract

(CIDB, n.d). This means that the contractor who is appointed to perform work, according to the contract agreement, must undertake the project according to the stated requirements to achieve successful delivery. It is widely acknowledged that activities in the construction industry are project based and, therefore, the contractor should undertake such activities using a project management approach that will lead to successful project delivery. In the case where ECs serve as the contractor, the goal is also that their projects are performed in a manner that will bring them more projects in the future. These expectations give rise to the need for an appropriate PMF that takes their needs into consideration.

It is widely known that activities in the construction industry are project oriented and they have a specified beginning and an end (Larson and Gray, 2018). Thus, such activities should be managed using a project management approach to achieve successful outcomes. Ottosson (2012) argued that project management is not new to the construction industry and has always been used to undertake projects in the industry. This means that the use of any project management methodologies in the construction industry should not create problems as most people in the industry have already been using a project management approach to manage their activities in the sector. Therefore, the idea of developing a PMF for use by ECs in the construction industry should not create any problems because ECs might already be aware of most of the elements in the PMF.

2.3. CHALLENGES FACING EMERGING CONTACTORS

Projects undertaken by ECs continue to receive negative reviews from clients in areas such as schedule, quality of work delivered, resolution of defects, and the level of defects despite continuous government support (CIDB, 2015b). Ranjit, Mwanaumo and Nkado (2011), Chauke (2013) and CIDB (2011a) identified slow project delivery, cost overruns, poor workmanship, poor cashflow, lack of capital equipment, inadequate managerial skills, inadequate business knowledge, high start-up cost, lack of access to funding from banks and delayed payments as some of the challenges facing ECs. There is consensus that most of the challenges faced by ECs are as a result of a lack of construction knowledge and skills, and a lack of project management

knowledge, skills and experience (Mavetera et al., 2015; CIDB, 2011b). According to Wentzel, Smallwood and Emuze (2016), many of the challenges faced by ECs have a negative effect on their performance, development and sustainability, thereby leading to their high failure rate. This situation is a concern because it could affect the achievement of the EC Programme objective as well as the government's goal to use the programme as a vehicle for the economic empowerment of previously disadvantaged population groups. Given that the business activities of ECs are project based, there is a need for an appropriate PMF to help to alleviate some of the challenges faced by ECs to support their sustainability.

2.4. THE PROJECT MANAGEMENT FRAMEWORK AND THE ESSENTIAL COMMPONENTS

A PMF is generally considered to be the basic structure by which to understand project management (PMI, 2017). Thus, the use of a PMF is critical to understanding how project management is used to achieve successful project outcomes. Furthermore, frameworks usually provide stability, consistency and clarity in complex and confusing situations (Urban and Venter, 2015). In addition, the PMF used is based on the needs of an organisation and the environment in which projects are undertaken as well as the availability of resources (Scavetta, 2020). Philips (2012) and Ledwith, Turner and Kelly (2010) were also of the opinion that a project management approach for small businesses, such as ECs, should be modified to meet their needs. Furthermore, the project management approach should include all the relevant components that support successful project delivery (Philips, 2012). Thus, the PMF should be able to provide ECs with consistency, stability, and clarity, while taking into consideration their needs and limited availability of resources during their project management process in the construction industry. This is key to the project-based business of ECs since they then would be able to deliver the projects they undertake successfully, leading to their sustainability. Given this background, it is key that the PMF consist of components that are essential to the project business and resource constraints issues of ECs. Naybour (2010) noted that there are three key parts of any PMF, including project lifecycle, project control cycle, tools and templates, which may be used to facilitate the project management process from the start to the end. Whiles careful evaluation of

the essential components suggested by Naybour (2010) shows their alignment with the definition of project management by the PMI (2013), a well-established authority of project management guidelines. The advice of Scavetta (2020), Philips (2012) and Ledwith, Turner and Kelly (2010) that the chosen PMF and the essential components should be based on the needs, as well as the resource level of the organisation, is relevant. Thus, the study adopted a PMF that is made up of project lifecycle, project control cycle, tools and templates as the essential components that will be responsive to the resource availability and the project needs of ECs. Besides, the three essential components are well established and form the foundation of almost all project management methodologies (PMI, 2013). Overview and detailed description of the three essential components are presented in Chapter 3 of the study.

2.5. PROJECT MANAGEMENT FRAMEWORK TO SUPPORT THE DEVELOPMENT AND REPLICATION OF PROJECT MANAGEMENT PRACTICES

ECs operate their business activities in the construction industry, where such activities are project oriented (Larson and Gray, 2018). Thus, the use of a project management approach is important to achieve successful project outcomes (Pinto, 2013; Brown and Hyer, 2010). It has been noted further that the use of a project management approach helps in the successful delivery of projects of all types and sizes (Maley, 2012; Brown and Hyer, 2010). Consequently, the use of project management applications should enable ECs to achieve successful project outcomes. However, Ledwith, Kelly and Turner (2010) mentioned that little is known about the use of a project management approach by small businesses such as ECs. This assertion affirms a CIDB (2011a) report in which it was shown that most ECs do not apply any project management methodology owing to a lack of technical skill. However, Ratnasingma (2007) argued that several small businesses, such as ECs, are moving towards the application of a project management approach for its perceived benefits. Ledwith, Kelly and Turner (2010) and Philips (2012) suggested that small businesses, such as ECs, do not need to use the elaborate project management approaches used by larger firms. This suggestion was based on the projects undertaken by small businesses, such as ECs,

being smaller and less complex compared with those undertaken by larger firms. Nevertheless, although Philips (2012) advised that ECs don't need to use an elaborate project management approach, however, any project management approach for ECs should include all the essential components that can support the successful delivery of projects. Furthermore, Shi (2011) and Thomas and Mullaly (2007) argued that organisations required guidance and a structured approach on which key project management efforts they should concentrate on when undertaking projects. In support, Fernandes, Ward and Araujo (2014) contended that with a structured approach and guidance, organisations may consistently utilise project management processes in undertaking their projects activities. This argument does support the idea of a PMF to support the development and replication of project management practices among organisations such as ECs. Consequently, a PMF was developed in this study that should provide a structured approach to applying project management consistently among ECs to support successful project outcomes which can influence ECs sustainability in the construction industry.

2.6. USING A PROJECT MANAGEMENT FRAMEWORK TO ASSIST EFFECTIVE COMMUNICATION AMONG PROJECT STAKEHOLDERS

Project stakeholders generally include any person or group of people that have a vested interest in the project and are required to provide some inputs that affect the project (Wysocki, 2019; PMI, 2017). According to Richardson and Jackson (2019), the failure of a project is linked to how stakeholders are identified and managed during the project management process. Gido, Clements and Baker (2018) argued for the early identification of stakeholders to enhance how they are managed during the early stages of a project. The key for small construction firms such as ECs is to ensure that all project stakeholders are identified at an early stage of the project and provisions made for how to manage them. Thus, ensuring the effective and efficient engagement of stakeholders requires an appropriate communication structure which can be established as part of a PMF (Wysocki, 2019; Kerzener, 2017b). The PMI (2017) regards project communication as involving all the processes that are required to

ensure that the information needs of the project and its stakeholders are met through the development and implementation of procedures that enable the effective exchange of information during the management of a project. Essentially, project communication should provide an approach to how exchanges of information are carried out during a project to enable the successful delivery of the project outcomes. Furthermore, an appropriate exchange of information should enable all project stakeholders to understand the various stages of the project in order to contribute effectively to the achievement of the success of the overall project (Handzic and Bassi, 2018). For example, Lewis (2011) and Wysocki (2019) argued that projects either succeed or fail based on the flow of information and, usually, many problems during projects occur as a result of poor communication which leads to stakeholders being uninformed. Thus, with the use of a PMF, it should be much simpler and easier to manage communication appropriately among all the relevant stakeholders to support successful project delivery (Heldman, 2018). The use of a PMF should provide a structured guideline for how communication should take place efficiently and effectively during a project to achieve successful project outcomes (Wysocki, 2019; Schwalbe, 2014; Kerzner, 2017b).

2.7. PROJECT MANAGEMENT FRAMEWORK TO STREAMLINE THE USE OF PROJECT TOOLS AND TEMPLATES

Templates are partially complete documents in a predefined format that provides a defined structure for collecting, organising, and presenting information and data (Bissonette, 2016). Tools are tangible items such as a template or a software programme, that are used in performing an activity to produce a product or result (Bissonette, 2016). Thus, project tools and templates can be used to provide a standardised approach to project management in an organisation. This is because, with the tools, and templates, an organisation can establish a set of procedures that can be applied to each stage of the project management process. Project tools, and templates, such as a communication plan, project matrix, work breakdown structure, quality journey framework, risk assessment matrix, and responsibility assignment, among others, can be used to provide a standard and consistent approach to managing the change aspect of a project by an organisation (Kerzner, 2017b). As a

result, when developing a PMF the role of project tools and templates should be regarded as a critical component of the project management process. This is because a project manager needs tools, and templates in order to deal with the fundamental aspect of the project management process in ensuring project success (Jha, 2010). Furthermore, the use of templates and tools can save ECs lots of resources and time given that there will be no need to reinvent the wheel when they undertake projects (Wells and Kloppenborg, 2019). As already highlighted, ECs are resource constraints therefore, having templates, and tools as part of the PMF should streamline their use for key management processes. This is because small construction firms such as ECs don't have to redevelop new templates and tools with every project, but they can save time by just modifying an existing one. Thus, having a framework that includes typical project templates and tools should streamline the use of such templates and tools.

2.8. PROJECT MANAGEMENT FRAMEWORK TO FACILITATE CUSTOMERS' UNDERSTANDING OF THE PROJECT MANAGEMENT PROCESS

In project management, a customer or a client is considered to be the end-user or recipient of the result of the project and could be either internal or external to the organisation (Heldman, 2018). In most cases, the customer is the owner of the project and defines the scope of the project (Kerzner, 2017b), thus, it is important that the customer is informed continuously about the progress of work on the project. This is because, for the project to be considered as being a success, it must first meet the requirements stated by the customer or client (Heldman, 2018). According to Dobson (2015), project customers need overall information about the project as well as all early warning signals of any potential issues that might affect the successful delivery of the project. Larson and Gray (2018) suggested that it is necessary for project managers to be responsive to the changing needs of the customers to meet their expectations which is key to achieving a successful project outcome (Rose, 2014). This means that making appropriate information regarding the project available at the right time is critical to satisfying the requirements of the customer. Consequently, the use of a PMF becomes critical since it can be used to plan and specify the relevant information to

be provided at each stage of the project (Kerzner, 2017b) as required by the customer or client. Thus, a framework like PMF is important in providing real-time information to customers which could contribute to the successful delivery of project outcomes. Furthermore, projects undertaken by ECs in the construction industry often have several related customers that need to be satisfied and have a direct impact on current projects as well as future projects (Yang and Peng, 2008). As a result, having structured guidance in dealing with diverse customers by utilising a PMF can facilitate how these customers understand the project management process of ECs.

2.9. PROJECT MANAGEMENT FRAMEWORK TO MAINTAIN FOCUS ON AGREED MILESTONES AT THE EARLY STAGES OF THE PROJECT LIFECYCLE

Milestones are considered to be significant points of reference during the accomplishment of project work and can be included by the customer or the client in the project contract (Sears et al., 2015). Milestones are usually at the beginning or end of a phase or stage of the project and play a key role in the process of monitoring a project. Furthermore, milestones can serve as a reference point for the monitoring and control of a project since they provide details about the completion of which activities is significant and should be noted during the execution of the project (Sears et al., 2015; Lester, 2017). It is critical, therefore, that the importance of milestones is not underrated during the project management process as this could affect the process of monitoring the project (Lester, 2017). A key component of the project management process that was considered in this study was to ensure that all relevant project management processes were incorporated into the PMF. As a result, the PMF includes a channel for reporting continuously on progress towards milestones throughout a project. For instance, the project life cycle component of the PMF will ensure that all the agreed milestones are identified and well documented to ensure that they are used to monitor the progress of the project work. Therefore, using the PMF should make it easier for ECs to maintain focus on the agreed milestones that form the project life cycle stages (Badewi and Shehab, 2016; Pollack, Costello and Sankaran, 2013).

2.10. PROJECT MANAGEMENT FRAMEWORK TO ENSURE ADEQUATE MONITORING OF, AND REPORTING ON PROJECT DELIVERABLES

As has been the argument so far, a PMF can be used to provide a consistent approach to managing a project, and stability during its use in undertaking a project (Venter and Urban, 2015). Similarly, the PMF provides a structure according to which project management can be undertaken using the relevant project management processes (PMI, 2017). Furthermore, according to Naybour (2010), a PMF includes: a project life-cycle, project control cycle, tools, and templates. The project control cycle component of the PMF contains the procedures or guidelines for monitoring, controlling, and reporting on project performance (Scavetta, 2020). Therefore, the use of a PMF should encourage continuous monitoring, control and reporting on a project since this process contributes generally to successful project delivery. This is because, through project monitoring and control, any issues that could jeopardise the project can be identified and corrected before it is too late in the project (Larson and Gray, 2018). Often, ECs would have to spend a considerable amount of time and resources monitoring and reporting on the progress of their projects by comparing the actuals with the planned (Wu, 2020). ECs are known to be resource constraints, therefore, their ability to go through the monitoring, controlling, and reporting stages requires a standardised approach to focus on only the essential activities. Orgut et al. (2020) and Larson and Gray (2018) found that using a project management approach provides a better chance of performing effective monitoring, control and reporting of projects. As a result, the developed PMF can provide such respite given that the project control component was developed with ECs resources constraints issues in mind but also have the essential activities that are required for project monitoring, control, and reporting.

2.11. SURVIVAL AND SUSTAINABILITY OF EMERGING CONTRACTORS

The CIDB, in collaboration with a number of partners, has developed the National Construction Development Programme (NCDP) to address some of the challenges that are hampering developments in the construction sector, including the concerns for ECs. The main objectives of the NCDP are to increase the capacity, equity ownership, sustainability, quality, and performance of contractors registered with the CIDB across all grades (CIDB, 2011a). Generally, the NCDP could be said to be directed at ECs since most of the constraints faced in the construction sector are attributed to ECs and their project activities (CIDB, 2011a). The NCDP aims to enhance the capacity and the overall performance of ECs in construction contracts to ensure that ECs are effective and efficient in their activities in the construction industry (CIDB, 2011a). In addition, the survival of ECs is dependent on their sustainability which is consequent upon how they undertake projects in the construction industry. Thus, it is paramount that ECs project activities are delivered successfully to ensure future work in the construction industry (CIDB, 2015b)

2.12. BENEFITS OF APPLYING PROJECT MANAGEMENT

The ultimate benefit of using a project management approach is to have a satisfied customer because of a successful project outcome (Clements, Gido and Harinarain, 2018). This is because there is a strong correlation between the use of a project management approach and the successful delivery of projects (Larson and Gray, 2018; Maley, 2012; Meredith and Mantel, 2012). In addition, Al-Hajj and Zraunig (2018) showed in their study that project success was dependent on the use of project management techniques and tools. This means that the use of a project management approach can lead to a successful project outcome which, in turn, could lead to a satisfied customer. For ECs, this could lead to future business from the same customer or new business from a new customer referred by the previously satisfied customer (Clements, Gido and Harinarain, 2018). Such a situation is critical to the survival and sustainability of EC businesses.

The application of a project management approach can contribute also to improved financial management, quick and economic project completions, proactive risk management on projects, more predictable project work and proactive scope

management (Larson and Gray, 2018; Schwalbe, 2014). Many of these benefits are critical to the operations of any project business in the construction industry where future project business is determined by the success of the current project (Clements, Gido and Harinarain, 2018). This is important to a business because, no matter the size of a business, its survival depends on how it satisfies its customers. This is critical even for small businesses such as ECs that are resource constrained and cannot afford to undertake business activities unsuccessfully. In this context, the application of an appropriate project management approach becomes beneficial. Thus, the main purpose of the study was to develop a PMF that takes into consideration the resource constrained nature of EC businesses to support their sustainability.

2.13. CHALLENGES OF USING A PROJECT MANAGEMENT APPROACH

While the application of sound project management offers several benefits (Steyn et al., 2016), it has been noted widely that not many organisations are using this approach in undertaking their projects. The inability of most organisations to use a project management approach in undertaking their projects has been linked to challenges such as: having to make organisational changes (Oosthuizen and Venter, 2018); the need for upfront investment to acquire skills and knowledge (Larson and Gray, 2018); and the need for detailed planning and risk management (PMI, 2013). Any of these challenges could be a deterrent for any organisation that wishes to adopt the project approach to doing business. In addition, a project management approach requires extensive resource capability to adopt and implement, which is a major concern for ECs and their operations. This raises some doubt as to whether these challenges can be overlooked when recommending a project management approach to a business, such as an EC, that is resource constrained. While the argument might be pertinent, it is also important to consider that ECs operate in an environment where business activities are project-based. Thus, the need to use a project management approach led to this study to develop a PMF that is specific to the needs of ECs given the challenges of using a project management approach identified in this section.

2.14. THEORETICAL FRAMEWORK

This study was based on research into theory relating to sustainability and resource constraints. Resource constraints and a balanced concern for the economic well-being of the owners, the environment and the communities define how business is conducted today. These issues are relevant to ECs and, therefore, are discussed in the following sub-sections.

2.14.1. Sustainability

Sustainability has become a major part of the operations of all industries including the construction industry in which ECs operate (Clarke and Clegg, 2000). For example, Ortiz, Castells and Sonnermann (2009) and Berardi (2011) indicated that the construction industry is more concerned about sustainability now than it has ever been. This is because the construction industry affects the economy, the environment, and society as a whole (Mjakuškina, Kavosa and Lapiņa, 2019; Adetunji et al., 2003). Furthermore, the construction industry serves almost all other industries and leads the way in economic value creation by means of buildings and other constructed assets (Mjakuškina, Kavosa and Lapiņa, 2019; World Economic Forum, 2016). In addition, the construction industry is noted as being the largest consumer of raw materials, and constructed objects account for 25% to 40% of the world's total carbon emissions (World Economic Forum, 2016). Thus, any business that operates in construction needs to consider issues of sustainability seriously. Consequently, sustainability is critical to ECs since their activities are in the construction industry.

Sustainability is a broad concept that always sparks debate among scholars and researchers and applies differently to different industries and their activities (Portney, 2015; White, 2013; Faber, Jorna and Van Engelen, 2009). For the purpose of this study, sustainability has been considered in terms of its application in the construction industry as it applies to the operation of ECs. The concept of sustainability is explored in the following sub-sections.

2.14.2. Definition of Sustainability

Sustainability is deemed to be a complex concept (White, 2013; Faber, Jorna and Van Engelen, 2009; Munier, 2005) and, thus, it is important for researchers to specify in what context they are using the concept of sustainability to avoid ambiguity (Aragon-Correa et al., 2017; Pantelic, Sakal and Zehetner, 2016; Portney, 2015). In the current study, sustainability is viewed as a business strategy that leads to the long-term survival of a business through the process or activities of managing economic, environmental, and social assets of the business that compose its capital (Giovannoni and Fabietti, 2013; Lubin and Esty, 2010). In addition, sustainability is considered in this study in terms of how small businesses, such as ECs, can apply it simply to their way of doing business in the construction industry. As such, the purpose of this study did not require a complex construct of the concept of sustainability.

Depending on the sphere of analysis, sustainability can be viewed as a construct made up of three different components: economic, environmental and social (Caradonna, 2020; World Economic Forum, 2016; Adetunji et al., 2003). Similarly, Udo-Akang (2012) and Spangenberg (2005) argued that sustainability can be viewed from a theoretical perspective when considering the relationship between the three components of economic, environmental and social sustainability. Regardless of the worldview applied when examining sustainability, Portney (2015) and Lubin and Esty (2010) contend that a business can achieve economic viability, social equity and environmental well-being which can lead to a win-win situation for all stakeholders in the firm's operation if the firm views sustainability to include economic, social, and environmental sustainability. Portney (2015) posit that the whole notion of sustainability as it is today comprising of three co-equal part of economy, environment and equity (social) originate from the work of the United Nation's World Commission on Environment and Development report of 1987. So, for ECs, it is critical that their activities in the construction industry must be geared towards promoting a combination of the three dimensions of economic, social, and environmental sustainability to achieve the overall sustainability of their businesses in the long term (Portney, 2015).

In the broader perspective of the construction industry, economic sustainability can be viewed as the contribution of the industry to the economy of a country (Adetunji et al., 2003). For example, it has been reported that the construction industry accounts for 5% to 8% of the total GDP of developed and developing countries respectively, as well as being responsible for the employment of 100 million people worldwide (World Economic Forum, 2016). Environmentally speaking, the construction industry has been noted to be the largest consumer of resources and raw materials which include approximately 50% of the steel produced globally (World Economic Forum, 2016; Adetunji et al., 2003). Finally, on the social front, the construction industry is responsible for the provision and maintenance of infrastructure for accommodation and construction determines where and how everyone lives, works and plays (Caradonna, 2020; World Economic Forum, 2016; Adetunji et al., 2003). Overall, the construction industry has a critical role to play in achieving and maintaining sustainability so that the industry and its operators can achieve their business objectives while not harming society and the environment (Caradonna, 2020; Majdalani, Ajam and Mezher, 2006). Since ECs are involved in project activities in the construction industry, the achievement of their project objectives must be linked with their overall sustainability (social, economic, and environmental). By comparing the parameters used in determining project success with the pillars of sustainability, it can be concluded that, if project activities are undertaken successfully, they could lead to the achievement of overall sustainability. This is based on the argument that time, cost, scope, the satisfaction of stakeholders and the well-being of the environment (Kerzner, 2017b), which are indicators of project success, can be linked to the economic, social, and environmental dimensions of sustainability. Figure 2.1 illustrates the argument of there being links between the project success parameters of time, cost, scope, stakeholder satisfaction, and environmental concerns (Daugherty, 2021) and the economic, social, and environmental pillars of sustainability. It is argued further that the achievement of project success by ECs based on time, cost, scope, concern for stakeholders and the environment (Daugherty, 2021) can influence the attainment of economic, social, and environmental sustainability, which can lead to the overall attainment of sustainability by ECs in the construction industry. The three components of sustainability in the construction industry are explored further in the next sub-section of the study.

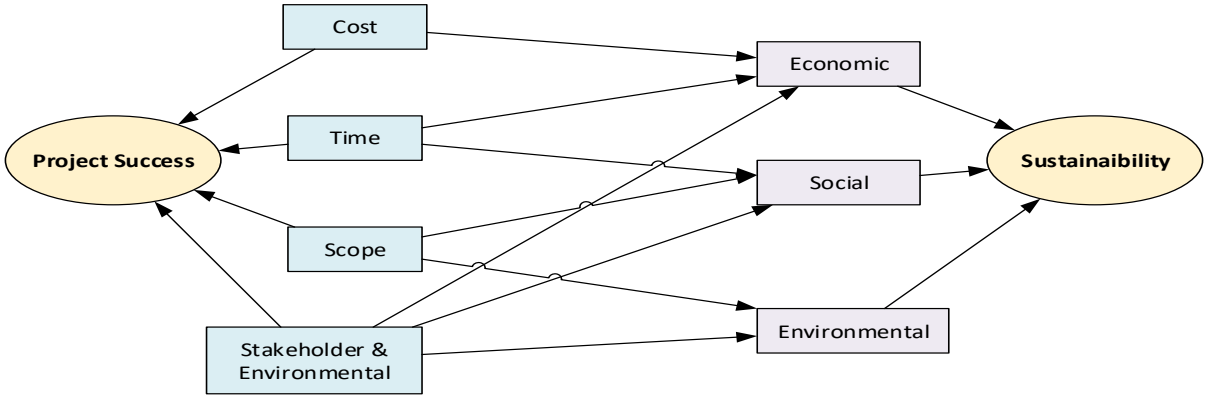

Figure 2.1: The link between project success parameters and pillars of sustainability

2.14.2.1. Economic sustainability

Economic sustainability is regarded by most authors as the ability to support indefinitely a level of defined economic production or profitability (Caradonna, 2020; Vescos and Ferrero, 2015; Mairal, 2015). For example, Caradonna (2020) and Stiglitz, Fitoussi and Durand (2018) explained economic sustainability as being the ability to generate, at any time, enough cash flow to ensure liquidity and produce persistent long-term returns such that the economic needs of the company and its stakeholders are met. Furthermore, Wanamaker (2011), Hardisty (2010) and Doane and MacGillivray (2001) stated that economic sustainability is about making sure that the project endeavours of the firm can create economic value while taking into consideration the concern for issues of social and environmental sustainability. Thus, for any business to achieve economic sustainability its business activities must be geared towards consistent generation of cash flow to ensure liquidity, thereby achieving long-term profitability as well as creating economic value from its business activities (Caradonna, 2020; Hardisty, 2010; Lien, Hardaker and Flaten, 2007). In the construction industry, sustainability is often associated with the creation of jobs, economic growth, and the generation of wealth for the owners and the construction businesses (World Economic Forum, 2016; Adetunji et al., 2003). Therefore, with regard to ECs, the attainment of economic sustainability can be linked to their ability to generate enough cash flow, create jobs and support regional and local economic growth as well as contribute to the country's GDP (Hardisty, 2010; Lien, Hardaker and Flaten, 2007). Consequently, ECs can achieve economic sustainability by undertaking

their projects successfully, which will put them in a position to secure future construction contracts since a successful project can boost the confidence of construction clients in their business activities. It is argued in this study that ECs can achieve successful project outcomes by using a dedicated PMF that takes into account the resource constrained nature of ECs in the construction industry.

2.14.2.2. Social sustainability

Social sustainability has received little attention in the literature until lately (Afshari et al., 2022; Eizenberg and Jabareen, 2017; Silvestre, 2015). This is due to the lack of understanding of social sustainability factors, making their application and implementation challenging (Afshari et al., 2022; Eizenberg and Jabareen, 2017). However, the importance of social sustainability has evolved over the past few years (Afshari et al., 2022). Hajirasouli and Kumarasuriya (2016), Weingaertner and Moberg (2014) and Åhman (2013) all contended that there is no consensus regarding the definition of social sustainability which has resulted in many variations in its definition because of different perspectives of social sustainability (Jaeger, Tàbara and Jaeger, 2011). For example, Becker and Jahn (1999) saw social sustainability to be a viable society that can establish a long-term relationship with nature. Polèse and Stren (2000) defined social sustainability as a balanced development of a civic society. Woodcraft, Hackett and Caistor-Arendar (2011) and Mckenzie (2004) saw social sustainability as an approach that is used to address people's needs and improve their living conditions. Overall, social sustainability can be seen to relate to the impact of an organisation's products, processes, or services on a society (Eizenberg and Jabareen, 2017; Finkbeiner et al., 2010). Several researchers have argued that no matter their size, businesses or enterprises contribute to the social welfare of their communities, and that, in turn, such contributions tend to result in better performance of such enterprises in the long run (Mani, Jabbour and Mani, 2020; Van Aardt and Benzuidenhout, 2014; Ehlers and Lazenby, 2010). This means that firms, such as ECs, can attain social sustainability depending on how they contribute to or give back to the communities in which they operate during their project endeavours in such communities. Furthermore, Van Aardt and Benzuidenhout (2014) argued that the survival of a newly established business is sometimes linked to the survival of the

community because such businesses are part of the communities in which they operate.

It is widely acknowledged that the construction industry is generally responsible for where and how almost everyone lives, works and plays (World Economic Forum, 2016). Thus, it is imperative that the actions of those in the industry should endeavour to provide quality of life for stakeholders and patrons in the best possible ways. In effect, construction activities must be undertaken in such a way that they provide safe places for individuals to live, work and play, and this must be done even by small businesses such as ECs that operate in the industry. In the case of ECs, therefore, their achievement of social sustainability is related to how they conduct their businesses in the areas where they operate so that their project activities do not lead to health-related complications. In addition, ECs can be of benefit to the communities in which they operate by giving preference to job opportunities to individuals in such communities. Furthermore, ECs must make sure that their services, processes and products are human-friendly and risk-free, which can lead to the achievement of social sustainability.

2.14.2.3. Environmental sustainability

Environmental sustainability refers to the activities of an organisation that reduces pollution and waste generated by its operations (Zhu, Geng, and Lai, 2010). According to Hardisty (2010), environmental sustainability is seen as the ongoing viability of the ecosystems that provide the basis for all life on earth. Furthermore, Caradonna (2020) contended that environmental sustainability requires the maintenance of a stable resource base, the preservation of renewable resources, and the safeguarding of biodiversity and essential ecosystem services. Moreover, environmental sustainability seeks to improve human life welfare and social sustainability by protecting the sources of raw materials used for human needs and ensuring that the sinks for human wasters are not exceeded (Goodland and Daly, 1996). Thus, environmental sustainability actions are aimed to reduce the use of physical resources, the use of renewable rather than depletable resources, the redesign of production processes and products to eliminate the production of toxic materials and the protection and restoration of the

natural habitat and environments valued for their beauty (Morelli, 2011; Sutton, 2004). However, advocates for environmentalism have raised concerns about how the actions of businesses and individuals continue to degrade our physical environment (Vesal, Siahtiri and O'Cass, 2022; Goodland, 1995). Most advocates believe that, if nothing is done soon, the long-term negative effect will be disastrous for our planet (Collins et al., 2013; Goodland, 1995). For this reason, environmental sustainability has become a critical component of the operations of businesses worldwide (Geradts and Bocken, 2019; Epicoco, 2016; Figge and Hahn, 2012). This trend is not limited to large businesses only but includes small businesses such as ECs. For instance, businesses of all sizes have been encouraged to operate in such a manner that their activities do not degrade the ecosystem (Hoffman, 2005; Kolk and Pinkse, 2005; Bansal, 2002; Reilly, 1999; Levy, 1997). The construction industry is considered to be one of the major contributors to environmental degradation through its activities and this is not limited to larger operators in the industry only but includes small businesses such as ECs (Lima et al., 2021; Majdalani, Ajam and Mezher, 2006).

General observation of the activities even of ECs in our communities has shown that they also contribute to the degradation of the environment even though they are small in nature. Dzansi and Okyere (2015) and Redmond, Walker and Wang (2008) argued that owing to their large numbers, the aggregation of the impact of small businesses, such as ECs, could affect the environment significantly. Thus, it is now paramount for ECs to examine their actions and how they operate in construction critically if they are to achieve environmental sustainability in the areas in which they operate.

In the construction industry, environmental sustainability can be addressed by minimising waste generation, using natural resources and energy efficiently, and using resources that prevent pollution of the environment (Sourani and Sohail, 2011; Zhu, Geng, and Lai, 2010; Goodland and Daly, 1996). In South Africa, water shortages and fluctuation in the supply of electricity mean that the activities of ECs in the construction industry, especially where water is used, should always be considered carefully. This means that ECs who normally operate in remote areas must be aware of the water scarcity and adopt water conservation practices. Furthermore, ECs must desist from environmental despoliation, for example, the destruction of natural vegetation, unwise digging up of soils for construction purposes and the destruction of the habitat of

another organism. This is a daunting task for ECs with small resource capacity and capability. However, with the use of a PMF to support their activities, ECs should be able to achieve environmental sustainability.

2.14.3. Achieving sustainability

At the heart of sustainability is the triple-bottom-line philosophy of managing a business. The triple bottom line includes social, economic, and environmental sustainability (Savitz and Weber, 2006; Elkington, 1998). As a result, to achieve sustainability, it is necessary for a business to work towards achieving the three dimensions of sustainability (Elkington, 2004; Elkington, 1998). For instance, Oberoi (2014) and Hansen and Schaltegger (2014) believed sustainability to be the result of the desired actions of people or organisations to ensure the long-term survival of society by balancing short-term and long-term profitability by holistically managing the economic, environmental, and social interests of the business. Consequently, sustainability can be achieved only by simultaneously protecting the environment, preserving economic growth and development and promoting social equity (Elkington, 2004; Elkington, 1998). Thus, achieving overall sustainability requires an understanding of the link between business profitability, social cohesion and the responsible environmental practices of individuals and businesses.

From a sustainability perspective, the idea is that ECs, who operate as small businesses, should be sustainable, which is a feat that can be achieved only through their simultaneous understanding of the link between their project endeavours, their profit, social cohesion, and responsible environmental practices (Adetunji, Price and Fleming, 2008). Furthermore, ECs, as small businesses, might be focused on profit but, in so doing, they must not neglect the concerns for society and the environment since the only way they can achieve sustainability is if they combine the three dimensions of profitability, social well-being and environmental preservation in their project activities (Li et al., 2022; Ma et al., 2018; Almahmoud and Doloi, 2015). The argument in this study is that ECs will be able to achieve sustainability if they use a dedicated PMF which takes their constrained resources and needs into consideration. This is because the components of a PMF include tools and techniques which are

known to assist in achieving successful project outcomes without undermining social and environmental responsibilities (Herazo, Lizarralde and Paquin, 2012; Ledwith, Kelly and Turner, 2010). Since ECs are engaged mainly in project activities, the use of a PMF will make it easier for them to achieve sustainability (Marcelino-Sádaba, González-Jaen and Pérez-Ezcurdia, 2015) because it is argued that the parameters used to measure project success are closely linked to the three dimensions of sustainability as shown in Figure 2.1. In addition, it could be reasonably expected that ECs who deliver projects successfully will most likely be considered for repeat business (subsequent projects) in the future by satisfied clients or stakeholders, thereby increasing their chances of long-term survival (CIDB, 2015), an accomplishment which is believed to be possible only by using a dedicated PMF.

2.14.4. Resource Constraints

No activity in business can be undertaken without an appropriate and adequate mix of resources (Ismail et al., 2012). The issue of resources is critical in the construction industry which is known to be resource intensive (Kokkaew et al., 2022). Resources are the people, money, materials, and equipment that are used to accomplish a project or business objectives (Larson and Gray, 2018; Nieman and Nieuwenhuizen, 2014). For projects, the availability or unavailability of resources often influences how projects are managed (Larson and Gray, 2018).

Generally, project activities compete for project resources because of the resource-intensive nature of projects and the general reality of resources being limited (Gido, Clements and Harinarain, 2018) which is common in project environments, particularly for small businesses. This phenomenon is often referred to as a situation of resource constraint. This situation does not only affect projects but also can affect organisations that undertake a project, which is the case with small businesses such as ECs. With regard to resources, the resource constrained nature of small businesses, such as ECs, can be a major obstacle to their business and project operations. Thus, it is reasonable to expect that constrained financial and human resources will leave little or no room for investment in an elaborate PMF by ECs. This was why it was necessary for the proposed, dedicated PMF to take into consideration the resource constrained

nature of ECs. This also means that, given the specific nature of ECs, they must do more with less, as expressed in the 80/20 principle, also known as Pareto's Law.

2.14.5. Pareto's Law

Pareto's Law, also known as the 80/20 principle, was initially suggested by management thinker, Joseph M. Juran. According to the 80/20 principle, efforts should be concentrated on the few activities that can produce significant business results (Koch, 2014; Koch, 2018; Process Excellence Network, 2011) or, conversely, more should be done with less (Koch, 2018). For the purpose of this study, the original version of Pareto's Law has not been explored further but its derivative, "do more with less" (Koch, 2018) has been applied. The derivative has been interpreted to mean: to concentrating efforts on the few activities that can produce significant business results and doing more with less or achieving more with fewer resources.

In the case of ECs, the principle means that they should direct their project efforts at working on activities that can produce significant successful project outcomes. It is argued that this is possible with the use of a dedicated PMF which takes the constrained nature of the resources available to ECs into consideration. Furthermore, with a PMF in place, ECs can achieve sustainability even with their limited resources, since the PMF will help them to use their limited resources judiciously in undertaking projects and business endeavours in the construction industry.

2.15. THE CASE FOR A PROJECT MANAGEMENT FRAMEWORK

A framework is a combination of interlinked practices that support a particular approach to achieving a specific objective (Budler and Trkman, 2019). Consequently, PMF is a basic structure for understanding project management (PMI, 2013). Thus, a PMF can be referred to as the basic structure of understanding project management which can be used to achieve project objectives through the combination of interlinked

practices (Budler and Trkman, 2019; PMI, 2013). Ledwith, Kelly and Turner (2009), Murphy and Ledwith (2007), Lediwth (2000) and Larson, Gobeli and Gray (1991) argue that small businesses given their limited resources required a structured and less elaborate approach to using project management processes. Therefore, considering the limited resource nature of ECs, it is necessary to ensure that a dedicated PMF for such small businesses should not be as elaborate as those used by larger organisations (Ledwith, Kelly and Turner, 2009; Murphy and Ledwith, 2007; Ledwith, 2000; Larson, Gobeli and Gray, 1991). Indeed, it has been argued that the use of an elaborate PMF by small businesses, such as ECs, amounts to a misallocation of resources (Process Excellence Network, 2011). This is because their projects are normally smaller than those of larger businesses and, therefore, might not require the use of certain components of an elaborate PMF (Ledwith, Kelly and Turner, 2009; Murphy and Ledwith, 2007; Ledwith, 2000). Thus, it is argued in this thesis that, for ECs to achieve sustainability, it is essential that a dedicated PMF is not as elaborate as those used by larger organisations, but the essential components that could make its application by ECs effective and efficient must not be compromised.

2.15.1. Project Management and Sustainability

While there are several studies devoted to sustainability and project management, few of these studies have been devoted to the relationship between project management and sustainability (Aarseth et al., 2017; Martens and Carvalho, 2016). However, Mavi et al. (2021) argued that the relationship between project management and sustainability is established in the literature. On the contrary, Silvius (2017) contended that the relationship between sustainability and project management is a new school of thought. The argument by Aarseth et al. (2017), Silvius (2017) and Martens and Carvalho (2016) regarding the paucity of literature regarding project management and sustainability seemed valid because it was difficult to retrieve relevant literature on the intersection of the two concepts. This made it difficult to compile a comprehensive review of the literature regarding the relationship between project management and sustainability. Consequently, this also made it difficult to provide existing empirical evidence of the benefits of the use of a PMF and its positive impact on sustainability in small businesses such as ECs. However, it is argued that the very nature of project

management and the parameters used in measuring project success (see Figure 2.1), can be linked to the three dimensions of sustainability (Adetunji et al., 2003) thereby leading to the general sustainability of ECs if they apply the proposed PMF in their business activities.

According to Silvius and Schipper (2014), project management and sustainability are not naturally linked because of the apparent divergent approach to business required. By contrast, Dobrovolskiine and Tamosiuniene (2016) took a position similar to the one adopted in this study that there is a link between project management and preserving natural resources, having a positive impact on society, and strengthening economies worldwide. This is self-evident worldwide, where organisations use projects and project management to execute their business strategies. As such, it is reasonable to say that project management can be used to achieve sustainability (Alvarez-Dionisi, Turner and Mittra, 2016; Gemünden, 2016), which means ECs can use a dedicated PMF to achieve the sustainability of their businesses. Furthermore, it is argued clearly in this thesis that there is a link between the parameters used in measuring project success and the three pillars of sustainability (see Figure 2.1). Thus, it can be concluded that a PMF, that takes into account the limited resource capacity of ECs, when utilised can support the business sustainability of ECs, as there is a link between the project management and sustainability.

2.15.2. Project Management and Resource Constraints

Both large and small organisations are not able to undertake many of their potential projects because of limited resources (Schwalbe, 2014; Browning and Yassine, 2010; Jaselskis and Ashley, 1991). This is because project objectives are accomplished mainly by using a mix of appropriate resources (Gido, Clements and Harinarain, 2018; Abbasi, Shadrokh and Arkat, 2006). Project management is an approach that helps large or small businesses to accomplish projects successfully through the application of skills, knowledge, tools, and techniques (PMI, 2013; Crawford, 2005). Thus, it is evident that the availability of resources is critical in undertaking and accomplishing project objectives successfully. Therefore, organisations require optimal allocation and utilisation of their limited resources to achieve project outcomes successfully

(Oostuizen and Venter, 2018; Jaselskis and Ashley, 1991). One way in which many organisations have achieved an optimal allocation and utilisation of limited resources in achieving project outcomes successfully is by selecting projects that are aligned to the overall strategy of the organisation and using a project management approach in undertaking those projects (Schwalbe, 2014; Oostuizen and Venter, 2018).

The concern for ECs in this regard is that, generally, they are contractors to public sector clients who have already selected projects, and they must undertake those projects to achieve successful outcomes. Therefore, the question is, how do ECs allocate their limited resources to such projects to achieve successful outcomes in a way that is linked to their sustainability? Schwalbe (2014) maintained that the advantage of being able to control the financial, physical, and human resources of an organisation better is one of the benefits of adopting and applying a project management approach in managing business activities. This implies that it is possible for ECs also to achieve successful project outcomes if they adopt and apply a project management approach to their project and business activities in the construction industry. This, therefore, supports the case for the use of a dedicated PMF which takes into consideration the limited resource capacity of ECs, thereby guaranteeing ECs the chance to achieve project outcomes successfully, which is key to their sustainability in the construction industry. In other words, it can be concluded that, even with their limited resources, ECs can make use of a PMF to support their sustainability in the construction industry.

2.16. GAPS IN KNOWLEDGE

Several studies have been conducted regarding ECs such as Ncwadi and Dangalazana (2006), Martin and Root (2012), Thwala and Phaladi (2009), Rmokolo and Smallwood (2008), Moss and Smallwood (2008) and Mavetera et al (2015) but none in the context of ECs and PMF components. The framework could be utilized to support ECs sustainability in the South African construction industry. Moss and Smallwood (2008) and Ramokolo and Smallwood (2008) discovered that ECs in South Africa have poor project management literacy and skills. Basic skills to manage the critical aspect of projects leading to successful outcomes were absent. Mavetera et al

(2015) found out that majority of projects undertaken by ECs in Mahikeng, South Africa for instance were of lower quality and involved many scope creeps. Thus, quadruple constraints were not well managed possibly because of the lack of an established PMF to guide the project managers.

It has also been noticed that limited research efforts have been dedicated to exploring the use of PMF to support ECs project management endeavours in terms of effective communication, development and replication of accepted project management practices, facilitating customers' understanding of the project management process and the ability to maintain focus on the agreed milestones. For instance, authors such as Thwala and Mvubu (2008), Bikitsha and Amoah (2020), Muzondo and McCutcheon (2018), Kulemeka, Kululanga and Morton (2015) and Tshivhase and Worku (2012) have all conducted various studies on ECs but have not covered how ECs utilisation of a PMF can support ECs project management process in the South African construction industry. Therefore, to the best of the author's knowledge, the question of the use of a PMF to support ECs project management activities to achieve successful project outcomes has not been investigated yet. Considering the economic importance of ECs delivering successful projects, this study is worthwhile for investigation.

In this section, a breakdown of the literature reviewed in the chapter, in relation to the research objectives, is presented in Table 2.1. The in-depth review of the literature in the chapter led to the identification of gaps in available knowledge about the sustainability of small construction firms (ECs) in the construction industry, and the application of project management by ECs to achieve sustainability. To realise the contribution of this study, answers to the research questions have been sought to achieve the research objectives set out in the previous sections to fill the gaps in knowledge that have been identified, as shown in Table 2.1.

Table 2.1: Breakdown of literature review in relation to research sub-questions

Literature review section	**Sub-questions**						
	1	2	3	4	5	6	7
The project management framework for emerging contractors	X						
Application of project management among emerging contractors		X					

Effective project communication using a project management framework			X				
Project management framework and project stakeholders			X		X		
Project tools and techniques for using a project management framework				X			
Project management framework and customers'/clients' understanding of project management					X		
Project management framework and project milestones						X	
Using a project management framework to ensure monitoring of, and reporting on, project deliverables							X

2.17. CHAPTER SUMMARY

It is clear from the literature review that the national EC Programme plays a significant role in the economic empowerment of individuals and firms.

Some of the constraints faced by ECs in the execution of their project and business activities in the construction industry, which could affect their sustainability, were evident in the literature. Project management and sustainability are two dimensions of the current approach that is used to conduct business globally. Finally, the findings of the literature review show that the use of a project management approach can enhance the project performance of ECs in the construction industry.

3. CHAPTER THREE: THE PROJECT MANAGEMENT FRAMEWORK

3.1. INTRODUCTION

The aim of this study was to determine how a PMF could be used to support the sustainability of ECs in the Free State Province of South Africa. The outcome of the study was to develop a PMF that would support the sustainability of ECs in the FS Province of South Africa.

3.2. CONCEPTUALISING "PROJECT" AND "PROJECT MANAGEMENT"

In this section, project management is explored to provide the context of the proposed PMF that could support the sustainability of ECs. Kerzner (2013) suggested that any efforts to define "project management" be preceded first by the definition of "project" since this facilitates the understanding of project management and its associated processes. This is because project management is the process used to achieve project outcomes. As such, a project is first defined, followed by project management, in the ensuing sections.

3.2.1. Defining "Project"

The definitions of a project given in Table 3.1 share many commonalities. These commonalities are characteristics that differentiate a project from a normal organisational routine. From the definitions in Table 3.1, projects have established objectives, have a defined duration with a specified beginning and end, involve multi-functional collaborations, they are unique, they have limited time, cost, and performance requirements, and are aimed at solving a problem, taking advantage of an opportunity, and responding to a mandate. Time, cost, and performance seem to

be the key dimensions across all the definitions and, therefore, are normally considered to be the key determinants of a successful project (Larson and Gray, 2018). However, all the definitions were not conclusive on the role played by the environment, society, and all other stakeholders in determining the success of a project. This displays a narrow view of what a successful project should be since projects have an impact on the environment, society, and all other stakeholders.

Table 3.1: Selected definitions of a project

Definition	Author (s)	Interpretation
A project is a temporary endeavour undertaken to create a unique product, service, or a result.	PMI (2013)	The key attribute highlighted by this definition is that a project is a temporary endeavour that is time-bound. While a project is temporary, it is however used to create a unique product, service, or result. This definition extends to ECs as most of their business activities are temporary and aimed at producing a service, a product, or results in the construction industry.
A project is an endeavour to achieve a specific objective through a set of inter-related activities and the effective utilisation of resources.	Gido, Clements, and Harinarain (2018)	In this definition, it is recognised that, for the intended objectives of a project to be achieved, it is necessary to use resources effectively to perform work on a series of inter-related activities. This closely resembles the business activities of ECs in the construction industry. ECs are generally expected to deliver project objectives by using appropriate resources effectively.
A project is a temporary endeavour intended to solve a problem, seize an opportunity, or respond to a mandate.	Brown and Hyer (2010)	In this definition, it is acknowledged that, although they are temporary, projects are aimed at solving problems, responding to mandates, and taking advantage of opportunities. ECs generally undertake projects for public sector organisations to deliver results, products or services that help such organisations to fulfil their mandates and solve problems.
A project is a sequence of undertakings that has a beginning and an end and is carried out to meet established goals within cost, schedule, and quality objectives.	Fox and Van der Waldt (2015)	While highlighting the fact that projects are time bound, in this definition, the limitation that is associated with projects is also acknowledged in terms of resources and time to deliver the expected result.
A project can be defined as a series of activities to effect change in a planned and controlled manner to achieve specific results that have fixed resources and a definite	Carruthers (2008)	According to this definition, a project consists of a series of activities that are intended to achieve a specific result but must be performed within the constraints of time and fixed

Definition	Author (s)	Interpretation
beginning and an end, the success of which is not only based on the traditional measures of time, cost and performance but also must take into consideration the environmental impact.		resources. This describes many of the business activities of ECs in the construction industry. Furthermore it is suggested in the definition that the measurement of the success of a project goes beyond just the constraints of time, cost and scope, and must also include environmental impact.
A project can be any series of activities and tasks that have a specific objective to be completed within a certain specification, have defined start and end dates, have funding limits, consume human and non-human resources and are multi-functional.	Kerzner (2013)	In this definition, while presenting the common view of what a project is, it is acknowledged that the performance of a project requires a multi-functional dimension as well as concern for time, resources, and funding constraints.

As shown in Table 3.1, Carruthers (2008) suggested that the traditional dimensions of cost, time and scope or performance as indicators of a successful project are no longer enough. Any successful project outcome should consider cost, time, scope, or performance as well as the overall impact of the project on the environment, society, and all other stakeholders (Ward, 2018; Carruthers, 2008). It is agreed that any project, no matter its size, has an impact on the environment, society, and all stakeholders in one way or another. Consequently, for the purpose of the current study, a project is defined as a temporary endeavour undertaken within the constraints of time, cost, and scope, that has an effect on the environment, society, and all other stakeholders, to create a unique product, service or results that are intended to solve a problem or respond to a mandate.

3.2.2. Defining “Project Management”

The definitions of “project management” in Table 3.2 share many similarities. In the definitions, the key roles of skills, knowledge, tools, and techniques are acknowledged as well as the efficient and effective use of organisational resources to enable the successful achievement of project objectives. All the authors listed in Table 3.2 seem to agree that any organisation that intends to achieve project objectives successfully will need to make use of project management. This is because, with a project management approach, organisations can apply knowledge, skills, tools, and techniques that are aimed at achieving project outcomes successfully through

planning the work and working the plans (Gido, Clements and Harinarain, 2018). This premise supports the case for the use of an appropriate project management approach by ECs in their project endeavours since their business activities are project oriented. This means also that ECs can achieve sustainability, since they would be able to achieve successful project outcomes that would lead to opportunities to secure further project work based on their ability to achieve successful delivery.

Table 3.2: Selected definitions of "project management"

Definition	Author (s)	Interpretation
Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.	PMI (2013)	In this definition, it is argued that the combination of appropriate skills, knowledge, tools, and techniques is paramount in achieving project objectives successfully. This definition extends to ECs since their business activities are in the construction industry where such activities are project oriented. As a result, they require the use of project management to achieve their project outcomes successfully.
Project management is the planning, organising, directing, leading, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives.	Kerzner (2013) and Gido, Clements, and Harinarain (2018)	In this definition, the efficient and effective utilisation of a firm's resources is recognised as a key to achieving project objectives successfully. According to this definition, ECs must know how to manage their resources efficiently and effectively to achieve project outcomes.
Project management is the process of bringing together and optimising the resources (skills, talents, facilities, tools, equipment, techniques, and team efforts) necessary to complete a project successfully.	Newton (2016)	In this definition, the role of enhancing the necessary resources available to the organisation is acknowledge in achieving the goal of a project successfully. Therefore, ECs must learn to optimise all the necessary resources at their disposal to enable them to complete their projects successfully.

3.3. CONCEPTUAL FRAMEWORK

The aim of the conceptual framework of this study was to develop a PMF that would assist ECs in achieving sustainability. The conceptual framework, as depicted in Figure 3.1, indicates how ECs can achieve sustainability by using the proposed PMF. Overall, ECs adoption and use of the PMF, which comprises the project life-cycle, project control cycle, and tools and templates, should lead to achieving economic, environmental, and social sustainability which are considered to be the three, key

dimensions in achieving overall sustainability in business (Portney, 2015). However, the literature reviewed in this chapter pertains only to the PMF and its essential components because sustainability and its three dimensions have been discussed in Chapter Two.

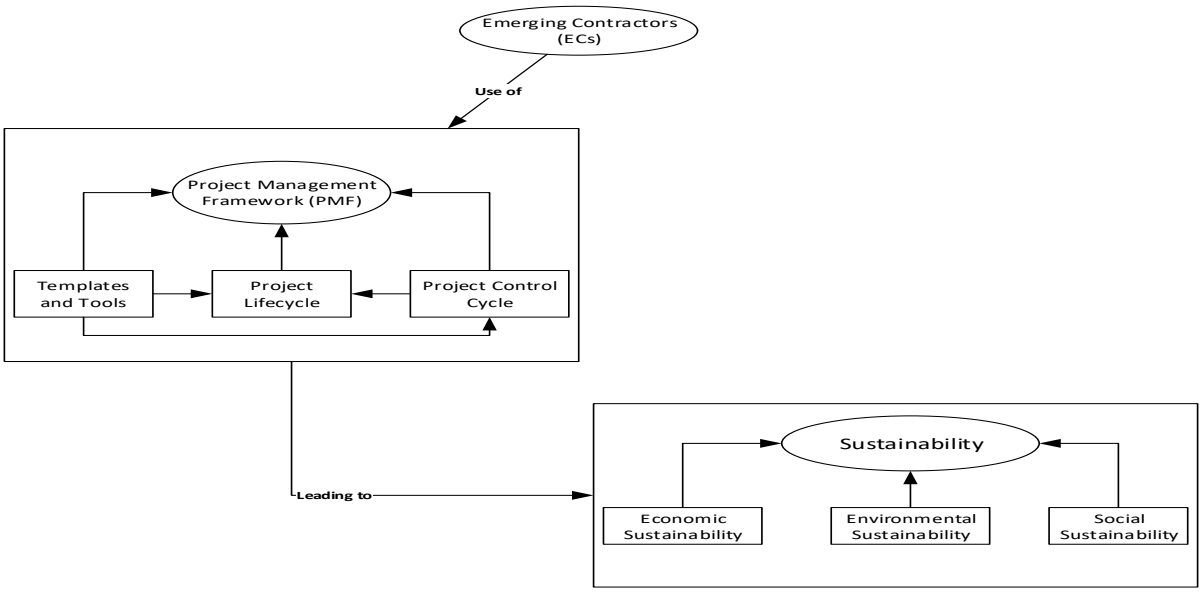

Figure 3.1: Using a dedicated PMF to attain the sustainability of ECs (Researcher's own construction)

3.4. THE PROJECT MANAGEMENT FRAMEWORK

The PMI (2013) regards a PMF as a basic structure for understanding project management. McConnell (2010) considers a PMF to be a sub-set of tasks, processes, tools and templates used in combination to initiate, plan, execute, control, monitor and close project activities. Thus, a PMF is a structure that that provides a way of using project management methodology to achieve successful project outcomes (Watton, 2017). Therefore, a PMF should support the orderly application of project management in an organisation to support the effective and efficient use of project management methodologies by an organisation during their projects. McConnell (2010) argued that the main idea behind a PMF is to create and share a clear understanding of the basis of a project and its management among stakeholders, including the project team. A PMF will help to accomplish a project according to a chosen methodology and deliver it successfully. In addition, Naybour (2010) noted that a PMF makes effective decision-

making, project cost, time and scope control, as well as project team motivation easier, so that clients know what to expect. Overall, the PMF serves as the foundation for how projects are undertaken and accomplished continuously within an organisation for better project outcomes (Watton, 2017).

For businesses, such as ECs, whose business activities are solely project based, the use of a PMF is vital in achieving successful project and business outcomes. This is because the PMF would provide a structured way of using the project management process in undertaking projects. However, Philips (2012) suggested that ECs do not require an elaborate project management approach such as those used by larger businesses. Consequently, the PMF developed in this study is considered to be for ECs that have limited resources but require a project management approach in undertaking projects in the construction industry. It is argued that the PMF should take into consideration the limited resources of ECs and should not be elaborate, but should not exclude the essential components required for the project management process to be effective.

3.5. THE ESSENTIAL COMPONENTS OF THE PROPOSED PMF

Naybour (2010) noted that there are three key parts of any PMF, including project life-cycle, project control cycle, tools and templates, which are used to facilitate the project management process from the start to the end. A careful evaluation of the parts suggested by Naybour (2010) shows their alignment with the definition of project management by the PMI (2013). Given that a PMF is a structured way of understanding and using a project management approach (PMI, 2013; Watton, 2017; McConnell, 2010), the essential components of the proposed PMF are: project life-cycle, project control cycle, project tools and templates. The essential components and their inter-relationships that can support ECs in attaining sustainability are depicted in Figure 3.2 and are explored in the ensuing sections.

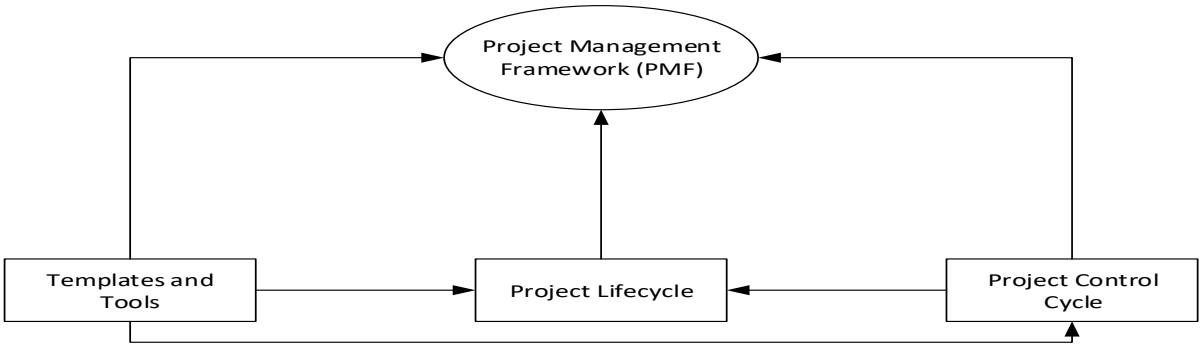

Figure 3.2: The essential components of the proposed PMF (Researcher's own construction, 2020)

3.5.1. Project Lifecycle

There was consensus in the literature reviewed that a project life-cycle is a series of phases through which a project goes from its initiation to its closure (Larson and Gray, 2018; PMI, 2013; Meredith and Mantel, 2012; Fox and Van der Walt, 2015). Similarly, the project life-cycle is sub-divided into stages which provide a logical sequence of how activities are performed during each phase to achieve the project goals (Oosthuizen and Venter, 2018; Burke, 2011). Burke (2011) argued that the structure of a project life-cycle forms that backbone of most, if not all project management methodologies. There are various generic types of project life-cycles that are aimed at achieving project outcomes. However, Burke (2011) and Naybour (2010) argued that the choice of project lifecycle depends on the business and the requirements of the project to be undertaken. This supports the idea that the project life-cycle for any PMF can be selected to suit the project and business requirements of the firm undertaking the project, as well as the objectives of the project.

While acknowledging the availability of several generic types of project life-cycle phases (Larson and Gray, 2018; Kloppenborg, 2015; Naybour, 2010), for the sake of simplicity and ease of use, as well as the needs and limited resources of ECs, for the purpose of this study, the four-phase project life-cycle recommended by Larson and Gray (2018) was adopted and includes: defining the project, planning the project,

executing the project and closing the project. Figure 3.3 depicts how the sequence and relationship of the activities in the adopted project life-cycle should be considered.

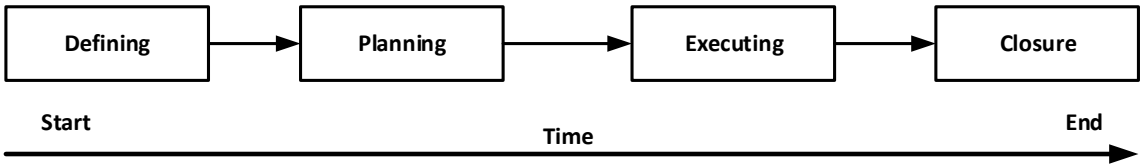

Figure 3.3: Phases of the project life-cycle (Larson and Gray, 2018)

3.5.1.1. Project defining phase

Gido, Clement and Harinarain (2018), Larson and Gray (2018), and Philips (2012) all agreed that the defining phase of a project lifecycle heralds the beginning of an organisation's project and project management activities. According to Larson and Gray (2018), a typical project definition phase includes determining the goal of the project, assigning responsibilities, and determining the tasks and the specifications of the project. Similarly, Keoki Sears et al. (2015) state that the project definition phase involves establishing the broad characteristics of the project, such as location, performance criteria, size, configuration, layout, equipment, services, and other owner requirements needed to establish the general aspect of the project. While Keoki Sears et al. (2015) argued that the project definition is the responsibility of the project owner, Horine (2009) suggested that whoever is going to undertake the project needs to know how to define a project properly and how to evaluate whether the project definition performed by others is complete. It is agreed that the suggestion by Horine (2009) is important because the contractor should know exactly what is required in terms of the project, which is only possible if the contractor is able to define the project thoroughly.

While acknowledging the similarities between the elements of project definition explained by both Larson and Gray (2018), and Keoki Sears et al. (2015) as being relevant to defining projects, because the aim of this study was to develop a PMF that suits the needs of ECs who are resource constrained, the components of the project definition phase adopted for this study are shown in Figure 3.4 and explained in Table 3.3 below.

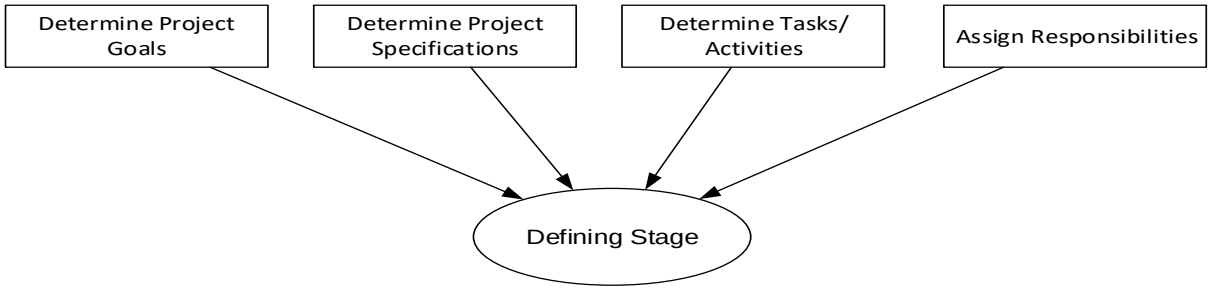

Figure 3.4: Components of the project definition phase (Larson and Gray, 2018)

Table 3.3: Stages of the project definition phase

Item	Description
Determine project goal	The goal or objective of a project is what the project is intended to achieve ultimately when it is completed at a specific level of quality, within a given time-frame and budget (Bunin, 2012). Generally, this is specified in the contract document by the owner of the project that is to be undertaken. Thus, for ECs, the goal of the project would have been known to them when they sign the contract to undertake the project. However, it is important that ECs evaluate this goal to be sure it is complete and can be used to develop detailed project plans that will lead to successful project delivery in the long run. For example, it is often noted that the failure of many projects in Africa is because of unclear project goals. Thus, ECs' ability to comprehend the goal of the project fully is a critical part of their undertaking a successful project.
Determine project specifications	Specifications are the specific and measurable ways in which the success of the project will be determined and are derived from further detailing of the project requirements as provided in the contract document (Rose, 2014). Considering the nature of EC businesses in the construction industry, they are normally provided with the specifications which are stated clearly in the contract. It is necessary for ECs to evaluate these specifications critically to be sure that they understand them. In cases where they do not understand, they can seek professional or technical advice and assistance. In addition, Rose (2014) believed that customer co-ordination is important in understanding the specifications to provide the foundation for appropriate project planning. Essentially, this stage should guide ECs to evaluate all requirements appropriately before they start the planning process in the projects that they undertake, since this stage can give them and idea of all that is expected of them to make the project successful.
Determine project activities	A task or an activity is a specific action that needs to be completed to achieve a project goal (Bunin, 2012). Without identifying the tasks/activities required to complete a project, it is impossible to undertake the project and complete it successfully. The determination of the tasks/activities becomes clearer for ECs if they understand the goal as well as the specifications of the project, since this will enable them to know the exact tasks or activities on which they must work to achieve the goal of the project. Larson and Gray (2018), and Brown and Hyer (2010) advocate the use of a work breakdown structure (WBS), which is used to sub-divide projects into smaller work elements.

Item	Description
Assign responsibilities	Project management is generally a results-oriented management style that places a premium on building a collaborative relationship among a diverse cast of characters aimed at achieving a goal (Larson and Gray, 2018). However, individuals are normally assigned to individual work elements or tasks during project execution. This approach generally provides the foundation on which team members are responsible for activities, thereby creating accountability, which is critical to achieving project success. It is a known fact that it is much easier to identify issues regarding a task or activity that is performed by one person than a task performed by several people because of the ease of assigning responsibility and accountability. Therefore, it is critical that ECs assign work elements to individual project team members who are aware of their role in achieving project success, thereby making it easier to maintain responsibility and accountability during project execution.

3.5.1.2. Project planning phase

The project planning phase of a project is concerned with how work will be done (Badiru, Rusnock and Valencia, 2016). Equally, Gido, Clement and Harinarain (2018) mention that the planning stage enables contractors, such as ECs, to undertake detailed planning of how the project will be accomplished, based on the goal or objectives stipulated by the client. This makes project planning a critical component of the project life-cycle, since it provides a roadmap for how the project will be undertaken to achieve a successful outcome (Meredith, Shafer, and Mantel, 2017; Schwalbe, 2014). Larson and Gray (2018), Gido, Clements and Harinarain (2018) note several areas that should be considered when performing project planning. Table 3.4 shows a comparison between the areas recommended by these authors.

Table 3.4: Stages in the project planning phase

Authors	Recommended project planning stages
Larson and Gray (2018)	• Scheduling • Project budgeting • Estimating resources. • Managing risk. • Staffing
Gido, Clements and Harinarain (2018)	• Establish project objectives. • Define project scope. • Create work breakdown structure. • Assign responsibility. • Define specific activities. • Sequence activities • Estimate activity resources.

Authors	Recommended project planning stages
	• Estimate activity durations. • Develop a project schedule. • Estimate activity cost. • Determine project budget
Meredith, Shafer and Mantel (2017)	• Work tasks • Resources • Schedules • Costs • Managing project changes • Project communication • Project quality • Project risks • Project procurement • Project team management

The summary from Larson and Gray (2018) in the table above contains fewer stages that should be considered during project planning. Considering the typical nature of ECs and the limited resources available to them, it was considered that the stages recommended by Larson and Gray (2018), which include scheduling, project budgeting, resource estimation, risk management and staffing, were appropriate for this study and, therefore, they were adopted as illustrated in Figure 3.5. and are discussed in the following sections.

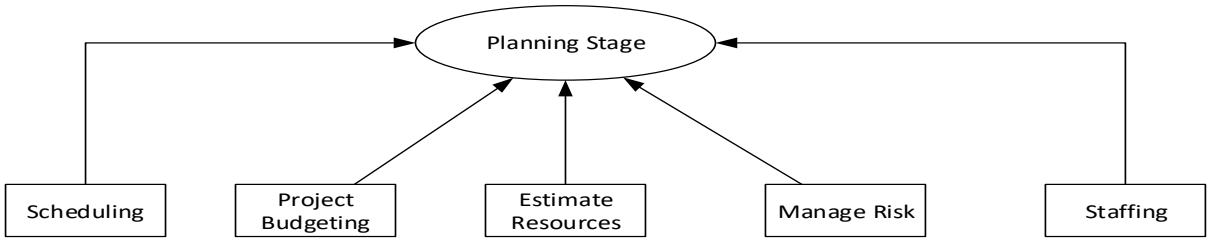

Figure 3.5: Stages in the project planning phase (Larson and Gray, 2018)

- **Develop project schedule (scheduling)**

  Developing a project schedule makes it possible to link project activities logically with planned dates, durations, milestones, and resources (PMI, 2013; Gido, Clements and Harinarain, 2018; Cobb, 2015). Thus, through scheduling, individual activities and the relationships that exist between them can be established for work to be performed in a sequential manner leading to the achievement of the project objectives (Gido, Clements and Harinarain, 2018;

Horine, 2009). Besides, it is impossible to undertake a project without an appropriate schedule, since it will be difficult to know the links and the relationships between the project activities and the resources that are required to undertake the work on those activities. According to Mubarak (2015), scheduling is useful in managing and controlling a project to a successful outcome if the process is prepared and used consistently and intelligently throughout the project life-cycle. However, it is important to note that scheduling is only possible after a WBS has been used to disaggregate the project into manageable units (Larson and Gray, 2018). Given the usefulness of project scheduling and the limited resources available to ECs, it is argued that scheduling could play a key part in how they undertake projects to achieve a successful outcome. This is because effective scheduling can lead to efficient application and use of scarce resources when undertaking projects for a successful outcome.

- **Determine project budget (project budgeting)**

  All projects come with a budget which is an approve estimate for the overall project in terms of cost all WBS components (PMI, 2013; Pinto, 2016). While the overall budget could indicate the cost of the project, it is important the project budget is coordinated with the project activities define in the WBS in order to achieve a desirable budget (2016). Project budgeting can take the form of top-down, bottom-up or activity-based budgeting (Larson and Gray, 2018; Pinto, 2016). This study argues for the use of activity-based budgeting which is an approach that first assign cost to activity then to the project based on each project's use of resources (Pinto, 2016). The choice of this approach is to ensure that ECs derive value for the project they undertake based on the overall budget and the profit that they accrued at the end of the project which is critical to their financial survival. Given, that with this budgeting approach, it because easier to also determine the sufficiency of the funds allocated to the project. Pinto (2016) opine that activity base budgeting should include four steps that could ensure an efficient budgeting project as.

  1. Identify the activities that consume resources and assign costs to them.

2. Identify the cost drivers (project personnel and materials) associated with the activity.
3. Compute a cost rate per cost driver unit or transaction.
4. Assign costs to the project by multiplying the cost driver rate by the volume of cost driver unit consumed by the project.

- **Resources (estimating project resources)**

  Projects are accomplished by applying the appropriate resources in the right amount at the right time. Such resources include the people, materials, and equipment that are required to perform the work (Gido, Clements and Harinarain, 2018). Estimating the resources required for activities provides ECs with the input in terms of what resources are needed, in what quantity to complete activities. Estimating resource requirements must take into consideration the availability of the type of resource, whether internal or external, and the quantity available over the duration of the project (Gido, Clements, and Harinarain, 2018; Larson and Gray, 2018). Determining the quantity as well as the availability of the resource required over the duration of the project provides key information for budgeting as well as scheduling work so that project work is not delayed. Furthermore, this information also provides a foundation for risk management so that contingency plans can be made to address resource constraints during the performance of project work. Thus, completing this stage enables ECs to be aware of the resource needs, the quantity, the quality, and the availability of such resources before they even commerce with work. By so doing, ECs will be able to make provision for the appropriate and relevant resources that are required to enable them to undertake and deliver the project successfully to build the success of their businesses, which is linked to their sustainability.

- **Risks (managing project risks)**

  Project risk management is the process of identifying possible risks, assessing their potential consequences, and developing and implementing plans to minimise any negative effects of the risks (Portny, 2017). Project risks are uncertain events that could have either positive or negative effects on project

outcomes when they happen (PMI, 2013). While project risk management cannot eliminate risk, it offers an avenue for managing risk to achieve a successful project outcome (Portny, 2017). Thus, managing project risk is a critical aspect of any project endeavour and should be used at all levels by individuals who are involved in a project. Besides, it is reported that many construction projects are affected negatively because of inadequate or lack of project risk management (Gido, Clements, and Harinarain, 2018). The indication is that, since EC businesses are in the construction industry, it is necessary for ECs to adopt project risk management as a key aspect of their project management process to ensure successful project outcomes.

- **Staffing (assign responsibility)**

  Staffing on a project, or assignment responsibility, is a key component of the project management process. This is because it provides the project manager and the project team with information regarding the role played by every individual involved in the project in determining the successful completion of project activities at each stage of the project (Brown and Hyer, 2010). This process also provides a window for accountability and responsibility during the project execution period, since individuals are fully aware of their roles in achieving the successful completion of the project. However, this is not possible if activities are not identified and the right resources, such as personnel, are not identified and recruited for the project. Thus, ECs must use this stage, in association with the responsibility assignment matrix, to make sure that individuals who are recruited to work on the project are assigned appropriately to enable efficient performance of work leading to the successful delivery of the project.

3.5.1.3. Project execution phase

During the execution phase, the actual work is performed after the project plan has been developed. During this phase the project team performs the project work to achieve the overall results according to the established requirements. According to Gido, Clements, and Harinarain (2018), this phase results in the achievement of the

project objective by accomplishing the full scope of the project, leaving the customer and all other stakeholders satisfied. Fox and Van der Waldt (2015) noted that this phase also makes it possible to co-ordinate and guide team members to work and complete the work as outlined in the approved project plan. While acknowledging the number of activities that can lead to the completion of the project execution phase (Gido, Clements, and Harinarain; Larson and Gray, 2018), the four activities noted by Larson and Gray (2018) as being critical to the execution phase of a project adopted for the purpose of this study, including status report, changes, quality, and forecasts. The selection of the four activities recommended by Larson and Gray (2018) was in line with keeping the components of the PMF simple, while maintaining their usefulness in supporting the project management endeavours of ECs. Figure 3.6 illustrates the relationship between the activities that must be performed to achieve the execution stage of a project.

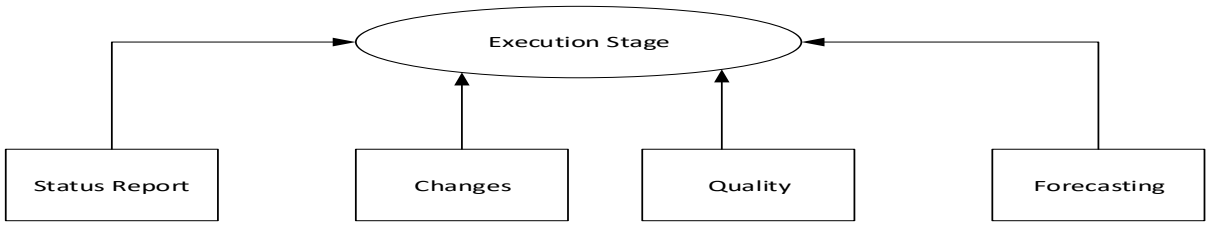

Figure 3.6: Stages of the execution phase (Larson and Gray)

- **Status reporting**

  Status reporting is used to provide an update on where a project currently stands in terms of the metrics that are used to measure the progress of the project (Gudda, 2011). Thus, by status reporting, project team members and all other stakeholders are provided with information on how the project is performing at a particular time, based on when the status report is provided. For ECs this phase can give them the idea of constantly reporting on the progress of a project, based on the metrics that are agreed for measuring the progress of the project. Status reporting is a critical part of the project execution and should be considered by ECs because it can help to eliminate misinformation and miscommunication regarding the progress of the project among all the stakeholders, which can be detrimental to delivering a successful project (Pinto, 2016).

- **Changes**

  Changes are inevitable and can destabilise a project no matter how effective and efficient the project planning. According to Larson and Gray (2018), it is impossible that every detail of a project plan will occur as expected. Thus, it is necessary to plan to deal with changes during project execution. This is because, without the necessary plan to deal with changes in the project, the success of the project could be compromised in the long run. The implication for ECs is that they should be aware of possible changes that could occur during project execution. These changes can then be included in the process of managing change, which forms part of the project control cycle when undertaking projects. Overall, ECs should be aware that, no matter how detailed and complete their project plans are, they must always be prepared for changes.

- **Quality concerns**

  Quality determines the degree to which a project fulfils the requirements that are acceptable to the customer or the client (PMI, 2013). In essence, quality is the key aspect of the project that must be satisfied to consider the project to be a success. Normally, this quality requirement is indicated in the contracts and must be satisfied at the end for the project to be deemed successful. Thus, during the project execution phase, where all work related to the achievement of the project objectives is undertaken (Larson and Gray, 2018), it is important that the project team is constantly aware of what quality requirements must be satisfied for the project to be considered complete and successful. The inclusion of this stage in the execution phase is to remind ECs to evaluate the quality requirements of the project constantly as work progresses so they are not caught unaware of what quality dimensions they must satisfy for the project. Normally, these dimensions are measured in terms of cost, time, and scope as well as consideration for the environment and all other stakeholders of the project.

- **Forecasting**

  Forecasting is an estimate or prediction of conditions and events in a project's future, based on information and knowledge about the project available at the

time of the forecast (PMI, 2013; Gudda, 2011). This means that a forecast is a prediction made about what to expect from a project, based on the performance of the project at the time of the forecast. The forecasting information is critical to how the project results are achieved in the end. The information is also relevant to all project stakeholders, since it will give them an idea of what to expect from the project in the future, based on the past performances of the same project. In addition, a forecast can reveal whether it will be possible to meet the requirements of the project in the future, as contained in the contract. The goal of including this stage in the project execution phase is for ECs to know that, for project execution to be completed, it is necessary to provide the stakeholders constantly with a future prediction of how the project will perform.

3.5.1.4. The project closing phase

This is the phase in which all work is completed, and the customer has accepted the project deliverables. In cases where a contractor is used to undertake the project, this is the stage where the customer verifies that all agreed project requirements have been delivered according to the stated objectives (Gido, Clements, and Harinarain, 2018). Fox and Van der Waldt (2015) argued that this stage also involves times for celebration as well as reflection on how the project unfolded, how the team has worked and kept its focus on the final stages of the project even though they might be anticipating new projects. In addition, the closing stage provides the client or customer with an opportunity to make final inputs that could lead to project modification to enable satisfactory delivery of the final project to the customer (Brown and Hyer, 2010).

However, Larson and Gray (2018) suggested that project closure activities should cover all types of project closures. Larson and Gray (2018) mentioned that project closure activities can be undertaken to include normal, premature, perpetual, failed and changed-priority projects. While there was consensus in the literature on the number of activities that are required to complete this phase in the project life-cycle (Gido, Clements, and Harinarain, 2018; Larson and Gray, 2018; Kendrick, 2015; Brown and Hyer, 2010), five activities noted by Larson and Gray (2018) that should be considered during the closing phase of a project were adopted for the purpose of this

study to ensure simplicity and ease of use among ECs. Figure 3.7 shows the activities that include: train the customer, transfer documents, release resources, evaluations and lessons learned. These activities are explored in the next sub-sections.

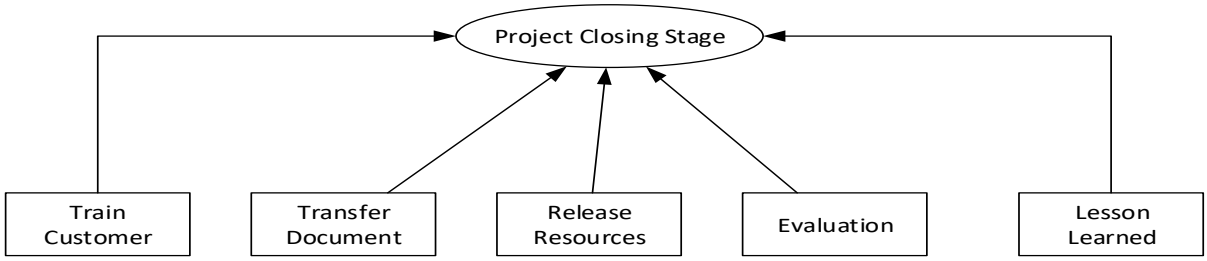

Figure 3.7: Stages in the project closure phase (Larson and Gray, 2018)

- **Train the customer**

  When projects are delivered to the customer during the closing stage, it is important that the customer is trained on how the project product works (Larson and Gray, 2018; Pinto, 2016). This can be an important part of the closing stage because it gives the project team and project manager the chance to demonstrate how the project will work to avoid difficulties in using the product when it has been handed over. Whilst this might seem to be an easy approach, it is a critical component of the quality of the project and how successful it will be deemed to be by the customer. Thus, in closing a project, ECs should make time to teach the end-users and the customers how the project will function and they key indicators of the correct performance of the project product. This also could alleviate some of the difficulties with the use of the project product, which could be linked to unsuccessful project delivery by ECs.

- **Transfer of documents**

  Another key part of delivering a project is to transfer the relevant documents of the project product to the intended user (Larson and Gray, 2018). Pinto (2016) argued that, to complete the delivery of a completed project to the intended user, it is paramount that all documents related to the project product are also handed over to the user. Pinto (2016) mentioned documents such as technical designs and features, all drawings, and engineering specifications must be made available to the user. It is agreed that such documents should be released

to the user to ensure the correct usage of the project product. Therefore, ECs should consider this stage when they close their projects since many of the complaints about their project product could be avoided if users have all the relevant documents that contain details of how to use the project product efficiently and effectively.

- **Release resources**

  When closing a project, it is important that all resources used are redeployed to other projects or are returned to their owners in the case of equipment and materials that are rented (Larson and Gray, 2018). Thus, this stage reminds the project manager and the team about the responsibility to make sure that the resources are released appropriately so that they might be easy to access and use for a future project. While releasing equipment and other material resources might be easy, project managers could face problems with regards to human resources. Lewis (2011) argued that a project manager might face project team apprehension during this stage, as most team members might not have new jobs when released. This makes the process critical and should be handled with care to ensure that relationships are not destroyed, which can affect future engagement on projects.

- **Post-project evaluation**

  Post-project evaluation is an important project stage that should be done for all projects during the closing stage (Sokowski, 2015). This activity affords the project team and stakeholders an opportunity to review and evaluate the performance of the project to identify what can be done to improve future project performances (Gido, Clements, and Harinarain, 2018). This is critical for organisations in which projects are their core business, since this stage can afford them the opportunity to improve their future project activities. Although, it has often been argued that each project is unique, it has also been suggested that lessons from previous projects can be useful in future project endeavours (Larson and Gray, 2018). Thus, project-based businesses, such as ECs, should make every effort to ensure this stage is part of their project closure phase.

- **Lesson learned**

  Lessons learned enable the project manager and the team to capitalise on the knowledge and the experienced gained during a project to improve their performance on future projects (Brown and Hyer, 2010). One way for ECs to improve their project management activities is to gain knowledge and experience in project management activities. Through the identification and documentation of lessons learned, they can have access to a pool of knowledge and experience to use in improving on their project delivery activities. The lessons learned should not be just for the moment but should be stored and used as a guide for future project management endeavours. Larson and Gray (2018), and Brown and Hyer (2010) advised that relevant project documentation and copies of lessons learned should be kept for future reference to promote improvement in project performance. This is relevant to ECs who are often reported to struggle with the project management process in their business undertakings in the construction industry.

3.5.2. Project Control Cycle

The project control cycle entails a repeated approach to how project control is undertaken by an organisation to achieve a successful project outcome (Pierce, 2013). The project control cycle provides a framework that can be followed to make use of the project control process effectively during the performance of a project. Naybour (2010) suggested that the project control cycle is a navigation system for how each stage of the project life-cycle is planned and managed. This means that the project control cycle serves as a tool to ensure that the project is performed as planned. In addition, the project control cycle enables the project team to perform processes that help to identify deviations of the actual project performance from the project plan, thereby making it possible for corrective actions to be taken. McConnell (2010) believed that the project control cycle makes it possible for the project team to control the project through a series of steps and processes to achieve the project objectives successfully. Therefore, the main purpose of the project control cycle is to support the management of work during each stage of the project cycle in alignment with the project objectives and to help to prepare for each subsequent stage of the project.

While most authors seemed to agree on the purpose of the project control cycle, they had divergent views on the activities that should be performed during the project control cycle (Larson and Gray, 2018; Naybour, 2010; Gido and Clements, 2015; McConnell, 2010). For example, Naybour (2010) advocated the use of a project control cycle based on the plan-do-check and act (PDCA) process, while McConnell (2010) proposed a five-step approach to applying the project control cycle, including: hold meetings, perform quality control, track work progress, respond to changes, and manage issues. Larson and Gray (2018) recommended a four-step approach to the project control cycle, which includes: setting a baseline plan, measuring progress and performance, comparing actual against plans, and taking actions. Although, the suggestions from Naybour (2010), Larson and Gray (2018), and McConnell (2010) all have different activities, a critical review shows that the activities are similar in terms of project control. Given the need to ensure a simple yet effective PMF that would suit resources available to ECs, the activities recommended by McConnell (2010) for project control were adopted for the project control cycle of the proposed PMF. Figure 3.8 shows the activities suggested by McConnell (2010) for project control, being: quality control, tracking work progress, holding meetings, responding to changes in the project and managing issues. These activities are discussed in the following sub-sections.

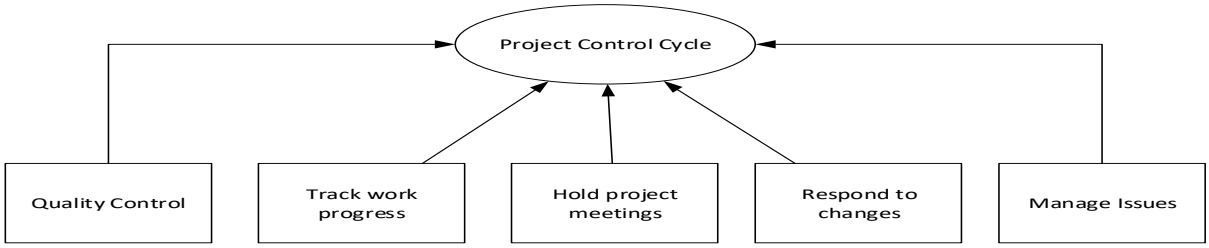

Figure 3.8: Phases of the project control cycle (McConnell, 2010)

- **Quality control**

  Quality control is a tactical process of making sure that the output of a project product meets the specifications stipulated in the contract (Richardson, 2015).

This means that quality control is a procedure that is used to ensure that a project is delivered to meet the quality specifications which are critical to the success of the project. Furthermore, quality control provides a platform on which to recommend necessary changes that can lead to a successful project outcome (PMI, 2013). This is because quality is considered to be the extent to which a project conforms to specifications and meets customer requirements (Lewis, 2011). Thus, quality plays a key role in determining what constitutes a successful project. Since it has often been reported that ECs' projects do not conform to quality specifications, their projects are declared to be unsuccessful. The PMI (2013) maintains that quality control is of benefit to a project because it can be used to identify the causes of poor project quality and recommend ways to eliminate them as well validate that the final deliverable meets the requirements and will be accepted by the stakeholders. The intended benefits for ECs are that, by including quality control in their project management process together with a quality control plan, arguably, it is possible for them to deliver projects that meet quality specifications and will be accepted by the stakeholders.

- **Track work progress**

  Tracking the progress of work makes it possible for a project team to measure work performance against the project plan. The idea is for the project team to be able to compare the planned activities with how work on them has progressed in relation to the objectives of the project. Tracking work progress is considered to be a key element of project success (Richardson, 2015). This is because, without knowing how the project is progressing against what was planned, might make it difficult to know whether the objectives of the project will be achieved. Besides revealing how the project is progressing, tracking work helps the project team to take corrective actions as well as preventive measures during the project (Philips, 2017). Larson and Gray (2018) suggested that the best approach to tracking work progress is to monitor individual activities during project execution. Given this background, tracking work progress can be deemed to be critical to the project control cycle.

- **Hold project meetings**

  Holding project meetings is a critical component of the project management process. It is during meetings that individuals and stakeholders can communicate realistically on issues regarding the project being undertaken. In addition, meetings help to build trust and relationships during a project (Portny, 2017). The PMI (2017) argued that management basically depends on meetings to achieve successful project outcomes since meetings are required at every stage of the project management process. Project meetings can be face to face, virtual, formal, or informal depending on the project type and the project environment (PMI, 2017). In addition, project meetings should include all stakeholders of the project, where appropriate, because the goal is to deliver a successful project that meets the requirements of all who are affected by the project (PMI, 2017). The PMI (2017) suggested that, to avoid the issues of boring meetings, such project meetings should be planned well in advance and all stakeholders should be informed about their purpose. The importance of including project meetings in the project control cycle cannot be over-stated. The idea is that, with regular meetings, ECs will be able to communicate easily on the progress of the project and to provide all other relevant information that is necessary to achieve the project goals successfully.

- **Respond to changes**

  Changes in a project could originated from the customer, owner, project manager, team members, or the occurrence of risk events (Larson and Gray, 2018). In addition, changes could occur as a result of changes in the scope of a project, implementation of contingency plans when risk events occur, and changes suggested to improve the performance of the project (Larson and Gray, 2018). Given the sources of possible changes that could occur during projects, this explains why it is impossible that changes will not occur when projects are undertake. The key, therefore, is to plan how to respond to changes when they do occur during the project since that is the only way to undertake the project successfully. In addition, responding to changes in projects should still be focused on the schedule, budget, risk, and quality, as these are the critical factors that can affect a project outcome (Richardson, 2015). Heldman

(2018) suggested that an approach to responding to change should be planned formally into the project at the planning stage and documented so that project stakeholders are aware of how to deal with such changes. With a formal process in place, it becomes less disruptive to the overall project management process. Thus, for ECs also, it is necessary to have a formal structure in place that helps them to deal with changes in their project activities. An approach to managing changes that would suit the needs and resources of ECs was adopted for this study, as shown in Figure 3.9.

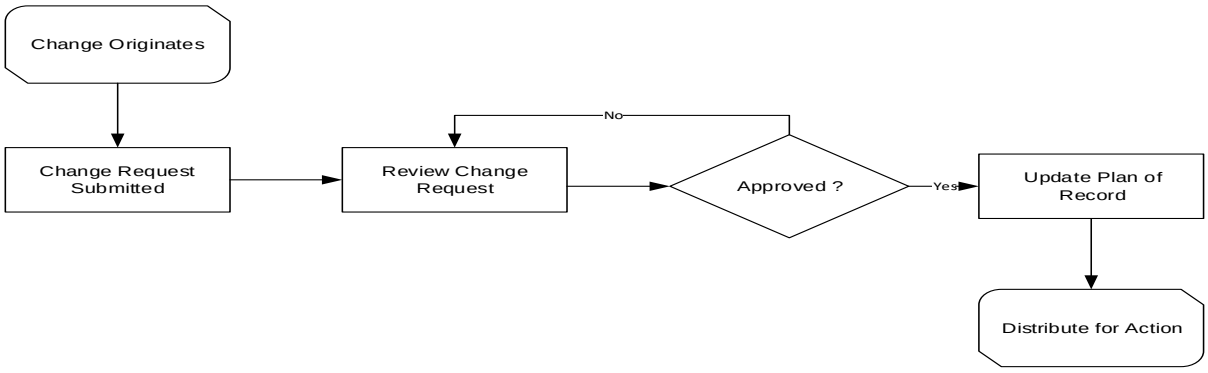

Figure 3.9: Process for managing changes (Larson and Gray, 2018)

- **Manage issues**

  The PMI (2013) defines an issue as a point or matter in question, or dispute, that has not been settled and is under discussion, or over which there are opposing views. Thus, issues generally represent unplanned, supporting events that need to be resolved during a project to ensure the smooth undertaking of the project (Richardson, 2015). It is impossible to predict issues and when they will arise during a project since project activities are undertaken in uncertain environments and depend on several stakeholders (Richardson, 2015). Therefore, it is crucial for project team members to plan a way to manage the issues that could occur during the project management process (Pinto, 2016) because failure to do so can be detrimental to the achievement of the overall goals of the project (Lewis, 2011). The key, therefore, is to have a procedure to manage issues when they occur as part of the project management process. An issues management process provides a mechanism for organising, maintaining, and tracking the resolution of issues in a timely

manner so that they do not have a negative impact on the project (Richardson, 2015). Furthermore, an issues management process should include a process of identifying, defining, prioritising, addressing, communicating, documenting, and controlling to ensure that issues that might occur are addressed when undertaking projects (Richardson, 2015). Overall, while issues are not easy to predict, having a process in place that supports how they are managed can go a long way to support the achievement of successful project outcomes, because the issues will not be left unresolved. Thus, it is suggested in this study that ECs have an issues management process that includes: identification, definition, prioritisation, addressing, communication, documentation, and control.

3.5.3. Templates and Tools

A critical component of project management is the use of essential templates and tools. The templates and tools provide a quick way of undertaking project management since they provide an existing framework within which to carry out typical and simple project management activities during project execution. Naybour (2010) advocated the use of simple templates and tools to support the implementation of project management within an organisation and advised that such templates and tools must be relevant to the needs of the organisation to ensure effectiveness in supporting the successful delivery of projects. This advice is most relevant to EC businesses that are small and also face resource constraints. For the purpose of this study, after a critical review of the available templates and tools used in project management, the following templates and tools were adopted: communication plan, project priority matrix, risk management plan, quality journey framework, work breakdown structure, responsibility matrix. These six templates and tools are illustrated in Figure 3.10 and are explored in the following sub-sections.

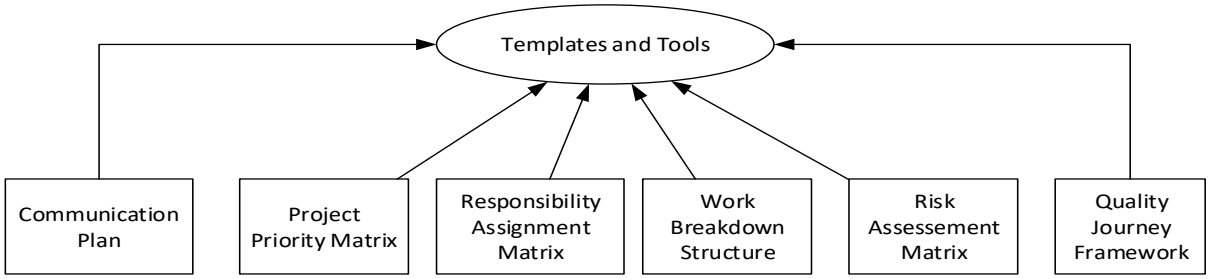

Figure 3.10: Templates and tools of the PMF

3.5.3.1. Communication plan

Gido and Clements (2015) regarded a communication plan as a tool that defines the generation and distribution of project documents among project stakeholders throughout a project. In addition, the communication plan outlines the aspects of what, when, how, who and where for all the communication needs of a project (Gido and Clements, 2015). Not only does a communication plan provide a guideline for effective communication, but also it provides a straightforward way of managing project communication. Given that projects are performed by diverse individuals, efficient and effective communication is critical in achieving success during a project, thus a communication plan is deemed to be necessary to ensure successful communication (Burke, 2013). The details of a proposed, generic communication plan are given in Table 3.5.

Table 3.5: Generic communication plan template (Gido, Clements and Harinarain, 2018; Larson and Gray, 2018)

No	What information	Target audience	When		Method of communication	Provider
1	Issue report	Staff and customer	Weekly		Email and hardcopy	Team recorder
2	Project status	Staff and customer	Weekly		Email and hardcopy	Project manager

3.5.3.2. Project priority matrix

A project priority matrix is a project management template and tool that supports the process of making trade-offs during the project management process (Larson and

Gray, 2018). Managing and leading a project requires trade-offs and the use of a project priority matrix is essential in achieving this goal. This is because the project priority matrix guides the project manager and the team regarding how the triple constraints of time, cost and scope or performance should be considered during the project (Larson and Gray, 2018). For instance, Table 3.6 shows an example of how a project priority matrix could be applied to a project. The indication in the matrix (see Table 3.6) is that this project is time constrained which means the time must be adhered to strictly, the performance of the project should be enhanced to ensure that it delivers what is expected or more and finally, any additional cost will be accepted that is required to make sure the project objectives and requirements are met successfully. Given this indication, the project manager and the team can make the appropriate decisions regarding the project in terms of all the necessary trade-offs.

Table 3.6: Generic project priority matrix (Larson and Gray, 2018)

	Time	**Performance**	**Cost**
Constraint	X		
Enhance		X	
Accept			X

3.5.3.3. Responsibility assignment matrix

The responsibility assignment matrix is a project template and tool that can be used to define and share project team roles and responsibilities upfront to help to improve the performance of work on a project (Portny, 2017). A key aspect of the responsibility assignment matrix is that it can be used to ensure that all project activities are assigned to individuals or teams to ensure accountability as well as responsibility (Pinto, 2016; Richardson, 2015). The responsibility assignment matrix is considered to be a critical template or tool that can support ECs because, with their limited resources, it is necessary for them to make sure that individuals or teams are assigned appropriately during projects to avoid wastage and idleness. Larson and Gray (2018), and Gido and Clements (2015) also argued that. to achieve the desired assignment of responsibility during a project, using a responsibility assignment matrix is important. Table 3.7 shows a generic example of a responsibility assignment matrix that could be useful to meet

the needs of ECs in achieving a desirable assignment of responsibility during their projects.

Table 3.7: Generic responsibility assignment matrix (Larson and Gray, 2018; Gido, Clements and Harinarain, 2018)

	Project team members				
Task	Peter	Paul	Patricia	Patience	Pamela
Dig foundation	Responsible			Support	
Pour concrete		Responsible			Support
Lay bricks			Responsible		
Paint				Responsible	

3.5.3.4. Risk assessment matrix

A risk assessment matrix is a tool for assessing and managing risks that are inherent in a project (Gido and Clements, 2015). Generally, the risk assessment matrix should provide a framework for how risk is evaluated and managed when undertaking a project. The benefit of using risk assessment is that the user has a simple way of how to deal with any risk that might occur during the project. The adoption of a risk assessment matrix is useful because risks are part of projects and having a template or tool with which to address it can save time and resources, which are not readily available to ECs. A generic, risk assessment matrix, with the relevant components to guide its adoption and use, is shown in Table 3.8.

Table 3.8: Generic, risk assessment matrix (Gido and Clements, 2015)

Risk	**Impact**	**Likelihood of Occurrence** **L = Low** **M = Medium** **H = High**	**Degree of Impact** **L = Low** **M = Medium** **H = High**	**Action on Trigger**	**Responsibility**	**Response plan**
1						
2						

3.5.3.5. Quality Journey Framework

A quality journey framework is a seven-step approach to maintaining quality during a project of any size (Rose, 2014). The seven steps of the quality journey framework, as recommended by Rose (2014), include: customer, requirements, specifications, quality assurance activities, quality assurance plan, quality control, and quality improvement (see Figure 3.11). Given that quality is a critical determinant of the success of any project (Tayntor, 2010), it is believed that the use of a quality journey framework can play a tremendous part in ensuring that projects are delivered with the required quality. Thus, for the purpose of this study, the quality journey framework was adopted as a project template and tool to assist ECs to achieve quality during the projects they undertake. Furthermore, a quality journey framework provides the order in which steps should be taken to achieve the desired quality of a project (Rose, 2014). The steps in a quality assurance plan are explored in the following sub-sections.

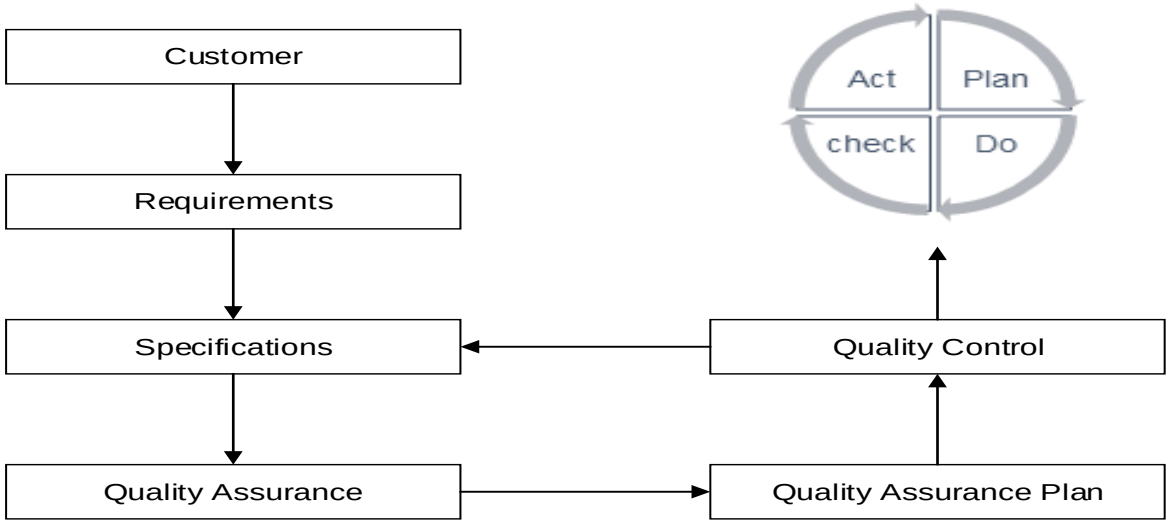

Figure 3.11: Quality Journey framework (Rose, 2014)

- **Identify customers**

  Identification of customers is the start of a quality journey framework to ensure that all the customers are identified and prioritised to avoid wasting time in meeting their quality requirements when undertaking a project (Rose, 2014; Larson and Gray, 2018). It is often argued that the customer requirements, not the product or the processes, are what determines the quality and ultimate

success of a project (Rose, 2014). According to Rose (2014), the customers of a project are often classified as external (paying clients, suppliers and end-users), internal (elements in the supplier-process-customer chain), and hidden (not directly involved but are concerned about the project outcomes). Identifying customers requires the use of explicit steps which include: analysis of the contract, analysis of the project team and the organisation, analysis of the product use, and analysis of the means of production (Rose, 2014). Following these steps should make it easy to identify all the relevant customers, who are then prioritised because not all customers carry the same value in terms of the outcome of the project and all that is expected to deem the project as being successful (Rose, 2014).

- **Identify requirements**

  The second step of the quality journey framework is to identify the requirements of the project, which are often provided by the customers. The contract from the paying customer generally provides the sources of the requirements that determine the success of the project. What must be done to deliver the project as stipulated in the terms and conditions of the contract. Rose (2014) argued that suppliers, sub-contractors, project and organisational elements can also be a source of requirements. Once the requirements have been identified and stated after consideration of the various sources of the requirements, it is vital that the requirements also are prioritised, so that attention, energy, and efforts are not wasted on irrelevant requirements (Rose, 2014). Rose (2014) advised that the identification and prioritisation of customers and requirements should be completed before the project plan is completed so that the project team can have a fair idea of what the project entails.

- **Specifications**

  The third step in the quality journey framework is to make provision for specifications which indicate further details of the requirements. This step is necessary because it ensures that the requirements are detailed in a way that makes them specific and measurable (Rose, 2014). This, in turn, provides a way to measure the progress of the project in specific terms to ensure that the

quality leading to the successful completion of the project is taken into consideration (Rose, 2014).

- **Quality assurance activities**

  The fourth step in the quality journey framework is for the project team to stipulate how the quality requirements of the project will be audited to ensure that the quality standards are followed and delivered (PMI, 2013; Kloppenborg, 2015). Rose (2014) proposed five steps which, it is believed, will be useful to include when selecting the relevant standards or specifications, being: operational definition, definition and provision of resources, assignment of responsibilities, and preparing a quality assurance plan. Undertaking these steps should help to improve the quality processes during project execution, thereby leading to a successful project outcome that will meet the requirements of the customers (PMI, 2013).

- **Quality assurance plan**

  The fifth step in the quality journey framework is to convert the quality assurance activities into a plan to ensure an easy way of dealing with quality assurance during a project (Rose, 2014). This is because, in cases where an organisation is dealing with many project tasks, it becomes difficult to track all activities, thus the quality assurance plan can provide an easy approach to managing quality assurance during such projects. Rose (2014) recommended six elements for a quality assurance plan, which were adopted for this study, including:

  - Work breakdown structure reference to the activity of concern.
  - Statement of requirements from the customer.
  - Statement of the specifications that are specific and measurable.
  - Description of the assurance activity.
  - Schedule of information.
  - Assignment of responsibility.

- **Quality control**

The sixth step in the quality journey framework is quality control whereby the project team monitors and records results from the quality execution process to assess performance and recommend necessary changes (PMI, 2013). This process enables the team to identify any causes of poor work on the project and take action to eliminate them. According to Rose (2014), the quality control process provides the project team with relevant information regarding the quality dimensions of the project to ascertain whether everything is going according to plan or whether there are corrective actions needed, and to provide feedback on the quality assurance process.

- **Quality improvement**

  The final step in the quality journey framework is quality improvement. Quality improvement is considered to be a deliberate process of design to use objective measurements and data to recommend an improvement to the project (Rose, 2014). Ordinarily, it is a data-oriented approach that is used to strive continually to offer incremental improvements to the project objectives to satisfy the customers' requirements. Rose (2014) recommended the use of a plan-do-check-act (PDCA) approach to achieve quality improvement during a project. Thus, it is recommended that ECs use the PDCA approach to improve the quality of their projects.

3.5.3.6. Work breakdown structure

The PMI (2013) defines a WBS as a process of sub-dividing project deliverables and project work into smaller, and more manageable, components. Burke (2013) argued that using a WBS as a tool in the project management process is critical to achieving a successful project outcome because it ensures that a project includes all the work required to achieve the project objectives. The efficient and effective use of a WBS during the project management process depends on the understanding of the characteristics and features (Burke, 2013). A WBS was adopted as a template for this study given its advantage of helping to sub-divide work, which is critical to delivering a successful project. In addition, when used appropriately it can save time and resources (Kloppenborg, 2015; Burke, 2013). Kloppenborg (2015) advised that

individuals who are familiar with the project activities be tasked with developing the WBS. A generic guide to developing a WBS for a project is shown in Figure 3.12, based on the sequential, top-down approach suggested by Larson and Gray (2018), Kloppenborg (2015) and Gido, Clements and Harinarain (2018).

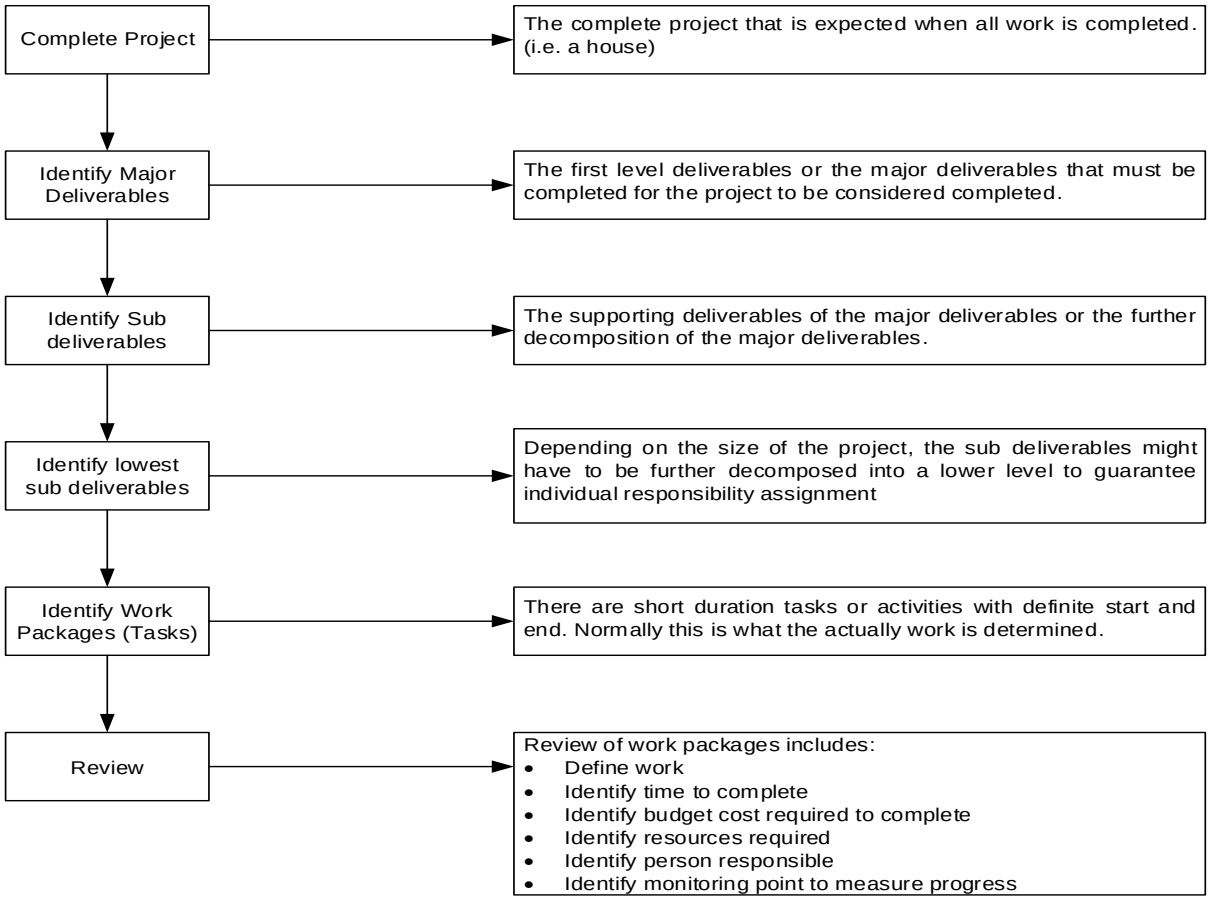

Figure 3.12: A guide to developing a WBS (Larson and Gray, 2018; Gido, Clements and Harinarain, 2018)

3.6. PROJECT MANAGEMENT FRAMEWORK FOR EMERGING CONTRACTORS

Figure 3.13 illustrates all the components of the proposed PMF to support the sustainability of ECs in their project-related business activities in the construction industry. The PMF includes a detailed breakdown of all the essential components which, when adopted by ECs and applied appropriately to their projects, should

support their sustainability. The components were discussed previously above and Figure 3.13 shows the relationship between the individual elements and how using the PMF could lead to the attainment of sustainability by ECs.

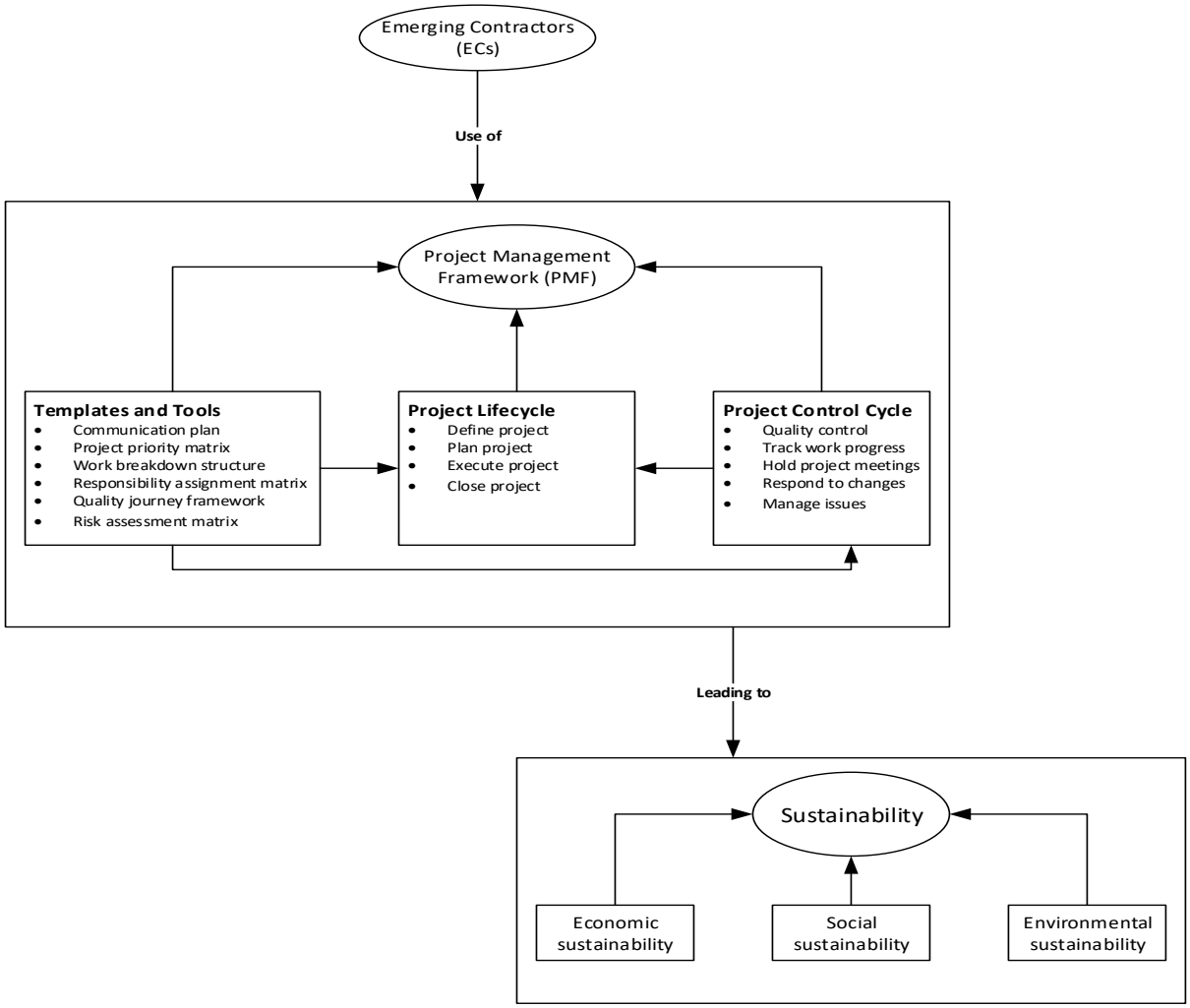

Figure 3.13: Proposed PMF to support the sustainability of ECs (Researcher's own construction, 2020)

3.7. PROJECT MANAGEMENT FRAMEWORK AND DELIVERY

A critical literature search showed that many organisations are developing and adopting a PMF to provide a standardised way of managing project activities by using the current project management methodologies (Larson and Gray, 2018; Brown and Hyer, 2010). These developments are reported to be a result of organisations striving

to have consistent and organised ways of managing their project undertakings to achieve consistent success in project delivery.

The aim of this study was to develop a PMF that would support the sustainability of ECs in the Free State Province of South Africa. It was envisaged that the PMF would provide an easier and simplified approach for ECs to undertake project management activities in the construction industry, taking cognisance of the typical resource constraints faced by ECs. The proposed PMF was based on current project management methodologies, applied in managing projects, which are a solid foundation for project management (PMI, 2013). Thus, the PMF includes components that are currently being used in project management, including: project life-cycle, project control cycle, tools, and templates. The goal is that the PMF should become the fundamental tool for project management by ECs in their project and business activities in the construction industry. Currently, many organisations are moving towards the development and adoption of a PMF to achieve successful project outcomes in their business processes. For instance, in a drive to achieve project success, the State of California's Department of Technology has created a PMF which serves as a guide to all departments and organisations involved in the project endeavour. Many practitioners have indicated that using the PMF is of benefit to their project management endeavours (California Department of Technology, 2019). In addition, the State of Queensland Department of Transport and Main Roads (2010) uses a PMF to guide and direct project management activities within the department by using a PMF to specify the roles and responsibilities of key players in the project delivery process.

3.8. BENEFITS OF A PROJECT MANAGEMENT FRAMEWORK

The proposed PMF should provide ECs with an appropriate guide on how to manage their projects successfully to achieve business success and sustainability. Considering the nature of ECs and their problem of resource constraints, the framework can provide a simple and straightforward approach to managing their typical project activities. Organisations that use a PMF consider it to be a tool that provides a guide, foundation, and direction for project management in various ways. For example, the

State of Queensland Department of Transport and Main Roads (2010) mentioned that the PMF provides the following benefits:

- Communication between and with project stakeholders.
- Planning the total project life-cycle before committing resources.
- Understanding the bigger picture and the project's part in it.
- Developing solutions that maximise stakeholder satisfaction.
- Identification and management of opportunities and risks.
- Improved reliability in estimating costs and benefits.

The nature of the general complaints regarding the project performance of ECs means that a PMF could be of benefit to them, as they will be in a position to derive some of the benefits which are critical to the delivery of successful projects, thereby achieving business success, which is a key determinant of sustainability.

3.9. CHAPTER SUMMARY

In this chapter, a case was made for a PMF that would support the sustainability of ECs in the FS Province of South Africa. In addition, the essential components of the proposed PMF were discussed thoroughly to provide adequate information about how their use can support the sustainability of ECs. In summary, it was shown that a PMF that could support the needs of ECs should include: a project life-cycle, project control cycle, tools, and templates.

4. CHAPTER FOUR: RESEARCH METHODOLOGY

4.1. INTRODUCTION

The methodology applied to this study is explained in this chapter. While acknowledging the availability of several research paradigms that guide the conduct of research, pragmatism, which is associated with mixed methods, was employed for this study (Creswell and Plano Clark, 2018). Pragmatism is centred on using a range of methods that best suits the purpose of the research (Hesse-Biber and Johnson, 2015). Pragmatism enabled the researcher to use the strength of both quantitative and qualitative research approaches. The underlying research philosophy, approach, design, method, target population, data collection procedure and data analysis techniques are addressed in this chapter. Matters relating to validity and reliability, as well as ethical issues relating to the research, are also considered. The procedure which was followed to realise the research objectives is documented in the chapter.

4.2. ELEMENTS OF THE RESEARCH PROCESS

The research process of this study can be explained by identifying the different research steps and goals involved, as presented in Figure 4.1. The research process includes an outline of the techniques and procedures used to generate the primary data for this study.

- Step 1

  The research background of the study was formulated. This included the direction of the study, and a detailed review of relevant literature on ECs, sustainability and PMF. In addition, the aim, the objectives, and the research questions of the study were compiled.

- Step 2

The research approach adopted for the study was explained, followed by the research design, the research methodology, and the strategy used for data collection.

- Step 3

This step was focused on the data collection procedures. The questionnaires were administered in person, followed by semi-structured interviews with a selected number of respondents. Statistical and textual data analysis were also performed.

- Step 4

The conceptual framework for the study was developed and validated through a closed-ended questionnaire administered to experts as well as selected ECs who were part of the study.

- Step 5

The findings, conclusions, and recommendations of the study were reported.

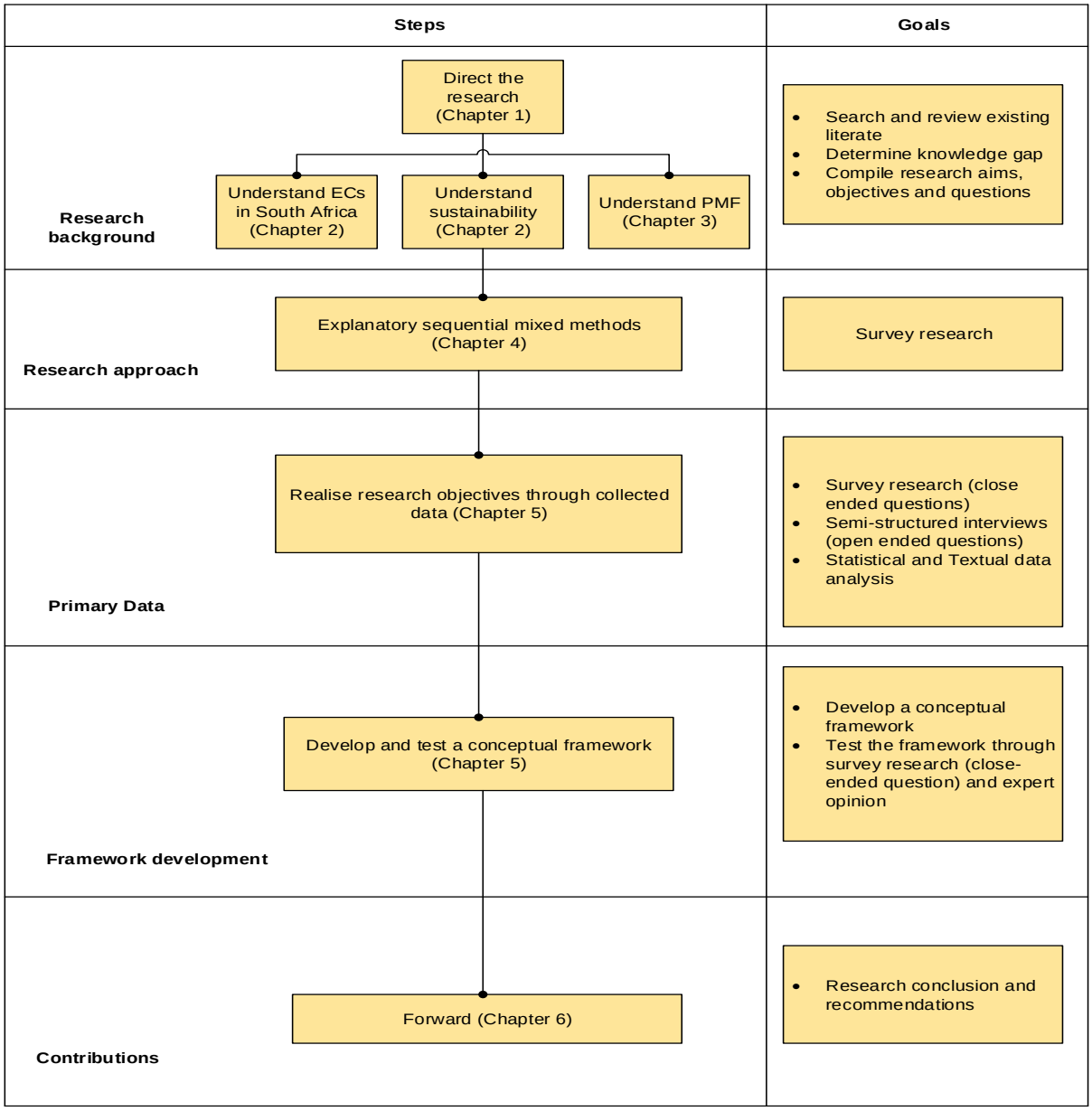

Figure 4.1: Elements of the research process for this study

4.3. RESEARCH PHILOSOPHY

Research philosophy relates to the development of knowledge and the nature of knowledge (Saunders, Lewis, and Thornhill, 2019). This means that the development of knowledge, whether at the grand or at the modest level, requires a paradigm to show how this knowledge is developed (Saunders, Lewis and Thornhill, 2019). Accordingly, achieving the aim of this study required the adoption of a philosophy to create knowledge. According to Creswell and Creswell (2018), a paradigm is chosen

based on the discipline orientation, research communities, advisers, mentors and past experiences. The chosen philosophy determines the assumptions that will underpin the research strategy and the methods that are chosen as part of the strategy. Selecting the paradigm for this study was based on the primary question to be answered.

The paradigm chosen for this study was pragmatism, according to which it is assumed that concepts are only relevant when they support actions (Saunders, Lewis, and Thornhill, 2019). Pragmatism implies that a study is concerned not only with theory but also with the practical aspect of the research objectives (Creswell and Creswell, 2018). Thus, a pragmatic worldview was appropriate for this study because the aim was to develop a model that could support the sustainability of ECs in the Free State Province of South Africa. This meant that any adopted philosophy should provide both theoretical and practical dimensions to the study (Saunders, Lewis, and Thornhill, 2019), which was the assumption that supported the main objective of the study.

4.4. RESEARCH APPROACH

A research approach contains an outline of the plans and procedures that are used by researchers to determine the methods of data collection, analysis, and interpretation (Creswell and Creswell, 2018). Quantitative and qualitative research approaches are considered to be the two common approaches used to conduct research studies. Creswell and Creswell (2018) argued that research studies can be conducted according to three approaches, namely: quantitative, qualitative, and mixed methods. The distinction between the three types of approaches is presented in Table 4.1.

Table 4.1: Distinction between the three main research approaches (Creswell, 2013:18)

Choices	Approaches		
	Qualitative	Quantitative	Mixed Methods
Philosophy	Constructivist. Transformative.	Post-positivist.	Pragmatist.
Strategies	Phenomenology. Grounded theory. Ethnography. Case study narrative.	Survey. Experiments.	Sequential. Convergent. Transformative.
Methods	Open-ended questions. Emerging approaches. Text or image.	Closed-ended questions. Pre-determined approaches. Numeric data.	Both open and close-ended questions. Both emerging and pre-determined approaches. Both qualitative and quantitative data and analysis.
Researcher practices	Positions him or herself. Collects participants' meanings. Focuses on a single concept or phenomenon. Brings personal values into the study. Studies the context or setting of participants. Validates the accuracy of findings. Makes interpretation of data. Creates an agenda for change or reform. Collaborates with the participants. Employs text analysis procedures.	Tests or verifies theories or explanations. Identifies variables to study. Relates variables in questions or hypothesis. Uses standards of validity or reliability. Observes and measures information numerically. Uses unbiased approaches. Employs statistical procedures.	Collect both qualitative and quantitative data. Develops a rationale for mixing. Integrates the data at different stages of enquiry. Presents visual pictures of the procedures of the study. Employs the practices of both qualitative and quantitative research.

Given the distinction between the various approaches to research, as shown in Table 4.1, and the aim of the study being consistent with the pragmatist paradigm, a mixed methods approach was employed for this study. A mixed methods approach allows the use of quantitative and qualitative research strategies in conducting the study. This involves data collection, analysis, and interpretation (Creswell and Creswell, 2018). The mixed-methods approach was deemed to be ideal for this research study given that the emphasis was on both the theoretical and practical dimensions (Saunders, Lewis, and Thornhill, 2019). Thus, this approach helped to achieve the main research

objective of the study which was to develop a framework that would support the sustainability of ECs. Furthermore, the approach helped to test the practicality of the PMF as an appropriate tool for use by ECs in the FS Province.

4.5. RESEARCH DESIGN

Research design is an essential step in a research study that gives direction to how the research study is conducted to realise the objectives (Vinayak Bairagi and Munot, 2019). According to Creswell and Creswell (2018), there are three core designs associated with a mixed-methods approach. The three core designs include: convergent, explanatory sequential, and exploratory sequential. The explanatory sequential, mixed-methods, research design was employed for this study. This research design involves the collection and analysis of quantitative data followed by the collection and analysis of qualitative data to help to explain the results of the quantitative data (Creswell and Creswell, 2018). Explanatory sequential research is considered to be ideal if the researcher intends to seek further clarity on a research problem after the collection and analysis of quantitative data (Edmonds and Kennedy, 2017). An explanatory sequential research design was considered to be appropriate for this study because the statistical data that underpin the PMF required additional explanations. Besides, it was found that previous studies regarding ECs such as Dzansi (2019), Ramorena (2016) and Akaba (2016) all used mono methods, thus this study could fill the methodological gap through the use of the explanatory sequential mixed method. Figure 4.2 shows the typical phases of explanatory sequential research design, as adopted for this study.

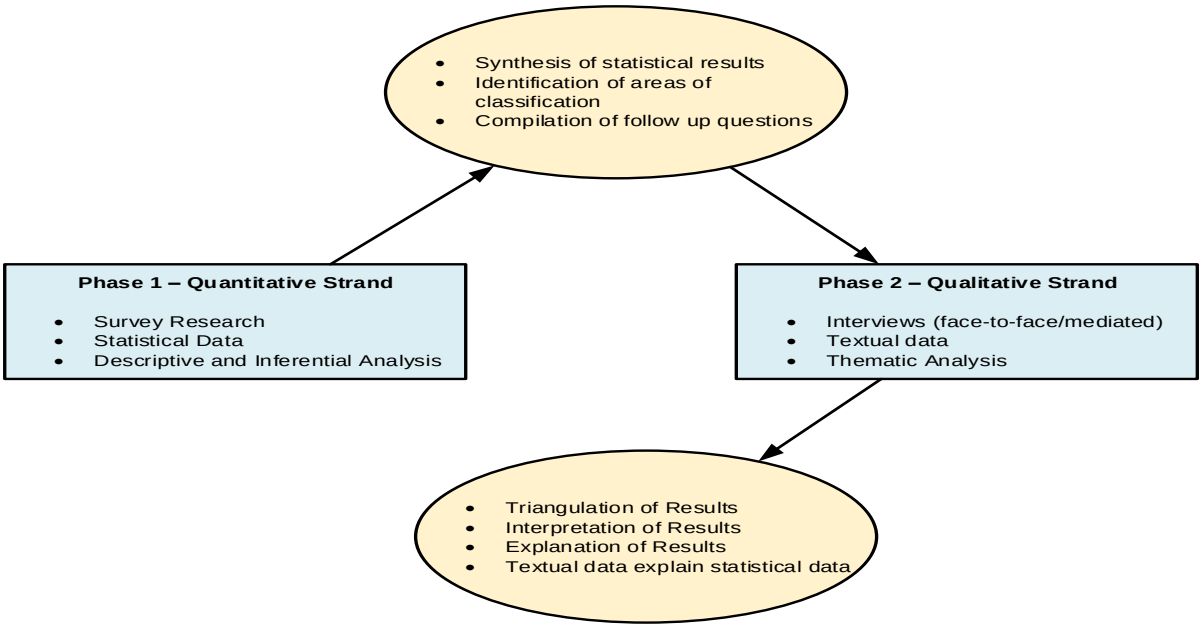

Figure 4.2: Phases of the explanatory sequential mixed-methods research design (Creswell and Creswell, 2018)

Through this approach, the researcher can use qualitative data to explain the quantitative results of the study. In addition, the elements selected for the collection of qualitative data are based on the findings from the quantitative data (Creswell and Creswell, 2018). Thus, the major advantage of the explanatory sequential mixed-methods approach is that, during the qualitative phase, the respondents can elaborate on their answers from the quantitative phase (Leedy and Ormrod, 2016). In addition, the qualitative data can be used to enhance and enrich the findings and help to generate new knowledge (Creswell and Plano Clark, 2018). Furthermore, the sequential explanatory, mixed-methods approach is easy to implement because the research can be focused on, as the collection of one data-set is built upon the other (Almalki, 2016). However, the method is also challenging in terms of the availability and selection of participants who can provide the information needed (Almalki, 2016). Given the benefits and challenges of the explanatory sequential, mixed-methods approach and the purpose and nature of the study, which was academic, it was deemed that the explanatory sequential, mixed-methods approach was the most appropriate for this study.

4.6. INTEGRATION OF THE RESEARCH OBJECTIVES

The aim of this study was to develop a PMF that would support the sustainability of ECs in the Free State Province of South Africa. The PMF would support the social, economic, and environmental sustainability of ECs based on three essential components which included: project life-cycle, project control cycle, tools and templates. It was expected that the developed PMF would serve as a guide to enable ECs to deliver successful projects in the construction industry, which was key to their business sustainability, which was a key component of their overall sustainability. The research questions of the study assisted in understanding how a PMF could support the sustainability of ECs in the construction industry. Subsequently, to address the research questions, the following seven research objectives were developed:

- Determine the essential components of a PMF that would be responsive to availability of resources to ECs.
- Determine the extent to which a PMF would support the development and replication of accepted project management practices among ECs.
- Determine the extent to which a PMF would assist effective communication within the project teams and other stakeholders of ECs.
- Determine the extent to which a PMF would streamline the use of tools and templates for key project management processes.
- Determine the extent to which a PMF facilitates customers' understanding of the project management processes.
- Determine the extent to which a PMF would ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle.
- Determine the extent to which the components of a PMF would ensure adequate monitoring of, and reporting on, project deliverables.

The research objectives were achieved by adopting a research strategy which included surveys and interviews, as shown in Table 4.2.

Table 4.2: Research methods adopted to achieve the research objectives

Strategy	Methods	Research objectives						
		1	2	3	4	5	6	7
Quantitative	Self-administered questionnaire	X	X	X	X	X	X	X
Qualitative	Semi-structured interviews (face to face and by phone)	X	X	X	X	X	X	X

4.7. PHASE ONE: THE QUANTITATIVE PHASE

Phase one was the quantitative phase of the project and was aimed at exploring the concept of using a PMF to support the sustainability of ECs. Based on the conceptual framework developed from the literature review, a research process appropriate to addressing the research questions was identified for use during this phase. This phase consisted of the collection of survey data from individual ECs. The data was statistically analysed against the conceptual framework to identify converging and diverging areas of interest which inform the preparation for Phase Two.

4.7.1. Design of data collection instrument

Owning to the unavailability of a pre-designed, structured questionnaire for the collection of quantitative data related to the phenomenon under investigation, it was necessary to design a self-administered questionnaire for the quantitative data collection. The survey questionnaire was developed based on the findings from the literature review, research questions and the aim of the study. Furthermore, the survey questionnaire was developed in consultation with the study promoters as well as the statistician to ensure appropriateness. Also, the survey questionnaire was developed with a cover letter detailing the critical components of the study, such as the research problem and the main objective of the study (please see Appendix 1). The survey questionnaire addressed the demographic information of the respondents, economic sustainability, social sustainability, and environmental sustainability. In addition, project lifecycle, project control cycle, templates and tools were also addressed by the survey questionnaire

4.7.2. The Study Population

The population or sample universe, also referred to as the target population in a research study, is the complete, specific population that is central to the research project, from which samples are drawn to collect the data required for the study (Zikmund et al., 2013). Furthermore, Cooper and Schindler (2014) infer that a population is a group of potential participants to whom the results of the study can be generalised. The target population for this study consisted only of ECs (Grade 1 to Grade 6) who were active and registered on the CIDB register of contractors in the Free State Province of South Africa. ECs are small businesses formed and managed by individuals from the previously disadvantaged population groups in the construction industry in the Free State Province of South Africa. The choice of the target population was deemed to be appropriate as it represented the required population at whom the main objective of the study was aimed. The target population from which the sample was drawn was sourced from the webpage of the CIDB. At the time of data collection, approximately 5884, registered and active ECs were identified on the CIDB webpage (https://registers.cidb.org.za/PublicContractors/ContractorSearch). This number represented ECs that were in good standing in the Free State Province only according to the parameters of the search conducted on the ECs registered and active on the CIDB webpage. The selection of the population was in line with the definitions of registered and active ECs, as indicated on the CIDB webpage. Table 4.3 shows the breakdown of the grades of ECs that formed the population of interest for the current study.

Table 4.3: Population of ECs Based on Classification Grades (CIDB webpage)

Grade	Total
1	5174
2	239
3	136
4	140
5	91
6	104
Total	5884

4.7.3. Sampling method

There are two main methods available for selecting a sample to be analysed when conducting research, namely: probability and non-probability sampling (Zikmund et al., 2013; Leedy and Ormrod, 2016). Generally, the use of any sampling method in research is to ensure lower cost, greater speed in data collection and greater accuracy of the results (Cooper, and Schindler, 2014). Given that this was an academic study with time and cost constraints, sampling methods were used to determine the most appropriate samples to represent the population. Trochim, Donnelly and Arora (2016) argue that the purpose of the research and the methodology adopted determine the type of sampling technique that can be applied to the study. In order to collect the quantitative data for Phase One, simple random sampling based on probability sampling was used to extract a representative sample. Probability sampling provides all sample elements in the target population with an equal chance of being considered as part of the sample (Saunders, Lewis, and Thornhill, 2019; Cooper, and Schindler, 2014). The sample for this study was extracted from the database of the CIDB. A sampling frame ought to be a suitable configuration to facilitate a representative sample to be selected (Cooper, and Schindler, 2014). Thus, an online random number generator as previously used in a study by Rambe and Ntshangase (2020) was used to select the sample components from the sampling until the preferred size was reached.

4.7.4. Sample size

Sample size refers to the number of elements from which the required information is gathered (Kumar, 2014). While there is an ongoing debate about the appropriate sample size in probability sampling, the issue of sample size in non-probability sampling is straightforward (Cooper and Schindler, 2014; Saunders, Lewis, and Thornhill, 2019; Bryman, 2012). This is because the determination of appropriate sample size in probability sampling is based on cost, time, the size of the target population and the need for accuracy and precision, as well as the ability to generalise the results for the target population (Cooper and Schindler, 2014; Saunders, Lewis, and Thornhill, 2019; Bryman, 2012). In contrast, non-probability sampling is used to

ensure the richness of the information gathered from the respondents rather than for the purpose of generalisation, thus, the sample size is not a major issue (Yin, 2014; Kumar, 2014). Furthermore, Cooper and Schindler (2014) noted that determining the appropriate sample size in probability sampling is a function of the variation in the population parameters under study as well as the estimating precision needed by the researcher. To this end, and in accordance with the explanatory sequential, mixed-methods research design adopted for the current study, simple random sampling of ECs from the sample frame of all ECs in the Free State was used to ensure that an accurate and precise sample was selected. The researcher considered a sample size of 450 elements for this study. The researcher established this figure by first determining the total population of registered and active ECs in the Free State Province between grades 1 to 6, which was 5884 at the time. Raosoft, an online sample size calculator (http://www.raosoft.com/samplesize.html) set at a 95% confidence level, and a confidence interval of 5% was used to determine the actual sample size. The sample size of 361 units was established from the calculation but was increased to 450 units to cater for the low response rate (Rambe and Ntshangase, 2020), which is normally characteristic of surveys involving small businesses such as ECs (Bavdaž, Drnovšek and Dolinar, 2009; OECD, 2004). Increasing the sample is often recommended when the response rate is expected to be low as this eliminates chances of sampling bias, and thus enhances the representativeness of the sample (Saunders, Lewis, and Thornhill, 2019; Bryman, 2012; Cohen, Manion and Morrison, 2008). This is essential for the quantitative phase of the study.

Table 4.4: Sample size and type of sampling method used

Sample size	**Type of sampling**
450	Simple random sample
25	Purposive sampling

4.7.5. Data collection

The questionnaire for the collection of quantitative data was administered to the respondents with the help of field workers. This was done after appointments had been made with the randomly selected ECs. The distribution of the 450 questionnaires was

undertaken over five weeks, after which 364 completed questionnaires were either collected or returned by the respondents with the help of the field workers. The field workers were important in this study because they helped in identifying the various addresses and locations of the respondents.

4.7.6. Quantitative Data Analysis

Quantitative data analysis enables a researcher to explore, present, describe and examine relationships and trends within the collected data (Saunders, Thornhill, and Lewis, 2019). The quantitative data analysis was performed using statistical techniques by a statistician. Descriptive and inferential statistical tools were adopted to analyse the quantitative data collected for the current study, using R Software, Version 4.0.0. R Software was deemed suitable for the data analysis because of its ease of use as well as its ability to perform all the needed statistical procedures required for the study (Knezevic, Streibig and Ritz, 2007).

4.7.6.1. Descriptive data analysis

Descriptive statistics are used to describe the characteristics of a population or a sample (Cohen, Manion and Morrison, 2018). Thus, descriptive statistics were used to describe the characteristics of the quantitative data collected for the current study, which made them easier to interpret. Furthermore, the results of the descriptive statistical analysis contributed to the general conclusions of the study (see Chapter Five for details).

4.7.6.2. Inferential statistics

Inferential statistics enable a researcher to generalise from a small sample to a larger population (Leedy and Ormrod, 2016; Salkind, 2014). Two inferential statistics techniques can be used in a research study, namely: parametric and non-parametric. The use of either technique is based on the data collected for the study. Non-parametric statistics were used for this study since ordinal data were collected using

a Likert Scale (Leedy and Ormrod, 2016; Salkind, 2012). The inferential statistics techniques adopted for the study included: Kruskal Wallis H Test, correlation analysis, linear regression analysis, exploratory factor analysis, confirmatory factor analysis and structural equation modelling (SEM) (see Chapter Five for details).

- **Kruskal Wallis H Test**

Cooper and Schindler (2014) described the Kruskal Wallis H Test as a one-way analysis of variance by ranking, which is typically used for non-parametric testing. The Kruskal Wallis Test exposes differences that might exist between three or more groups (Cohen, Manion and Morrison, 2018). This method was used to distinguish different respondent groups among the ECs, based on their demographic data, their views pertaining to the project life-cycle, project control cycle, project templates and tools, as well as the project management framework that should be used to support the sustainability of ECs, which included social, economic, and environmental sustainability (see Chapter Five for details).

- **Correlation analysis**

Correlation analysis is often used to describe the strength and direction of the linear relationship between two variables and can only take values from -1 to +1 (Pallant, 2016). The approach was used to determine the strength and direction of the linear relationships between all the variables considered for the PMF (see Chapter Five for details).

- **Linear regression analysis**

Normally, linear regression analysis is used to estimate the values of a variable based on the knowledge of the values of the other variables (Bordens and Abbott, 2018). In addition, linear regression analysis provides a way of modelling the relationship between the variables (Cohen, Manion and Morrison, 2018) and helps to eliminate variables that do not contribute to the prediction necessary for the effective combinations of the variables in a framework (Tabachnick and Fidell, 2013). Given that the aim was to develop a framework that is simple and takes the ECs' need for resources into consideration, whilst not comprising effectiveness, linear regression

analysis was used to make sure that only the relevant variables were included in the PMF (see Chapter Five for details).

- **Exploratory factor analysis**

Pallant (2016) explained that exploratory factor analysis is used to explore the inter-relationships among a set of variables in the early stages of data analysis. Bordens and Abbott (2018) explained further that exploratory factor analysis is used to reduce large sets of variables into small sets to help to establish patterns and relationships among them in order to generate and test such relationships. Therefore, exploratory factor analysis was used in this study to reduce the data set and explore the inter-relationships among the set of variables considered for the study (See Chapter Five for details).

- **Confirmatory factor analysis**

Pallant (2016) argued that confirmatory factor analysis is a more complex technique used later in the data analysis process to test and confirm specific theories concerning the structure and relationship of a set of variables. Confirmatory factor analysis makes it possible to confirm the prediction of a particular part of relationships, based on a theory or previous results (Devellis, 2017). This approach was used to confirm that the variables identified for the PMF were related and could lead to the intended outcome (see Chapter Five for details).

- **Structural equation modelling**

Tabachnick and Fidell (2013) described structural equation modelling (SEM) as the process of using a set of statistical techniques to examine the relationship between one or more variables. Furthermore, it makes it possible to test the importance of each of the independent variables in a model and helps to test the overall fit of the model to the data (Pallant, 2016; Cohen, Manion and Morrison, 2018; Hu and Bentler, 1999). The key to using SEM is to determine if the hypothesized model fits the data well (Xia and Yang, 2018). To achieve the aim of this study, SEM was used to examine all the variables proposed for the PMF and how they contributed to its usefulness, as well as to test the fit between the data collected from the respondents and the PMF. Comparative fit index (CFI), Tucker-Lewis index (TLI), Root mean square error of

approximation (RMSEA), and standardised root mean square residual (SRMR) were evaluated to determine the appropriateness of fit to the sample data.

The CFI is a sample size based fit index that is used to evaluate a hypothesised model to a null model (Byrne, 1998; Bentler, 1990). In general, CFI assumes that all latent variables are uncorrelated, and the sample size employed has no effect on the CFI performance (Tabachnick and Fidell, 2013; Bentler, 1990). CFI is applied using a cut-off criterion that ranges from 0.0 to 1.0, with a value closer to 1.0 indicating a good fit (Xia and Yang, 2018). A CFI score greater than 0.95 is considered a strong model-data fit in ensuring that misspecified models are not accepted (Hu and Bentler, 1999).

TLI was originally developed for factor analysis by Tucker and Lewis (1973) but is currently used in SEM to compare alternative models or to compare a proposed model against a null model (Schumacker and Lomax, 2010). TLI provides an indication of a model fit, as it compares the tested model to the baseline model that is independent of sample size changes (Bentler and Bonett, 1980). Similarly, the CFI application is based on a cut-off criterion value ranging from 0.0 to 1.0, with a value closer to 1.0 indicating a good fit (Xia and Yang, 2018). According to Hu and Bentler (1999) TLI value larger than 0.95 indicates a relatively good model data fit.

Steiger and Lind (1980) developed the RMSEA fit index for evaluating covariance structure models (Steiger, 1998). RMSEA is used to ascertain how far a hypothesised model is from a perfect model (Xia and Yang, 2018). RMSEA is one of the most extensively used methods for evaluating fit or misfit in SEM applications, and unlike many other fit indices, RMSEA may be used both descriptively and inferentially (Kelley and Lai, 2011; Jackson, Gillaspy and Purc-Stephenson, 2009; Taylor, 2008; Browne and Cudeck, 1992; Steiger and Lind, 1990). In general, RMSEA is used to evaluate model fit in one of two ways: utilising a cut off value and hypothesis testing to a point of an estimate to accept or reject at a specified significance level (Kelley and Lai, 2011). Browne and Cudeck (1992) argue that picking the right cut off value is vital for both strategies. According to Hu and Bentler (1999), RMSEA value of less than 0.06 indicates a strong model-data fit.

SRMR was proposed by Maydeu-Olivares (2017) to assess the exact size of model fit of SEM models. Pavlov, Maydeu-Olivares and Shi (2020) suggest that the test of close fit can now be performed using SRMR in conjunction with RMSEA. However, Maydeu-Olivares, Shi and Rosseel (2018) and Shi, Lee and Maydeu-Olivares (2018) argue that a more accurate confidence interval and test of close fits are obtained using SRMR rather than RMSEA. Since SRMR is an absolute measure of fit, naturally a value of 0 means perfect fits and its ranges up to 1. A value of 0.8 or less is generally considered to indicate a good fit (Maydeu-Olivares, Shi and Rosseel, 2018; Hu and Bentler, 1999). Overall, the use of the four indices in evaluating the SEM is vital in determining if there is a relatively good fit between the hypothesised model and the observed data based on cut off values. According to Hu and Bentler (1999), TLI and CFI require a cut off value of close to 0.95, SRMR requires a cut off value close to 0.08 and RMSEA requires a cut off value close to 0.06 (see Chapter Five for details)

4.8. PHASE TWO: THE QUALITATIVE PHASE

Phase Two was the qualitative component of the research and involved the development and administration, and analysis of interview data. The instrument for this phase was developed based upon the results of Phase One, in order to provide further explanation of the results that emerged from that phase. As Creswell and Plano Clark (2018) emphasise, qualitative data results can be utilised to enhance and enrich the findings and help to generate new knowledge. Therefore, the objective of Phase Two was to better explain the results of Phase One to understand how the PMF can support the sustainability of ECs.

4.8.1. Design of Interview Protocol

The interview protocol for the collection of the qualitative data was developed based on the results of the quantitative data. The protocol was developed in consultation with the study promotors to ensure its appropriateness. Furthermore, the protocol was developed with a cover letter detailing the critical components of the study, such as the research problem, and the main objective of the study. Besides, the interview

protocol also addressed personal information, the PMF, the project Lifecyle, project control cycle, templates, and tools.

4.8.2. Sampling method

Trochim, Donnelly and Arora (2016) argue that the purpose of the research and the methodology adopted determine the type of sampling technique that can be applied to the study. An explanatory sequential research design was used for this study which required both quantitative and qualitative data, thus, both probability and non-probability sampling methods were used to select the samples. Given that Phase Two of the study is qualitative, non-probability sampling was employed in selecting the appropriate sample for the interview. Zikmund et al (2013) emphasise that in non-probability sampling the chances of a participant being chosen are unknown and thus the selection of sampling unit is arbitrary. Several types of non-probability sampling procedures are available which include purposive, convenience, quota, and snowball sampling (Zikmund et al., 2013). Given that this project is an academic study which is resource and time constraints, as well as given the aim of the study, purposive sampling was deemed appropriate since it will enable the selection of experienced and relevant sample elements based on the judgement of the researcher as results of the outcome of the Phase One of the study (Zikmund et al., 2013).

4.8.3. Sample Size

non-probability sampling is used to collect data to ensure the richness of the information gathered from the respondents rather than for generalisation, thus, the sample size is not a major issue (Yin, 2014; Kumar, 2014). Consistent with the explanatory mixed method utilised for this study, the sample size for the qualitative phase data collection is derived from the sample that participated in the quantitative survey (Creswell and Plano Clark, 2018). Thus, a sample size of 25 active ECs was considered to be sufficient for the non-probability sample (Yin, 2014; Creswell and Plano Clark, 2018) and was selected purposively from the participants who responded

previously to the quantitative data collection process. Table 4.4 shows the summary of the participants in the qualitative data collection phase.

Table 4.4: Profile of Participants in the Qualitative Phases

Codes	Years of Experience	Educational Qualification	Participants Position
A1	11 Years	MBA	Director
A2	2 years	National Diploma	Director
A3	3 years	BTech	Director
A4	5 Years	BTech	Managing Director
A5	2 years	National Diploma	Director
A6	3 years	Diploma	Director
A7	5 years	BSc Hon	Director
A8	7 years	National Diploma	Director
A9	13 years	National Diploma	Director
A10	10 years	National Diploma	Director
A11	7 years	BTech	Project Manager
A12	8 years	BTech	Director
A13	7 years	Diploma	Director
A14	7 years	National Diploma	Director
A15	11 years	National Diploma	Director
A16	10 years	Not Disclosed	Supervisor
A17	7 years	Not Disclosed	Director
A18	8 years	B. Engineering	Director
A19	7 years	BTech	Director
A20	3 years	Post Graduate Diploma	Director
A21	1 year	Not Disclosed	Director
A22	13 years	National Diploma	Director
A23	4 years	N6	Director
A24	2 years	N3	Director
A25	3 years	National Diploma	Director

Source: (Field Study, 2021)

The data in Table 4.4 confirms the suitability of the participants for the qualitative data collection. The participation of the 25 purposively selected participants in this interview is important in obtaining in-depth information for analysis of the phenomenon under investigation. The 25 participants sampled hold positions relevant to the information

required and on the average, have 7 years of experience operating in the construction industry, therefore were deemed suitable for the interview

4.8.4. Administration of the Qualitative Data Collection Instrument

This data collection instrument was administered to the respondents through face-to-face and cell phone interviews. The interviews were conducted after appointments had been made with the ECs who were selected purposively after the collection and analysis of the quantitative data. A total of 25 ECs were interviewed during the four weeks of data collection. The interviews were recorded using the voice memo app on the researcher's mobile phones after permission was sought and granted from the participants for their responses to be recorded. The data collected from the 25 participants through the interview was considered adequate and suitable for the analysis required in relation to the aim of Phase Two of the study, thus there was no need for further data collection (Saunders, Lewis, and Thornhill, 2019). The interview of the 25 participants lasted for 40 minutes each on average.

4.8.5. Qualitative Data Analysis

Qualitative data analysis is the non-numerical assessment of observations made through participant observations, content analysis, in-depth interviews, and other qualitative research techniques (Babbie, 2014). Qualitative data analysis makes it possible to transform data through analytical procedures to provide a clear understanding of the data, thereby providing insight into the data (Rubin and Babbie, 2017). In this study, the responses of the ECs during the semi-structured interview were transcribed, categorised into different themes aligned to the research questions, and analysed thematically. The researcher transcribed the voice recordings by carefully listening to them and jotting down the main themes based on the questions from the interview protocol. Because of the small number of ECs that were purposively selected and interviewed for Phase Two, the qualitative data analysis was performed manually.

4.8.6. Data Triangulation

The triangulation process was aligned with the research approach that was adopted to enable the mixing of quantitative and qualitative data (Creswell and Plano Clark, 2018). Qualitative results were used to explain further the quantitative results which were adopted for use in the PMF (Creswell and Plano Clark, 2018).

4.8.7. Project Management Framework Validation Process

This section describes how the proposed PMF was validated based on the results of the survey conducted among selected ECs. The objective of this survey was to ascertain the consensus of ECs regarding the PMF based on predetermined criteria that include logical structure, clarity, coherence, practical relevance, applicability, and meaningfulness.

To validate the PMF a sample of 70 ECs were conveniently selected for this survey in the Free State province. The sample consisted of ECs from various backgrounds which include project managers, construction managers, business owners and business managers. In the survey questionnaire, the participants were asked to rate the predetermined criteria of logical structure, clarity, coherence, practical relevance, applicability, and meaningfulness on a Likert scale of excellent (5), good (4), fair (3) below average (2) and poor (1). The survey questionnaire also provided a column for additional comments from the participants. The questionnaires were administered by email and in-person to the 70 selected participants, a total of 36 questionnaires were returned and deemed to be useful for the intended purpose (Please See Chapter 5).

4.9. PRACTICAL ISSUES WHILE ADMINISTERING THE RESEARCH INSTRUMENTS

While validity and reliability are key to ensuring the credibility of a study, also important is the practicality of executing the measurement process (Cooper and Schindler, 2014). Often, validity and reliability are dictated by practicality which includes the economy, convenience and interpretability of the data collection process (Cooper and Schindler, 2014).

4.9.1. Economic consideration

The cost of administering a data collection instrument can be significant, especially if the data collection instrument has many items. However, many items yield greater reliability (Cooper and Schindler, 2014). Thus, it is necessary to balance cost with reliability in a practical sense. In this study, the number of items was kept to a moderate size to curtail cost and time constraints which affect reliability but support the administration of the instrument (Cooper and Schindler, 2014).

4.9.2. Ensuring convenience

The convenience of the data collection instruments is ensured if the instrument is easy to administer (Cooper and Schindler, 2014). The instrument should include detailed instructions, and the design layout must be appropriate for the respondents to comprehend easily. A Likert Scale was used in the questionnaire for the current study, which is noted for its ease of completion (Bryman, 2012). In addition, each section of the questionnaire was constructed with clear instructions on what was required from the respondents.

4.9.3. Ensuring interpretability

Cooper and Schindler (2014) suggested that interpretability is only relevant as a dimension of practicability if someone other than the designer of the instrument must interpret the results. Where applicable to this study, each questionnaire was administered with a cover letter detailing the research problem being investigated and the objectives of the study.

4.10. VALIDITY IN THIS MIXED METHODS STUDY

Cooper and Schindler (2014) maintained that validity is usually concerned with the extent to which a test measures what it is supposed to measure. Kumar (2014) reiterated that validity is used to determine the appropriateness and accuracy of the research process. Thus, validity is a critical consideration in ensuring the quality of a research study. In this study, quantitative validity was achieved by using an appropriate sample size of 450 participants, with an 81% response rate, which ensured that the use of statistical analysis made it possible to generalise the results to a larger population (Cooper and Schindler, 2014; Bryman, 2012). Furthermore, the participants in the study were individuals who fell within the categories considered to be relevant and appropriate for the study and therefore possessed the knowledge that was required for the study. Thus, the information collected from these participants correlated accurately with the data requirements for the study (Leedy and Ormrod, 2016). Qualitative validity was achieved in this study by using research instruments that were compiled on the basis of an extensive review of literature about the construct under study and thus supported the findings of the study (Leung, 2015). The constructs reviewed and used for the analysis process included: project life-cycle, project control cycle, tools and templates.

4.11. RELIABILITY IN THIS MIXED METHODS STUDY

Normally, reliability in a research study refers to the dependability or the consistency of the results (Leavy, 2017; Cooper and Schindler, 2014; Bryman, 2012). Schensul and LeCompte (2012) stated that reliability is concerned with whether the research results can be replicated in another research study using the same methods. Similarly, according to Tracy (2014) and Yin (2014), reliability requires that a research study should produce the same findings and conclusions if the same study is conducted by another researcher using the same procedures used by the first researcher. Reliability in qualitative research remains a contentious issue among researchers, compared with quantitative reliability, as their application and understanding are not the same

(Creswell, 2014; Willig, 2013; Leedy and Ormrod, 2016). While reliability in a quantitative study can be tested using statistical methods, the process in a qualitative study is based on philosophical assumptions which state that the world is both stable and objectively accessible (Merriam and Tisdell, 2016; Newman, 2014). Cooper and Schindler (2014) assert that respondents, situational factors, the interviewer, and the instruments used are sources of error that could compromise the reliability of a study's results. Thus, eliminating or reducing the occurrence of these sources of error could help to ensure reliability. To ensure the reliability of this study, the quantitative and qualitative data were collected during the specified time agreed with the respondents. All sensitive issues were avoided in compiling the questionnaires used for quantitative and qualitative data collection. Respondent confidentiality was strictly adhered to, and the questions in both sets of questionnaires were clear, straightforward, and free of ambiguities. The selection of participants was random but purposive and included only participants who were relevant to the study. In addition, interviews were recorded and transcribed, which enabled the researcher to obtain detailed field notes that were relevant to the study. Furthermore, the assistants who agreed to collect data for the study were trained on all the procedures of the data collection process.

4.12. ETHICAL CONSIDERATIONS

In the context of research, the essence of ethics is to ensure that no participants are harmed (Cooper and Schindler, 2014; Leavy, 2014). In support, Saunders, and Lewis (2012) consider research ethics in relation to how participants and data collected from them are treated in a research study. To ensure the highest ethical standard for this study, a cover letter explaining the purpose of the study, the consent to participate voluntarily in the study, and the assurance of confidentiality and anonymity of the information collected was attached to all the data collection instruments used for the study. Apart from personal demographics that cannot be linked directly to the participants, no other personal issues were requested from the respondents. Overall, participation in the research was voluntary for the participants, and the interviews were focused only on issues related to study.

4.12.1. Ethical Clearance

Ethical guidelines for both the quantitative and qualitative processes were strictly adhered to in conducting the study. Ethical clearance to conduct the study was sought from the Research Office of the Central University of Technology, Free State. Approval of the research and the research ethics was given by the Faculty of Management Sciences' Faculty Research and Innovation Committee (FRIC).

4.12.2. Voluntary Participation

Participation in a research study should be strictly voluntary (Leedy and Ormrod, 2016; Babbie, 2014). That means that individual participants should decide of their own will whether they are interested in participating in the study and should not be compelled. Participants in the current study were not compelled to participate, whether they formed part of the selected sample element or not. Thus, individuals who participated in both phases of the study participated freely without being compelled to do so.

4.12.3. Informed Consent

Informed consent refers to the ability of respondents to decide to be part of the research process based on their full knowledge of the entire research study (Babbie, 2014). According to Patten and Newhart (2018), informed consent is key to promoting ethics in a research study, since it enables the participants to decide to be part of the study based on full information regarding the study. Subsequently, Kumar (2014) noted that it is unethical to collect information from participants without giving them the required information about the study, thereby enabling them to decide to participate based on the full requirements of the study. To satisfy the informed consent requirement, a cover letter detailing the purpose of the study was attached to both the structured and semi-structured questionnaires used. Furthermore, during the qualitative data collection phase, the participants were educated about the purpose of

the study. In addition, participants in the first quantitative phase were informed about the possibility of a follow-up collection of data for the second qualitative phase (Leedy and Ormrod, 2016).

4.12.4. Right to Privacy

A research study involving human beings must respect the right to privacy of the participants (Leedy and Ormrod, 2016). This means that, under no circumstances, should the participants' responses be disclosed. According to Babbie (2014), the right to privacy can be maintained easily by the researcher keeping the participants' information secret and private. Thus, the research process must ensure that the nature and quality of individual participants' responses are strictly confidential. Babbie (2014) believed that the use of a structured questionnaire can provide an added layer of privacy. However, in the current study, both structured and semi-structured questionnaires were used, which meant that there was an element of concern about the right to privacy. To address this, participants were duly informed during the informed consent stage about the possibility of contacting them for further data collection during the second phase, when a semi-structured questionnaire would be used. Also, both questionnaires had no questions about the location and identity of the participants, which meant that participants could not be traced or contacted after the second phase of data collection.

4.12.5. Anonymity and Confidentiality

Kumar (2014) noted that it is ethical to share participants' information and link their information to them directly for a purpose other than the research. This implies that the participants in the research must remain anonymous or nameless (Neuman, 2014). In the current study, pseudonyms were used for the participants and their locations during both phases to collect quantitative and qualitative data. In addition, the pseudonyms of both the locations and participants were discarded immediately after capturing and processing the data for both phases. Furthermore, the data

collected during both phases were exposed only to people who were involved in the research.

4.13. CHAPTER SUMMARY

An overview of the methodology applied to the current study was provided in this chapter. Firstly, the research questions were reviewed. followed by the research philosophy adopted for the study. This was followed by a description of the sampling process, which included: defining the population, deciding on the appropriate sampling design and the sample size for both phases of the data collection. The measuring instruments used were specified. Finally, the data analysis was articulated clearly. Also, ethical considerations to enhance the quality of the study were detailed. The findings of the empirical investigation are reported in the next chapter.

5. CHAPTER FIVE: DATA ANALYSIS AND INTERPRETATION

5.1. INTRODUCTION

The main proposition of the current study was to develop a PMF that would support the sustainability of ECs in the Free State Province of South Africa. The research methodology employed for the empirical study was explained in the previous chapter. The current chapter is devoted to the presentation of the summary of the empirical findings, the interpretation of the quantitative and qualitative results and the use of the qualitative findings to explain the quantitative results further (Creswell, 2014). This procedure is consistent with the explanatory sequential, mixed-methods approach.

5.2. QUANTITATIVE FINDINGS, RESULTS, AND INTERPRETATION

5.2.1. Response Rate

Response rates of 81.8% for principal/general contractors and 78.3% for sub-contractor/specialist contractors were obtained for the survey and, overall, a response rate of 80.9% was obtained for the study from the circulation of a total of 450 questionnaires, of which 364 were completed appropriately and returned, as shown in Table 5.1. For quantitative research, the ideal situation is to have a representative sample that can be used to generalise for the population from which the sample was taken. However, Kumar (2014) noted that questionnaires are notorious for low response rates because not every respondent will complete and return the questionnaire. Saunders and Lewis (2012) attributed this to how and to whom the questionnaires were administered. While response rates can be considered to be good in terms of questionnaires administered collectively (Kumar, 2014; Saunders and Lewis, 2012), the response rate still turns out to be approximately 50%, which Kumar (2014) noted to be a success in terms of questionnaire administration. As such, the response rate of 80.9% was considered to be high enough for this study. Owing to

time constraints, it was decided to treat incorrect entries as missing items for this study (see each Table of results for the number of missing items) and, consequently, they were ignored in any calculations.

Table 5.1: Response rate to the quantitative survey

Respondent group	Sample size (No.)	Response (No.)	Response rate (%)
Principal/general contractor	335	274	81.8
Sub-contractor/specialist contractor	115	90	78.3
Total	450	364	80.9

5.2.2. Interpretation of the Results

Apart from the inferential statistics that were used to make inferences for the study, the majority of responses to the Likert-Scale type questions have been discussed based on the measurement scale and, where appropriate, percentages and mean scores (MS) have been used in the discussions. Owing to the descriptive nature of the results, hierarchical order was deemed to be appropriate in presenting the results, given that the data were ordinal. The Likert-Scale measurements used for the questions are shown in Table 5.2. The discussion of the results conforms to the suggestion that ordinal data enables indication of the order of data which requires conformity to logical interpretation (Cooper and Schindler, 2014). The researcher used plain terms in presenting the results in a deliberate attempt to enhance the understanding and readability of the statistical findings of the research. Thus, all the results are presented in plain terms to achieve clarity in the interpretations.

Table 5.2: Terms linked to Likert-scale measurements

Scale	Meaning
5	Strongly agree; major extent; very important; very extensive
4	Agree; near major extent; important; extensive
3	Neutral; moderate extent; somewhat important; limited
2	Disagree; near minor extent; neutral; very limited
1	Strongly disagree; minor extent; not important; not used

5.2.3. Demographics

The demographic data of the ECs are presented under sub-sections. The variables addressed included: age, gender, level of qualification, level of training in construction, number of years in construction, and role in the business. Furthermore, the characteristics of the firm, such as: the sector in which projects were undertaken, the project management activities in which the firm worked, the value of contract work, the stage in which the firm was mainly involved, and the extent of project management knowledge of contracts were addressed.

Table 5.3: Age of respondents

Age	Frequency	Percentage (%)
18 – 34 years	74	20.3
35 – 45 years	99	27.2
46 – 59 years	130	35.7
60 years and above	61	16.8
Total	364	100

It was evident from Table 5.3 that most of the respondents (62.9%) belonged to the age groups of 35-45 and 46-59 years, while the youth (18-34 years) represented only 20.3% of the individuals surveyed. This finding was rather disturbing given that unemployment among the youth in the country is on the increase, yet many of the youths are not involved in the construction industry. The current unemployment among youth (15-34 years) in South Africa is reported to be approximately 40.1% (Stats SA, 2020). The EC Programme is intended to assist the government in its drive to use the construction industry as a means to create employment and economic participation of previously disadvantaged population groups. In addition, the importance of the construction industry in job creation has been noted, both in the construction industry as well as other sectors of the economy (CIDB, 2018).

Table 5.4: Gender of respondents

Gender	Frequency	Percentage (%)
Male	169	46.9
Female	191	53.1
Total	360	100

Missing = 4

As indicated in Table 5.4, more females (53.1%) participated in the study than males (46.9%). This was surprising as the construction industry is generally noted to be mainly a male-dominated industry (Stat SA, 2015). While this finding would be positive news for policymakers and women advocates who seek equality in all sectors of the economy, the finding was inconsistent with the CIDB Report (2020a) and Ramorena (2016) who found that the number of female owners in the EC categories continued to decrease because of their upgrade to higher grade levels. Nevertheless, the empirical finding of this study showed that more females are participating in the construction industry.

Table 5.5: Level of education of respondents

Type of education	Frequency	Percentage (%)
No formal education	12	3.3
Primary	35	9.6
High school	91	25.0
Middle school	132	36.2
Under-graduate	61	16.8
Post-graduate	33	9.1
Total	364	100

Out of the total number of participants in the study (Table 5.5), 3.3% had no formal education, 9.6% had primary education, and 25.0% had high-school education. There were 36.2% who had middle-school education, 16.8% had undergraduate degrees, and 9.1% had post-graduate degrees. It was evident from the study that the majority of the participants had middle-school education, with the least having no formal education. This indicated that most of the participants in the study had some level of education, as confirmed in the Stats SA Report (2016) that highlighted an increase in the educational attainment of individuals aged 20 years and above. However, the finding was also consistent with that of Ntuli and Allopi (2013), which showed that the majority of ECs do not have post-secondary education. This scenario could lead to limited participation by ECs in the use of a more technical approach to understanding and running a business in the construction industry, such as the use of project management frameworks. Wanigasekara and Surangi (2011) and Thapa (2007) argued that there is a strong link between education level and decision making in small businesses due to the ability of educated owners to make informed business decisions

and choices. Nonetheless, the developed PMF could still be useful for ECs in ensuring successful project outcomes leading to sustainability given that it was developed with the limited resource capabilities of ECs in mind.

Table 5.6: Respondents' level of training in construction

Type of training	Frequency	Percentage (%)
None	145	40.2
Apprenticeship	52	14.4
Short courses	128	35.4
High school	2	0.6
Undergraduate	21	5.8
Postgraduate	13	3.6
Total	361	100

Missing = 3

It was surprising that, although a higher percentage of the participants had some level of formal education (Table 5.5), the majority of them had no formal training in construction (Table 5.6). This could have been a result of the type of education they had and the levels of education which were attained. Also, the opportunity to obtain education in construction is normally in the form of specialised study at higher educational levels, which could be the reason why the majority had some formal education, but few had training in construction. There were 40.2% of the total number of participants who had no training in construction, with the least (0.6%) being high school graduates. Some of the respondents (14.4%) obtained their level of training in construction in the form of apprenticeship, 35.4% completed courses, 5.8% had undergraduate degrees in construction, while 3.6% of them had post-graduate training in construction. Although 59.8% of the respondents had some form of education in construction, it was disturbing that 40.2% had no formal education in construction and yet were operating in the construction industry. The participation of the 40.2% without education in construction is often authorised by CIDB after an assessment of a contractor's competence level based on experience in the construction sector (CIDB, 2017). Overall, it should not be difficult for the proposed PMF to be adopted and used, given that approximately 59.8% of the respondents had some form of education in construction. In addition, because of their experience in the construction industry, the remaining 40.2% should find the use of the proposed PMF to be easy after being exposed to it.

Table 5.7: Respondents' number of years experience in construction

Number of years	Frequency	Percentage (%)
Below 5	49	13.4
5-10 years	114	31.3
11-15 years	77	21.2
16-20 years	83	22.8
0ver 20 years	41	11.3
Total	364	100

From the available data (Table 5.7), a total of 13.4% of the participants had been working in construction for less than 5 years, 31.3% had been involved in construction for between 5 and 10 years, and 21.2% between 11 and 15 years. Also, 22.8% of the total number had been involved in construction for between 16 and 20 years, while 11.3% had been working in construction for over 20 years. Most of the participants interviewed in the study had between 5 and 10 years of experience in the construction industry, with the least number working for over 20 years. These findings were inconsistent with the study of Worku (2013) and Ligthelm (2011) who found that most small businesses such as ECs, do not survive more than 2 years in their business activities. The inconsistencies could be because both studies of Worku (2013) and Ligthelm (2011) were conducted in provinces other than the Free State. Barring the inconsistency between the findings in the literature and the results of the study, this could indicate a positive outlook for ECs. However, ECs may survive much longer than other small businesses because of the nature of their business operations which are linked with government policy such as BBBEE in the construction industry, which is to make ECs an engine of economic transformation for previously marginalised population groups. As such, if in good standing with the CIDB, they are considered for business more easily than other small businesses.

Table 5.8: Respondents' positions

Type of position	Frequency	Percentage (%)
Manager	35	9.6
Owner	121	33.2
Owner/manager	190	52.2
Project manager	18	5.0
Total	364	100

As shown in Table 5.8, most of the participants (52.2%) were owner/managers. The second highest number of participants were owners (33.2%), 9.6% were managers, while 5.0% of the participants were project managers. Overall, the results showed that most of the respondents were in control of the operations of the business to some extent and were decision-makers. This finding is consistent with the study of Wijewardena, Nanayakkara and De Zoysa (2008) who found that there is a strong relationship between ownership of small businesses such as ECs and decision making. Furthermore, this result showed that a typical characteristic of small businesses is that they are owned often by one person. This assertion is in line with the views of Hamelin (2012) who view small businesses as business entities that are often owned and managed by one person. It was encouraging that most of the respondents (95.1%) were in a position of power and decision-making since it would be easier for them to consider the use of a PMF that could enhance their business operation and support their sustainability.

Table 5.9: Sectors in which respondents mainly undertook projects

Type of sector	Frequency	Percentage (%)
Building construction	196	54.0
Civil construction	82	22.6
Mining construction	52	14.3
Others	33	9.1
Total	363	100

Missing = 1

Table 5.9 shows the characteristics of the firms from which the participants were drawn. From the available data, most of the businesses (54.0%) were in building construction, 22.6% were in civil construction, and 14.3% were in mining construction. However, 9.1% of the total number were involved in other sectors of work. The finding shown in Table 5.9 was not surprising because the EC Programme was targeted mainly at the construction industry (BBBEE Act 53 of 2003), thus it was expected that most of the respondents' work would be in the construction sector of the country. In addition, the result supported the aim of the study which is to develop a PMF for use by ECs to ensure their sustainability in the construction industry, since activities in the construction industry are project oriented (Larson and Gray, 2018) and, as such, require the use of project management methodologies, which is what was developed

with the PMF. In addition, many experts believed that the use of project management methodologies is essential in order to deliver a project successfully (Larson and Gray, 2018; Mir and Pinnington, 2014; Maley, 2013). This made the developed PMF relevant because it included the necessary components of project management methodology that have been modified for use by ECs.

Table 5.10: Project management activities in which respondents worked

Type of category	Frequency	Percentage (%)
Principal/general contractor	274	75.3
Sub-contractor/specialist contractor	90	24.7
Total	364	100

As shown in Table 5.10, most of the businesses (75.3%) were involved in principal/general contractor project management activities, while 24.7% were involved in sub-contractor/specialist contractor project management activities. This result from the survey supported the use of project management methodologies, as the activities in which the respondents were involved were project oriented and required the use of project management methodologies to enable them to deliver successful projects (Larson and Gray, 2018; Mir and Pinnington, 2014; Maley, 2013). Consequently, the use of a PMF, designed with the needs of ECs taken into consideration, would be an essential tool in delivering a successful outcome, as proposed in this study.

Table 5.11: Value of project work undertaken by respondents

Project value	Frequency	Percentage (%)
Large size (More than R10m)	44	12.1
Medium size (R1m to R10m)	193	53.0
Small size (less than R1m)	127	34.9
Total	364	100

The project value of the work undertaken by the ECs was also analysed. From the results (Table 5.11), it was evident that 34.9% of the total participants indicated that their firm was involved in small-sized projects (less than R1m), and 53.0% were involved in medium-sized projects (costing between R1m and R10m). There were 12.1% whose firms were involved in large projects (more than R10m). The results

were consistent with CIDB's classification of ECs, since the ECs considered for the study were from Grade 1 to Grade 6.

Table 5.12: Phase of project in which respondents were involved mostly

Type of stage	Frequency	Percentage (%)
Defining	23	6.4
Planning phase	89	25.0
Execution phase	150	42.0
Closing phase	95	26.6
Total	357	100

Missing = 7

Most of the respondents indicated that their firms were involved in the execution phase of the projects they undertook (Table 5.12). There were 6.4% who indicated that their firms were involved in the defining phase of projects, and 25.0% stated that they were involved in the planning phase. There were 42.0% who indicated that they were involved in the execution phase of the projects they undertook, while 26.6% stated that they were involved in the closing stage of the projects they undertook. While most of the respondents were involved in the execution stage, the results showed overall that ECs were involved in the four phases of project management to some extent in their project endeavours. The findings are inconsistent with studies regarding ECs project management use in the construction industry. For instance, Mavetera et al. (2015) found that ECs are not able to use project management processes due to a lack of project management knowledge and skills which often lead to unsuccessful project outcomes. Nonetheless, the results and findings of the empirical study are a positive indication for the adoption and use of the developed PMF in their project businesses.

Table 5.13: Extent of respondents' knowledge of project management during contracts

Extent	Frequency	Percentage (%)
Minor extent	125	34.3
Near minor extent	23	6.3
Moderate extent	136	37.4
Near major extent	48	13.2
Major extent	32	8.8
Total	364	100

The extent of knowledge of the respondents' knowledge of project management was analysed for each firm (Table 5.13). Even though most of the firms were involved in the execution stage of their projects (Table 5.12), very few knew project management during their contracts. From the available data, 34.3% of the participants indicated that their firms knew project management to a minor extent during their contracts, and 6.3% had the knowledge to a near minor extent. There were 37.4% who knew project management to a moderate extent during their contracts, 13.2% had the knowledge to a near major extent, while 8.8% had the knowledge to a major extent. The concern with this finding was that few ECs considered the extent of project management during their contracts. According to Wu et al. (2018), the success of a project and its profitability all start from the contracting stages in the construction sector. This is because it is during the contracting process that all the details are finalised of what is required or expected of the project when it is completed and deemed successful (Dayanand and Padman, 2021).

5.2.4. Results of the Primary Survey

Section B: Please indicate the level of concurrence with the following statements regarding the economic sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

The questions asked in this section of the questionnaire that was circulated to active ECs registered with the CIDB in the Free State Construction Industry elicited responses that led to the achievement of the aim of the research. The questions were compiled based on previous research related to the sustainability of small firms in general. Further details about the construct are provided in Chapter Two of this thesis. Table 5.14 shows the respondents' concurrence with the statement regarding dimensions of economic sustainability as it pertained to their firms in the construction industry on a scale of 5 (strongly agree) to 1 (strongly disagree), and MS ranging from 1.00 to 5.00.

As shown in Table 5.14, all 9 MSs were above the midpoint of 3.00, which showed that, in general, the respondents strongly agreed/agreed that the items measured contributed to economic sustainability in South African construction. These findings indicated that 47% and 44.8% of the respondents strongly agreed and agreed, respectively, that the use of full cost accounting and real-time cost pricing to set prices and tariffs contributed to economic sustainability in South African construction. The finding is consistent with a study by Zhong and Wu (2015) who found that the use of full cost accounting methods may contribute to the attainment of economic sustainability in the construction industry.

Table 5.14: Items that contribute to economic sustainability

Statement	Response (%)					MS	Rank
	Strong agree .....Strongly disagree						
	5	4	3	2	1		
The company uses full cost accounting and real-time cost pricing to set prices and tariffs for goods and services.	47.0	44.8	18.5	17.6	18.8	4.39	1
Companies must develop a measurement and reporting system for evaluating performance and areas for improvement.	36.0	49.2	14.8	0.0	0.0	4.21	2
The company enhances competitiveness in the marketplace by adopting policies and practices that advance sustainability.	34.3	51.1	14.6	0.0	0.0	4.20	3
Improved sustainable performance is a source of productivity improvement.	40.1	38.7	21.2	0.0	0.0	4.19	4
Construction firms need to promote best practice in consumption procurement through the supply chain.	25.8	52.0	22.0	0.0	0.0	4.04	5
Construction firms need to use technology and innovation to increase the sustainability of the construction process.	31.6	36.8	31.6	0.0	0.0	4.00	6
Improved sustainable performance leads to new market opportunities.	25.0	44.2	30.8	0.0	0.0	3.94	7
Construction firms should execute projects that minimise resource consumption.	24.7	35.7	28.0	4.7	6.9	3.67	8
The company promotes employment creation through labour-intensive construction.	12.4	34.9	18.5	17.6	16.8	3.09	9

The ordinal hierarchy in Table 5.14 indicated that achieving economic sustainability in South African construction requires attention to be paid to all the 9 items measured for economic sustainability. This is because the 9 items have the potential to contribute to the economic sustainability of ECs in South African construction. The finding resonates with a study by Wanamaker (2011), Hardisty (2010), and Doane and

MacGillivray (2001) who found that economic sustainability is about making sure that the project endeavours of a firm can create economic value while taking into consideration the concern for issues of social and environmental sustainability. This is reflected in the 9 items (see Table 5.14) as reported by the current study to have the potential to contribute to the economic sustainability of ECs in the South African construction industry.

Section C: Please indicate the level of concurrence with the following statements regarding the social sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

Table 5.15 shows the respondents' perceptions of the extent to which the items measured contributed to social sustainability in South African construction, measured on a scale of 5 (strongly agree) to 1 (strongly disagree), and MS ranging from 1.00 to 5.00. It was notable that 10 out of the 11 MSs were above the midpoint of 3.00, which indicated that, in general, the respondents could be deemed to have perceived that the majority of the items measured contributed to social sustainability in South African construction. The finding is consistent with a study by Zuo, Jin and Flynn (2012) which suggest that social sustainability may be attainable in the construction industry if efforts are aimed to provide safety at workplaces, access to personal protection, protection of the community during construction and the demolition stages of a project. The findings of the current indicated that 91% strongly agreed and agreed that the items measured (see Table 5.15) were linked to social sustainability in the construction industry. This was encouraging because social sustainability requires a business to identify both the positive and negative impact of their operations on people (United Nations Global Compact, 2019; Almahmoud and Kumar Doloi, 2018). Also, social sustainability is often considered to be one of the most neglected of the three sustainability pillars (Zuo Jin and Flynn, 2012). Thus, the empirical findings of the study regarding social sustainability are encouraging.

Table 5.15: Items that contribute to social sustainability

Statement	Response (%)	MS	Rank

	Strong agree…Strong disagree						
	5	4	3	2	1		
Construction companies should protect and promote human health through a healthy and safe working environment.	29.2	56.0	16.8	0.0	0.0	4.10	1
Contractors must comply with governmental sustainability-related legislation.	18.7	65.7	15.7	0.0	0.0	4.03	2
Construction companies should have a good relationship with employees.	13.2	62.4	22.0	2.5	0.0	3.86	3
Construction companies should implement skills training and capacity enhancement to allow meaningful participation in a project.	13.7	45.9	41.2	0.0	0.0	3.73	4
Contractors should use appropriate procurement and contracting strategies to promote social sustainability.	5.5	61.5	32.7	0.3	0.0	3.72	5
There should be fair compensation for people adversely affected by construction operations.	11.5	44.8	43.7	0.0	0.0	3.68	6
Construction companies need to increase their commitment to sustainable construction through education and training of their employees.	9.1	46.2	44.8	0.0	0.0	3.64	7
Construction companies must seek fair distribution of the social costs of construction.	5.5	37.1	57.4	0.0	0.0	3.48	8
Construction companies should promote corporate social responsibility.	6.0	28.0	65.9	0.0	0.0	3.40	9
Construction companies need to seek equitable distribution of the social benefits of construction.	2.5	29.9	63.7	3.8	0.0	3.31	10
Construction companies must improve the quality of human life including poverty alleviation.	0.5	12.9	60.4	17.9	8.2	2.80	11

Section D: Please indicate the level of concurrence with the following statements regarding the environmental sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

Table 5.16 shows the respondents' perceptions of the extent to which the items measured affect the achievement of environmental sustainability in South African construction, measured on a scale of 5 (strongly agree) to 1 (strongly disagree), and MS ranging from 1.00 to 5.00. Significantly, all 11 MSs were above the midpoint of 3.00, which indicated that, in general, the respondents could be deemed to have perceived that all the items measured contributed to environmental sustainability in South African construction. The finding resonates with findings from Morelli (2011) and Sutton (2004) who found that environmental sustainability requires actions that are aimed to reduce the use of physical resources, the use of renewable rather than depletable resources, the redesign of production processes and products to eliminate the production of toxic materials and the protection and restoration of the natural

habitat and environments valued for their beauty. The current findings indicated that by choosing environmentally responsible suppliers and sub-contractors, contractors should reduce physical waste generation, and construction firms should use energy- and water-efficient methods that were ranked 1st, 2nd, and 3rd respectively, and seemed to be the items of most concern to the respondents in achieving environmental sustainability in South African construction.

Table 5.16: Items that contribute to environmental sustainability

Statement	Response (%)					MS	Rank
	Strong agree…Strong disagree						
	5	4	3	2	1		
The company chooses environmentally responsible suppliers and contractors.	45.3	36.0	18.7	0.0	0.0	4.26	1
Contractors need to make attempts to reduce physical waste generation.	14.3	68.7	17.0	0.0	0.0	3.97	2
Construction firms should use energy- and water-efficient methods /techniques.	13.7	57.4	28.8	0.0	0.0	3.85	3
Implementation of environmental strategies will improve contractors' competence in environmental management.	10.2	60.4	29.4	0.0	0.0	3.81	4
Construction companies should reduce carbon emissions during construction.	15.9	45.6	38.5	0.0	0.0	3.77	5
Construction firms need to support green design and construction.	10.4	54.4	35.2	0.0	0.0	3.75	6
Contractors need to use techniques that minimise the harmful effects of construction activities on the environment.	10.2	56.3	30.8	2.7	0.0	3.74	7
Improvement of environmental performance in a construction organisation leads to opportunity for increasing competitive advantage.	10.2	53.8	33.5	2.5	0.0	3.72	8
Construction companies must create a healthy, non-toxic environment.	10.2	53.8	33.0	3.0	0.0	3.71	9
Implementation of environmental strategies leads to improvements in business performance.	10.2	48.4	38.7	2.7	0.0	3.66	10
Construction companies must decrease CO^2 emissions by decreasing energy consumption.	15.9	30.8	41.2	12.1	0.0	3.51	11

Section E: Please indicate the degree of importance attached to the following activities during the definition, planning, execution and closing phases of project management activities in your firm. The weight of your selected response corresponds to the value of the response. that is (5) representing the highest weight and (1) the lowest weight.

Table 5.17 shows the respondents' perceptions of the degree of importance of the project life-cycle items measured on a scale of 5 (very important) to 1 (not important),

and MS ranging from 1.00 to 5.00. Significantly, all 23 MSs were above the midpoint of 3.00, which indicated that, in general, 100% of the respondents could be deemed to have perceived that the items measured were important activities that were necessary for the project life-cycle. This finding concurs with those of Oosthuizen and Venter (2018) and Burke (2011) who argued that the project lifecycle is the backbone of almost all project management approaches and thus determines how project activities are performed to achieve successful project outcomes. As result, one can argue that ECs consider project lifecycle as an essential component of a PMF thus its inclusion in the PMF for this study is justified.

In the definition phase, it is notable that all the MSs are greater than the midpoint of 3.00. This indicated that the respondents could be deemed to have perceived that the items measured were significant to completing the project definition phase successfully in the project life-cycle. This finding is consistent with Xia et al. (2016) and Ballard (2006). Xia et al (2016) pointed out that having a clear project definition is vital for a successful construction project. Also, Ballard (2006) argued inadequate project definition often leads to unsuccessful project outcomes. As such, the finding here is encouraging given that the ECs who participated in the study agreed on the importance of the project definition stage in the project management process as included in the PMF.

It was notable in the planning phase that all the MSs were above the midpoint of 3.00. Thus, it could be deemed that the respondents perceived resource availability, budgets, risk consideration, schedules and staffing during projects to be the most significant contributors to completing the planning phase in the project life-cycle. The finding is consistent with Taylor and Taylor (2009), Mantel and Meredith (2009) and Zwikael and Globerson (2004), who contended that faulty planning will result in project failure while high-quality planning increases the chances of project success as result, attaching importance to planning activities such as resource availability, budgeting, risk consideration, scheduling and staffing on the project are crucial in components of the project planning phase. Therefore, its inclusion in the PMF should be crucial to the effectiveness of the PMF in ensuring ECs are able to deliver projects successfully. Besides, Meredith, Shafer and Mantel (2017) and Schwalbe (2014) argued that project

planning is a crucial component of the project management process since it provides the roadmap for how projects are undertaken to ensure successful project outcomes.

The findings in the execution phase showed that the quality of a project, status reporting, changes to the project and forecasting during a project all had MSs which were greater than the midpoint of 3.00. This indicated that the respondents could be deemed to have perceived that these activities were important to achieving the project execution phase of the project life-cycle. This finding is in line with Larson and Gray (2018) who state that during the project execution phase, the quality of the project, status reporting, changes to the project and forecasting during the project are crucial components of the project execution phase that can lead to project success. Furthermore, the finding correlates with the views of Fox and Van Der Waldt (2015) who noted that the project execution phase makes it possible to coordinate and guide the project team members to work and complete the work as outlined in the approved project plan.

The results of the closing phase showed that all 5 MSs were above the midpoint of 3.00. The indication was that it could be deemed that the respondents perceived release of resources, evaluation of the project, transfer of documents, training of customers and identification of lessons learned as being significant activities during the closing phase of the project life-cycle. This finding is consistent with Sarfraz (2009) who found that the achievement of a successful closure is dependent on the importance attached to activities such as evaluation of the project, transfer of documents, training of customers and the release of resources. Furthermore, Kliem (2015) argued that the project closing phase remained one of the least acknowledged phases in the project lifecycle. Thus, the findings here is encouraging since the results show that the activities performed during this phase are important to ECs. This means that the inclusion of the closing phase in the PMF is justified.

Table 5.17: Importance of the items that contribute to project life-cycle

Statement	Response (%)					MS	Rank
	Very important… ……Not important						
	5	4	3	2	1		
Definition phase							
Project goals/objectives	63.2	33.2	3.6	0.0	0.0	4.60	1

Responsibility assignment	38.5	56.9	4.7	0.0	0.0	4.34	2
Definition of deliverables	42.0	46.7	11.3	0.0	0.0	4.31	3
Identification of milestones	37.4	53.0	9.6	0.0	0.0	4.28	4
Task/activities identification	28.0	70.3	1.6	0.0	0.0	4.26	5
Scope definition	25.0	63.5	11.5	0.0	0.0	4.13	6
Review with customer	24.5	52.5	23.1	0.0	0.0	4.01	7
List technical requirements of the project deliverables	19.8	60.4	19.8	0.0	0.0	4.00	8
Provision of limits and exclusions to project scope	17.6	59.3	23.1	0.0	0.0	3.95	9
Planning phase							
Resource availability	75.0	22.3	2.7	0.0	0.0	4.72	1
Budgets	67.0	32.4	0.5	0.0	0.0	4.66	2
Risk consideration	48.9	39.0	12.1	0.0	0.0	4.37	3
Schedules	36.3	63.2	0.5	0.0	0.0	4.36	4
Staffing on the project	34.6	52.5	11.8	1.1	0.0	4.21	5
Execution phase							
Quality of project	56.0	38.7	5.2	0.0	0.0	4.51	1
Status reporting	25.8	70.9	3.3	0.0	0.0	4.23	2
Changes to project	23.4	64.3	12.4	0.0	0.0	4.11	3
Forecasting during project	26.3	59.1	4.7	9.9	0.0	4.02	4
Closing phase							
Release of resources	69.5	30.5	0.0	0.0	0.0	4.70	1
Evaluation of project	54.9	45.1	0.0	0.0	0.0	4.55	2
Transfer of documents	11.3	64.8	23.9	0.0	0.0	3.87	3
Training of customer	11.5	61.5	23.6	3.3	0.0	3.81	4
Identification of lessons learned	16.8	59.9	10.7	12.6	0.0	3.81	5

Section F: Please indicate the degree of importance attached to the following activities during the project control cycle of project management activities in your firm. The weight of your selected response corresponds to the value of the response, that is (5) representing the highest weight and (1) the lowest weight.

Table 5.18 shows the respondents' perceptions of the degree of importance attached to the items of the project control cycle measured on a scale of 5 (very important) to 1 (not important), and MS ranging from 1.00 to 5.00. It was evident from the results that the MSs of all 5 activities of the project control cycle were above the midpoint of 3.00, which indicated that, in general, the respondents could be deemed to have perceived that all 5 activities were significant contributors to the project control cycle in the PMF. In a study on the critical factors for improving the reliability of project control metrics throughout the project lifecycle, Orgut et al. (2020) established project control activities are performed on a project from the beginning to the end and the activities include data gathering, management and analysis which are used to assess, forecast, and improve the time and cost outcomes of the project. This finding is consistent with the

findings of the current study as reported in Table 5.18. The activities identified in Table 5.18 are deemed important and are supposed to be performed from the beginning to the end of the project. Besides, the whole idea of project control is to compare actual performance with the planned performance from which variance analyses are performed and recommendations made for appropriate corrective action as needed (Rowe, 2015). The implication here is that project control activities need to be performed from the beginning to the end of the project. Therefore, ECs seeing the project control cycle activities as an important part of the project management process is encouraging and thus justifies their inclusion in the PMF that will support ECs' business and project activities in the construction industry to ensure their sustainability.

Table 5.18: Importance of the items that contribute to project control

Statement	Response (%)					MS	Rank
	Very important..... Not important						
	5	4	3	2	1		
Quality control	78.6	21.4	0.0	0.0	0.0	4.79	1
Tracking work progress	58.5	41.5	0.0	0.0	0.0	4.59	2
Holding project meetings	33.0	45.6	20.1	1.4	0.0	4.10	3
Responding to changes during project	29.7	45.6	17.6	2.2	4.9	3.93	4
Managing issues during project	29.4	43.1	6.9	13.7	6.9	3.74	5

Section G: Please indicate the extent of use of the following project management tools and templates in your project management endeavours. The weight of your selected response corresponds to the value attached to the response, that is (5) representing the highest weight and (1) the lowest weight.

Table 5.19 shows the perceptions of respondents regarding the extent to which they use project management tools and templates measured on a scale of 5 (very extensive) to 1 (not used), and MS ranging from between 1.00 to 5.00. It was notable that the 6 MSs were above the midpoint of 3.00, which indicated that, in general, the respondents could be deemed to have used extensively the 6 project management templates and tools considered for the study. The finding suggests that a quality assurance plan, responsibility assignment matrix and communication plan, which were ranked 1st, 2nd, and 3rd respectively, seemed to have been the project management

templates and tools that were used most extensively by the respondents. This finding is consistent with Bissonette (2016) and Jha (2010) who observed that project templates and tools are a fundamental aspect of project management and are required to provide a standard and structured guide in the project management process. Besides, Wells and Kloppenborg (2019) contended that using project templates and tools ensures that there is no reinventing of the wheel when it comes to the project management process. Thus, the results reported here show that ECs may consider the use of templates and tools as a crucial component of their project management endeavour. Thus, the inclusion of the templates and tools in the PMF is justified.

Table 5.19: Extent of use of project templates and tools

Statement	Response (%)					MS	Rank
	Very extensive..... Not used						
	5	4	3	2	1		
Quality assurance plan	59.6	40.4	0.0	0.0	0.0	4.60	1
Responsibility assignment matrix	42.3	57.7	0.0	0.0	0.0	4.42	2
Communication plan	40.4	50.0	9.6	0.0	0.0	4.31	3
Project priority matrix	40.4	44.5	15.1	0.0	0.0	4.25	4
Work breakdown structure	28.3	64.3	7.4	0.0	0.0	4.21	5
Risk management plan	17.3	60.2	22.5	0.0	0.0	3.95	6

5.2.5. Kruskal Wallis H Test

A Kruskal Wallis H Test was conducted to determine whether the degree of agreement with statements regarding sustainability and the project management framework were different among the participants grouped according to educational level, level of education and training in construction, number of years in construction, position of the respondents, project management activities, stage of project involved in and project management knowledge. The Kruskal Wallis H Test is normally used to determine the existence of statistically significant differences between two or more groups of independent variables, using a continuous or ordinal dependent variable (Keller, 2012; Black, 2013). Since the Kruskal Wallis H Test is not able to establish the specific group of the independent variables that is significantly different statistically from the others, a *post hoc* test is generally performed to establish that. A finding is deemed to be statistically significant if the probability that the result could have occurred randomly is less than 5 out of 100. Thus, a significant test result is concluded if $p < 0.05$.

Table 5.20: Differences in respondents' perceptions of items that contribute to economic sustainability

Demographic information	Economic sustainability			
	Category	MS	SD	P value
Level of qualification	No formal education	4.00	0.01	4.61e-06
	Primary	3.92	0.05	
	Middle school	4.11	0.45	
	High school	3.73	0.66	
	Under-graduate	3.91	0.59	
	Post-graduate	4.24	0.68	
Level of education and training in construction	None	3.83	0.61	8.45e-09
	Apprenticeship	4.31	0.47	
	Short courses	3.99	0.48	
	High school	4.06	0.39	
	Under-graduate	4.19	0.40	
	Post-graduate	3.45	0.03	
Number of years in construction	Below 5	3.88	0.31	2e-11
	5-10	3.71	0.53	
	11-15	4.22	0.78	
	16-20	4.18	0.37	
	Over 20	3.90	0.19	
Position	Owner	3.98	0.43	5.04e-09
	Manager	4.29	0.52	
	Owner/ manager	3.85	0.60	
	Project manager	4.51	0.06	
Project management activities	Principal/general contractor	3.86	0.53	1.53e-11
	Sub-contractor/specialist	4.31	0.50	
Phase of project	Defining phase	3.64	0.22	7.41e-05
	Planning phase	4.05	0.67	
	Execution phase	3.89	0.58	
	Closing phase	4.10	0.40	
Project management knowledge	Minor extent	3.78	0.55	2.36e-10
	Near minor extent	3.68	0.38	
	Moderate extent	4.00	0.48	
	Near major extent	4.19	0.55	
	Major extent	4.48	0.52	

As shown in Table 5.20, a Kruskal Wallis H Test was conducted to explore the level of agreement among participants, according to their different levels of education, regarding items that contribute to economic sustainability. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 32.56, p-value = 4.61e-06]. A *post hoc* analysis showed that the groups which differed significantly regarding items that contribute to economic sustainability were those respondents with high-school qualification compared with

those with middle-school, primary education and post-graduate degrees. There was a statistically significant difference between the perceptions of those with no formal education and those with primary education.

The results of the Kruskal Wallis H Test on participants' agreement on items that contribute to economic sustainability yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 46.15, p-value = 8.45e-09]. A *post hoc* analysis showed that the groups whose perceptions differed significantly were those respondents who had apprenticeship compared with those with no level of education and training in construction, post-graduate training and those with short courses. There was a statistically significant difference in agreement between those with high-school training compared with those with post-graduate training. There was a statistically significant difference between the perceptions of those with no level of education and training compared with those with short courses. Also, there was a statistically significant difference in agreement between those who had post-graduate training compared with those with short courses and those with under-graduate training and education in construction.

There was a statistically significant difference in agreement on items that contribute to economic sustainability among respondents with different years in the construction sector [X2(4,364) = 56.01, p-value = 2e-11]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. The perceptions of respondents with 11 to 15 years in the construction sector differed from those with 5 to 10 years, and below 5 years. Those with 16 to 20 years in the construction sector differed in agreement from those with 5 to 10 years, and those with below 5 years and over 20 years all had different views.

There was a statistically significant difference in agreement on the items that contribute to economic sustainability among respondents with different positions in firms [X2(3,364) = 41.53, p-value = 5.04e-09]. Furthermore, people in some of the positions had different perceptions about items that contribute to economic sustainability. Respondents who were managers had different perceptions compared with owners and with those who were either owners or managers. There was a statistically significant difference between agreement amongst owners and project

managers. Also, there was a difference in perception between project managers and owner/managers. There was a statistically significant difference [p-value = 1.53e-11] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions of items that contribute to economic sustainability.

There was a statistically significant difference in agreement on items that contribute to economic sustainability among respondents who were involved in different phases of projects [X2(3,364) = 21.73, p-value = 7.40e-05]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase of projects and respondents who were involved in the defining phase and execution phase had different perceptions regarding items that contribute to economic sustainability. Respondents who were involved with the execution phase of a project and those involved with the planning phase also had different views.

It was concluded that there was a statistically significant difference in perceptions of items that contribute to economic sustainability between respondents with different knowledge in project management [X2(4,364) = 50.89, p-value = 2.36e-10]. The *post hoc* result indicated a significant difference in agreement between the respondents with a major extent of knowledge in project management from those with moderate extent and near minor extent. There was a significant difference in agreement between those with a minor extent of knowledge in project management and those with moderate extent and near major extent. There was a statistically significant difference in agreement between those with moderate extent and near minor extent of knowledge in project management, while those with near major extent and near minor extent also had different perceptions regarding items that contribute to economic sustainability.

Table 5.21: Differences in respondents' perceptions of items that contribute to social sustainability

Demographic information	**Social sustainability**			
	Category	Mean	SD	P value
Level of qualification	No formal education	3.98	0.05	0.000195
	Primary	3.72	0.36	
	Middle school	3.63	0.42	
	High school	3.58	0.33	

	Under-graduate	3.52	0.20	
	Post-graduate	3.56	0.07	
Level of education and training in construction	None	3.53	0.34	1.55e-06
	Apprenticeship	3.49	0.10	
	Short courses	3.76	0.39	
	High school	3.82	0.26	
	Under-graduate	3.64	0.22	
	Post-graduate	3.55	0.06	
Number of years in construction	Below 5	3.49	0.32	1.95e-05
	5-10	3.54	0.31	
	11-15	3.56	0.22	
	16-20	3.68	0.32	
	Over 20	3.92	0.49	
Position	Owner	3.73	0.39	6.23e-07
	Manager	3.39	0.21	
	Owner/ manager	3.57	0.32	
	Project manager	3.72	0.17	
Project management activities	Principal/general contractor	3.57	0.36	5.02e-08
	Sub-contractor/specialist	3.76	0.25	
Phase of project	Defining phase	3.49	0.10	1.91e-08
	Planning phase	3.51	0.27	
	Execution phase	3.77	0.39	
	Closing phase	3.51	0.28	
Project management knowledge	Minor extent	3.48	0.31	4.30e-11
	Near minor extent	3.76	0.46	
	Moderate extent	3.77	0.35	
	Near major extent	3.47	0.21	
	Major extent	3.60	0.18	

As shown in Table 5.21, a Kruskal Wallis H Test was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the items that contribute to social sustainability. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 24.24, p-value = 0.000195]. A *post hoc* analysis showed that the groups which differed significantly regarding items that contribute to social sustainability were those respondents with high-school qualification compared with those with no formal education. There was a statistically significant difference in agreement between those with middle-school qualification and those without formal education. There was a statistically significant difference in agreement between respondents with no formal education and those with post-graduate as well as under-graduate education.

The results of the Kruskal Wallis H Test on the differences in agreement on the items that contribute to social sustainability yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 34.94,

p-value = 1.55e-06[. A *post hoc* analysis showed that the groups whose perceptions differed significantly were those respondents who had apprenticeship compared with those with short courses and under-graduate training. There was a statistically significant difference in agreement between those with no level of education and training and those with short courses.

There was a statistically significant difference in the level of agreement on items that contribute to social sustainability among respondents with different years in the construction sector [X2(4,364) = 27.04, p-value = 1.95e-05]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. The perceptions of respondents with 11 to 15 years in the construction sector differed from those with over 20 years in the industry, those with 5 to 10 years in the construction sector differed from those with over 20 years, and the perceptions of those with below 5 years and over 20 years differed.

There was a statistically significant difference in the level of agreement on the items that contribute to social sustainability among respondents with different positions in the firms [X2(3,364) = 31.64, p-value = 6.24e-07]. Furthermore, people in some of the positions had different perceptions about social sustainability. Respondents who were managers had different perceptions of items that contribute to social sustainability from owners, owner/managers, and project managers. There was a statistically significant difference between the perceptions of owners and owner/managers. Also, there was a difference in perception between project managers and owner/managers. There was a statistically significant difference [p-value = 5.02e-08] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions of the items that contribute to social sustainability.

There was a statistically significant difference in the level of agreement on items that contribute to social sustainability among respondents who were involved in different phases of projects [X2(3,364) = 38.80, p-value = 1.91e-08]. Furthermore, certain groups of respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase and execution phase had different perceptions regarding items that contribute to social sustainability. There was a significant difference in agreement between those involved in the

definition phase and those involved in the execution phase. There was also a significant difference in agreement between those who were involved in the execution phase and those involved in the planning phase.

It was concluded that there was a statistically significant difference in the perceptions of the items that contribute to social sustainability between respondents with different knowledge in project management [X2 (4,364) = 54.42, p-value = 4.30e-11]. The *post hoc* result indicated that there was a significant difference in agreement between the respondents with a minor extent of knowledge in project management and those with a moderate extent and near minor extent. There was a significant difference between the proceptions of those with a moderate extent of knowledge in project management and those with a near major extent.

Table 5.22: Differences in respondents' perceptions of items that contribute to environmental sustainability

Demographic information	**Environmental sustainability**			
	Category	Mean	SD	P value
Level of qualification	No formal education	4.07	0.24	0.0042
	Primary	3.68	0.30	
	Middle school	3.84	0.48	
	High school	3.70	0.61	
	Under-graduate	3.90	0.57	
	Post-graduate	3.70	0.21	
Level of education and training in construction	None	3.81	0.61	4.04e-09
	Apprenticeship	3.73	0.33	
	Short courses	3.72	0.31	
	High school	3.77	0.06	
	Under-graduate	4.52	0.51	
	Post-graduate	3.45	0.00	
Number of years in construction	Below 5	3.95	0.35	2.76e-13
	5-10	3.63	0.52	
	11-15	4.13	0.64	
	16-20	3.80	0.19	
	Over 20	3.42	0.18	
Position	Owner	3.84	0.46	1.25e-11
	Manager	4.19	0.58	
	Owner/manager	3.62	0.37	
	Project manager	4.54	0.60	
Project management activities	Principal/general contractor	3.64	0.39	2.2e-16
	Sub-contractor/specialist	4.26	0.51	
Phase of project	Defining phase	3.42	0.05	2.2e-16
	Planning phase	3.64	0.34	
	Execution phase	3.81	0.65	
	Closing phase	4.04	0.24	
Project management knowledge	Minor extent	3.79	0.51	8.51e-10

Demographic information	Environmental sustainability			
	Category	Mean	SD	P value
	Near minor extent	3.42	0.57	
	Moderate extent	3.69	0.32	
	Near major extent	3.95	0.59	
	Major extent	4.28	0.50	

As shown in Table 5.22, a Kruskal Wallis H Test was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the items that contribute to environmental sustainability. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 17.16, p-value = 0.0042]. A *post hoc* analysis showed that the groups which differed significantly regarding items that contribute to environmental sustainability were those respondents with no formal education compared with those with post-graduate and primary education.

The results of the Kruskal Wallis H Test on the differences in agreement on the items that contribute to environmental sustainability yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 47.73, p-value = 4.04e-09]. A *post hoc* analysis showed that the groups which differed significantly regarding items that contribute environmental sustainability were those respondents who had apprenticeship compared with those who had under-graduate education and training, and those who had high-school education and training compared with those who had post-graduate training. There was a difference between the perceptions of respondents who had no formal training and education in construction compared with those who had under-graduate training. There was a statistically significant difference in agreement between those with post-graduate education and training compared with those with short courses and under-graduate studies. Also, the respondents who had completed short courses had different perceptions on the items that contribute to environmental sustainability from those with under-graduate training.

There was a statistically significant difference in agreement on the items that contribute to environmental sustainability among respondents with different years in the construction sector [X2(4,364) = 64.85, p-value = 2.76e-13]. Furthermore, certain

groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed with regards to their perceptions about items that contribute to environmental sustainability from those with16 to 20 years, 5 to 10 years and over 20 years in the industry. Those with16 to 20 years in the construction sector had different perceptions from those with over 20 years and there were differences in agreement between those with below 5 years and over 20 years.

There was a statistically significant difference in the level of agreement on the items that contribute to environmental sustainability among respondents with different positions in firms [X2(3,364) = 53.78, p-value = 1.25e-11]. Furthermore, people in some of the positions had different perceptions about the items that contribute to environmental sustainability. Respondents who were managers had different perceptions from owner/managers. There was a statistically significant difference between owners and owner/managers and project managers. Also, there was a difference in perception between project managers and owner/managers. There was a statistically significant difference [t-value = -10.42, p-value = 2.2e-16] in agreement between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions on the items that contribute to environmental sustainability.

There was a statistically significant difference in the level of agreement on the items that contribute to environmental sustainability among respondents who were involved in different phases of projects [X2(3,364) = 85.96, p-value = 2.2e-16]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase and defining phase, the execution phase and planning phase had different perceptions regarding the items that contribute to environmental sustainability. There was a significant difference between the perceptions of those involved in the definition phase and those involved in the execution phase and planning phase.

It was concluded that there was a statistically significant difference in the perceptions on the items that contribute to environmental sustainability between respondents with different knowledge in project management [X2(4,364) = 48.22, p-value = 8.51e-10]. The *post hoc* result indicated a significant difference in the level of agreement between

the respondents with a major extent of knowledge in project management and those with minor extent, moderate extent, near minor extent and near major extent. There was a significant difference between those with a minor extent of knowledge in project management and those with moderate extent and near minor extent knowledge. Those with a moderate extent of knowledge also had a significant difference in perception compared with those with a near minor extent, while those with a near major extent had a statistically significant difference in perception compared with those with a near minor extent of knowledge in project management.

Table 5.23: Differences in respondents' perceptions of the importance of the items in the project life-cycle

Demographic information	**Project life-cycle**			
	Category	Mean	SD	P value
Level of qualification	No formal education	4.25	0.13	2.2e-16
	Primary	4.39	0.23	
	Middle school	4.35	0.32	
	High school	4.07	0.35	
	Under-graduate	4.44	0.26	
	Post-graduate	3.88	0.13	
Level of education and training in construction	None	4.14	0.37	5.02e-14
	Apprenticeship	4.20	0.31	
	Short courses	4.40	0.20	
	High school	4.20	0.03	
	Under-graduate	4.52	0.38	
	Post-graduate	3.74	0.09	
Number of years in construction	Below 5	4.04	0.21	1.47e-09
	5-10	4.17	0.40	
	11-15	4.41	0.29	
	16-20	4.33	0.31	
	Over 20	4.28	0.23	
Position	Owner	4.27	0.28	2.33e-12
	Manager	4.57	0.11	
	Owner/manager	4.16	0.35	
	Project manager	4.50	0.47	
Project management activities	Principal/general contractor	4.24	0.35	0.075
	Sub-contractor/specialist	4.30	0.30	
Phase of project	Defining phase	4.08	0.40	0.00029
	Planning phase	4.34	0.30	
	Execution phase	4.18	0.36	
	Closing phase	4.30	0.32	
Project management knowledge	Minor extent	4.11	0.37	5.08e-09
	Near minor extent	4.14	0.18	
	Moderate extent	4.38	0.22	
	Near major extent	4.26	0.42	
	Major extent	4.31	0.39	

A Kruskal Wallis H Test (Table 5.23) was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the importance of the items in the project life-cycle. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 98.55, p-value = 2.2e-16]. A *post hoc* analysis showed that the groups which differed significantly regarding the importance of the items in the project life-cycle were those respondents with high-school qualification compared with those with middle school, primary and under-graduate education. There was a statistically significant difference in agreement between those with middle-school qualification and post-graduate education. There was a statistically significant difference in agreement between respondents with no formal education and those with post-graduate degrees. Also, there was a difference in agreement between the respondents with post-graduate qualification and the respondents with primary and under-graduate education.

The results of the Kruskal Wallis H Test on the level of agreement on the importance of the items in the project life-cycle yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 71.49, p-value = 5.02e-14]. A *post hoc* analysis showed that the groups which differed significantly regarding the importance of the items in the project life-cycle were those respondents who had apprenticeship compared with those who had completed short courses, under-graduate and post-graduate levels of education and training. There was a statistically significant difference in agreement between those with no level of education and training and those with short courses, and between those with under-graduate and post-graduate levels of training. Also, there was a statistically significant difference in the perceptions regarding the importance of the items in the project life-cycle between respondents with a post-graduate level of education and training and the respondents with short courses and under-graduate training.

There was a statistically significant difference in the level of agreement on the importance of the items in the project life-cycle among respondents with different years in the construction sector [X2(4,364) = 47.07, p-value = 1.47e-09]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed

with regards to their perceptions of the importance of the items in the project life-cycle from those with below 5 years and between 5 to 10 years in the industry. The perceptions of those with 16 to 20 years in the construction sector differed from those with below 5 years and 5 to 10 years and the perceptions of those with below 5 years and over 20 years also differed.

There was a statistically significant difference in the perceptions of the importance of the items in the project life-cycle among respondents with different positions in firms [X2(3,364) = 57.20, p-value = 2.33e-12]. Furthermore, some people in the positions had different perceptions about the importance of the items in the project life-cycle. Respondents who were managers had different perceptions from owners and owner/managers. There was a statistically significant difference in agreement between owner/managers and project managers. However, there was no statistically significant difference [t-value = -1.79, p-value = 0.075] between principal/general contractors and subcontractors/specialist contractors regarding their perceptions of the importance of items in the project life-cycle.

There was a statistically significant difference in the perceptions of the importance of the items in the project life-cycle among respondents who were involved in different phases of projects [X2(3,364) = 18.91, p-value = 0.00029]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the defining phase and planning phase had different perceptions regarding the importance of the items in the project life-cycle. There was also a significant difference in agreement between those involved in the planning phase and the execution phase.

It was concluded that there was a statistically significant difference in the perceptions of the importance of the items in the project life-cycle between respondents with different knowledge in project management [X2 (4,364) = 44.49, p-value = 5.08e-09]. The *post hoc* result indicated that there was a significant difference the perceptions between the respondents with a minor extent of knowledge in project management and those with moderate extent. There was a significant difference in perceptions between those with a moderate extent of knowledge in project management and those with near minor extent.

Table 5.24: Differences in respondents' perceptions of the importance of the items in the project control cycle

Demographic information	**Project control cycle**			
	Category	Mean	SD	P value
Level of qualification	No formal education	5.00	0.00	8.69e-13
	Primary	4.59	0.39	
	Middle school	4.10	0.69	
	High school	4.05	0.60	
	Under-graduate	4.51	0.30	
	Post-graduate	4.07	0.20	
Level of education and training in construction	None	4.11	0.64	5.52e-05
	Apprenticeship	4.50	0.46	
	Short courses	4.22	0.58	
	High school	4.20	0.28	
	Under-graduate	4.53	0.50	
	Post-graduate	3.88	0.19	
Number of years in construction	Below 5	3.84	0.47	1.13e-12
	5-10	4.15	0.60	
	11-15	4.62	0.40	
	16-20	4.33	0.34	
	Over 20	3.95	0.91	
Position	Owner	4.13	0.69	6.69e-05
	Manager	4.51	0.47	
	Owner/manager	4.20	0.53	
	Project manager	4.69	0.40	
Project management activities	Principal/general contractor	4.14	0.62	5.99e-10
	Subcontractor/specialist	4.51	0.41	
Phase of project	Defining phase	4.37	0.59	2.91e-06
	Planning phase	4.35	0.36	
	Execution phase	4.01	0.62	
	Closing phase	4.38	0.63	
Project management knowledge	Minor extent	4.11	0.67	0.000122
	Near minor extent	3.79	0.67	
	Moderate extent	4.37	0.54	
	Near major extent	4.23	0.45	
	Major extent	4.39	0.42	

As shown in Table 5.24 above, a Kruskal Wallis H Test was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the importance of the items in the project control cycle. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 65.53, p-value = 8.69e-13]. A *post hoc* analysis showed that the groups which differed significantly regarding the importance of the items in the project control cycle were those respondents with high-school qualification compared with those with no formal education, primary and under-graduate education.

There was a statistically significant difference in agreement between those with middle school qualification and those without formal education, primary and under-graduate education. There was a statistically significant difference between the perceptions of respondents with no formal education and those with primary, under-graduate and post-graduate education. Also, there was significant difference in agreement between respondents with post-graduate education and the respondents with primary and under-graduate education.

The results of the Kruskal Wallis H Test on the level of agreement on the importance of the items in the project control cycle yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 27.07, p-value = 5.52e-05]. A post hoc analysis showed that the groups which differed significantly regarding the importance of the items in the project control cycle were those respondents who had apprenticeship compared with those who had no level of education and training, short courses and post-graduate training in construction. There was a statistically significant difference in agreement between those with a post-graduate level of education and training and those with short courses and an under-graduate level of education and training.

There was a statistically significant difference in the perception of the importance of the items in the project control cycle among respondents with different years in the construction sector [X2(4,364) = 261.94, p-value = 1.13e-12]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed with regards to their perception of the importance of the items in the project control cycle from those with 16 to 20 years, 5 to 10 years, below 5 years and over 20 years in the industry. Those with 16 to 20 years in the construction sector had different perceptions from those with below 5 years, and the respondents with 5 to 10 years had different perceptions on the importance of the items in the project control cycle from respondents with below 5 years of experience in the construction sector.

There was a statistically significant difference in the level of agreement of the importance of the items in the project control cycle among respondents with different positions in firms [X2(3,364) = 21.954, p-value = 6.69e-05]. Furthermore, some people

in the positions had different perceptions about the importance of the items in the project control cycle. Respondents who were managers had different perceptions from owners and owner/manager. There was a statistically significant difference between owners and project managers. Also, there was a difference in agreement between project managers and owner/managers. There was a statistically significant difference in agreement [p-value = 5.99e-10] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions of the importance of the items in the on project control cycle.

There was a statistically significant difference the level of agreement on the importance of items in the project control cycle among respondents who were involved in different phases of projects [X2(3,364) = 28.46, p-value = 2.91e-06]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase and the execution phase had different perceptions regarding the importance of items in the project control cycle. There was also a significant difference in agreement between those involved the planning phase and the execution phase.

It was concluded that there was a statistically significant difference in the perceptions of the importance of the items in the project control cycle between respondents with different knowledge in project management [X2 (4,364) = 23.073, p-value = 0.000122]. The *post hoc* result indicated a significant difference in agreement between the respondents with a major extent of knowledge in project management and those with near minor extent. There was a significant difference in agreement between those with a moderate extent of knowledge in project management and those with near minor extent. Also, there was a statistically significant difference in agreement between respondents with a near major extent and respondents with a near minor extent of knowledge in project management.

Table 5.25: Differences in respondents' perceptions of the extent of the use of project templates and tools

Demographic information	**Project templates and tools**			
	Category	Mean	SD	P value
Level of qualification	No formal education	4.58	0.51	2.2e-16

Demographic information	Project templates and tools			
	Category	Mean	SD	P value
	Primary	4.09	0.43	
	Middle school	4.52	0.34	
	High school	4.09	0.42	
	Under-graduate	4.38	0.39	
	Post-graduate	3.87	0.17	
Level of education and training in construction	None	4.20	0.49	6.60e-10
	Apprenticeship	4.31	0.34	
	Short courses	4.44	0.37	
	High school	4.00	0.00	
	Under-graduate	4.35	0.34	
	Post-graduate	3.67	0.00	
Number of years in construction	Below 5	3.98	0.32	2.83e-09
	5-10	4.30	0.50	
	11-15	4.51	0.40	
	16-20	4.22	0.41	
	Over 20	4.37	0.14	
Position	Owner	4.37	0.42	2.62e-09
	Manager	4.62	0.37	
	Owner/manager	4.16	0.42	
	Project manager	4.41	0.33	
Project management activities	Principal/general contractor	4.28	0.44	0.4371
	Subcontractor/specialist	4.32	0.43	
Phase of project	Defining phase	4.03	0.42	1.92e-13
	Planning phase	4.51	0.37	
	Execution phase	4.11	0.41	
	Closing phase	4.41	0.41	
Project management knowledge	Minor extent	4.14	0.48	1.58e-07
	Near minor extent	4.53	0.26	
	Moderate extent	4.43	0.37	
	Near major extent	4.24	0.48	
	Major extent	4.21	0.31	

Table 5.25 shows that a Kruskal Wallis H Test was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the extent of the use of project templates and tools. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 101.15, p-value = 2.2e-16]. A *post hoc* analysis showed that the groups which differed significantly regarding the extent of the use of project templates and tools were those respondents with high-school qualification compared with those with no formal education, middle school and under-graduate education. There was a statistically significant difference in the level of agreement between those with middle-school qualification and those with post-graduate and primary education. There was a statistically significant difference in

agreement between respondents with no formal education and those with post-graduate education. There was a significant difference between the perceptions of respondents with a post-graduate level of education and under-graduate education. Also, there was a statistically significant difference in agreement between primary and under-graduate respondents.

The results of the Kruskal Wallis H Test on respondents' perceptions of the extent of the use of project templates and tools yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 51.57, p-value = 6.60e-10]. A *post hoc* analysis showed that the groups which differed significantly regarding their perceptions of the extent of the use of project templates and tools were those respondents who had apprenticeship compared with those with post-graduate education. There was a statistically significant difference in agreement between those with high-school and a post-graduate level of education. There was a statistically significant difference in the level of agreement between those without formal education and those with short courses and post-graduate degrees. Also, there was a significant difference in the level of agreement between respondents with post-graduate education and those with short courses and under-graduate education.

There was a statistically significant difference in the level of agreement in the perceptions of the extent of the use of project templates and tools among respondents with different years in the construction sector [X2(4,364) = 45.70, p-value = 2.84e-09]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed with regards to their perceptions of the extent of the use of project templates and tools from those with 16 to 20 years, between 5 to 10 years and below 5 years in the industry. The perceptions of those with 16 to 20 years differed from those with below 5 years and over 20 years in the construction sector. There was a statistically significant difference in agreement between respondents with 5 to 10 years' experience in the construction sector and those with below 5 years. There was also a difference in the level of agreement on the extent of the use of project templates and tools between respondents who had below 5 years and over 20 years.

There was a statistically significant difference in the level of agreement on the extent of the use of project templates and tools among respondents with different positions in firms [X2(3,364) = 42.87, p-value = 2.62e-09]. Furthermore, some people in the positions had different perceptions about the extent of the use of project templates and tools. Respondents who were managers had different perceptions of the extent of the use of project templates and tools from owners and owner/managers. There was a statistically significant difference in agreement between owners and owner/managers. However, there was no statistically significant difference [p-value = 0.437] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions of the extent of the use of project templates and tools.

There was a statistically significant difference in the perception of the extent of the use of project templates and tools among respondents who were involved in different phases of projects [X2 (3,364) = 62.27, p-value = 1.92e-13]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase had different perceptions regarding the extent of the use of project templates and tools from respondents involved in the defining phase and execution phase. There was a significant difference in agreement between those involved in the definition phase and planning phase. There was a significant difference in the level of agreement between those who were involved in the execution phase and those involved in the planning phase.

It was concluded that there was a statistically significant difference in the perceptions of the extent of the use of project templates and tools between respondents with different knowledge in project management [X2(4,364) = 37.28, p-value = 1.58e-07]. The *post hoc* result indicated a significant difference in agreement between the respondents with a major extent of knowledge in project management and those with a moderate extent and near minor extent. There was a significant difference in agreement between those with a minor extent of knowledge and those with a moderate and near minor extent of knowledge. There was a statistically significant difference in agreement between respondents with a near major extent of knowledge and those with near minor extent.

Table 5.26: Differences in respondents' perceptions of the use of a PMF

Demographic information	**Project management framework**			
	Category	Mean	SD	P value
Level of qualification	No formal education	4.42	0.07	2.2e-16
	Primary	4.36	0.27	
	Middle school	4.34	0.35	
	High school	4.07	0.37	
	Under-graduate	4.44	0.28	
	Post-graduate	3.90	0.13	
Level of education and training in construction	None	4.15	0.40	2.97e-11
	Apprenticeship	4.26	0.31	
	Short courses	4.38	0.24	
	High school	4.16	0.06	
	Under-graduate	4.49	0.39	
	Post-graduate	3.75	0.06	
Number of years in construction	Below 5	4.00	0.23	2.89e-11
	5-10	4.19	0.42	
	11-15	4.46	0.31	
	16-20	4.31	0.30	
	Over 20	4.25	0.28	
Position	Owner	4.27	0.31	1.15e-09
	Manager	4.57	0.11	
	Owner/manager	4.17	0.37	
	Project manager	4.51	0.44	
Project management activities	Principal/general contractor	4.23	0.37	0.0063
	Subcontractor/Specialist	4.34	0.30	
Phase of project	Defining phase	4.11	0.43	1.98e-06
	Planning phase	4.37	0.28	
	Execution phase	4.14	0.37	
	Closing phase	4.33	0.34	
Project management knowledge	Minor extent	4.12	0.41	1.50e-07
	Near minor extent	4.16	0.19	
	Moderate extent	4.39	0.26	
	Near major extent	4.25	0.40	
	Major extent	4.30	0.38	

A Kruskal Wallis H Test (Table 5.26) was conducted to explore the level of agreement among participants, according to their different levels of education, regarding the use of a PMF. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 85.09, p-value = 2.2e-16]. A *post hoc* analysis showed that the groups which differed significantly regarding the use of a PMF were those respondents with high-school qualification compared with those with primary, middle-school and under-graduate education. There was a statistically significant difference in the level of agreement between those with middle-school qualification and those with post-graduate

education. There was a statistically significant difference in the level of agreement between respondents with no formal education and those with post-graduate degrees. Also, there was a statistically significant difference in agreement between respondents with post-graduate education and those with primary and under-graduate education regarding their perceptions of the use of a PMF.

The results of the Kruskal Wallis H Test on the level of agreement in participants' perceptions of the use of a PMF yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 58.12, p-value = 2.97e-11]. A *post hoc* analysis showed that the groups which differed significantly regarding their perceptions of the use of a PMF were those respondents who had apprenticeship compared with those had completed short courses, under-graduate education and post-graduate degrees. There was a statistically significant difference in the level of agreement between those with no level of education and training and those who had completed short courses, under-graduate education, and post-graduate degrees. There was a statistically significant difference in the perceptions regarding the use of a PMF of respondents with post-graduate degrees compared with the respondents with short courses and under-graduate education.

There was a statistically significant difference in agreement on the use of a PMF among respondents with different years in the construction sector [X2(4,364) = 55.24, p-value = 2.89e-11]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed with regards to their perceptions on the use of a PMF compared with those with below 5 years, 5 to 10 years, 16 to 20 years and over 20 years in the industry. The perceptions of those with 16 to 20 years in the construction sector differed from those with below 5 years, and the level of agreement differed between those with below 5 years and over 20 years.

There was a statistically significant difference in the level of agreement on the use of a PMF among respondents with different positions in firms [X2(3,364) = 44.56, p-value = 1.15e-09]. Furthermore, some people in the positions had different perceptions on the use of a PMF. Respondents who were managers had different perceptions from owners and owner/managers. There was a statistically significant difference in

agreement between owners and project managers. Also, there was difference in perceptions between project managers and owner/managers. There was a statistically significant difference [p-value = 0.0063] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions on the use of a PMF.

There was a statistically significant difference in the level of agreement in perceptions on the use of a PMF among respondents who were involved in different phases of projects [X2(3,364) = 29.26, p-value = 1.98e-06]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase and the execution phase had different perceptions regarding the use of a PMF. There was a significant difference in agreement between those involved in the definition phase and the planning phase. There was a significant difference in agreement between those who were involved in the execution phase and those involved in the planning phase.

It was concluded that there was a statistically significant difference in participants' perceptions on the use of a PMF between respondents with different knowledge in project management [X2(4,364) = 37.38, p-value = 1.50e-07]. The *post hoc* result indicated a significant difference in the level of agreement between the respondents with a major extent of knowledge in project management compared with those with a minor extent. There was a significant difference in agreement between those with a minor extent and a moderate extent of knowledge in project management. There was a statistically significant difference in agreement between respondents with a moderate extent and a near minor extent of knowledge.

Table 5.27: Differences in respondents' perceptions of overall sustainability in construction

Demographic information	**Overall sustainability**			
	Category	Mean	SD	P value
Level of qualification	No formal education	4.02	0.07	0.024
	Primary	3.76	0.24	
	Middle school	3.84	0.32	
	High school	3.66	0.45	
	Under-graduate	3.77	0.42	
	Post-graduate	3.81	0.27	
Level of education and training in construction	None	3.71	0.45	3.56e-05
	Apprenticeship	3.82	0.23	

	Short courses	3.81	0.28	
	High school	3.87	0.05	
	Under-graduate	4.11	0.36	
	Post-graduate	3.49	0.03	
Number of years in construction	Below 5	3.76	0.22	5.33e-08
	5-10	3.62	0.39	
	11-15	3.96	0.48	
	16-20	3.87	0.24	
	Over 20	3.74	0.18	
Position	Owner	3.84	0.28	1.33e-08
	Manager	3.94	0.40	
	Owner/manager	3.67	0.37	
	Project manager	4.24	0.27	
Project management activities	Principal/general contractor	3.68	0.34	2.2e-16
	Sub-contractor/specialist	4.09	0.26	
Phase of project	Defining phase	3.51	0.04	5.02e-06
	Planning phase	3.71	0.37	
	Execution phase	3.82	0.43	
	Closing phase	3.87	0.24	
Project management knowledge	Minor extent	3.68	0.40	2.40e-06
	Near minor extent	3.62	0.37	
	Moderate extent	3.81	0.29	
	Near major extent	3.85	0.39	
	Major extent	4.10	0.29	

As shown in Table 5.27, a Kruskal Wallis H Test was conducted to explore the level of participants' agreement, according to their different levels of education, regarding their perceptions of overall sustainability in construction. The results of the Kruskal Wallis H Test yielded statistically significant variation among the different levels of qualifications [X2(5,364) = 12.92, p-value = 0.024]. A *post hoc* analysis showed that the groups which differed significantly in their perceptions of overall sustainability were those respondents with high-school qualification compared with those with no formal education. There was a statistically significant difference in the perceptions of those with no formal education and respondents with under-graduate education.

The results of the Kruskal Wallis H Test on the level of agreement in perceptions of overall sustainability yielded statistically significant variation among the different levels of education and training in construction [X2(5,364) = 28.05, p-value = 3.56e-05]. A *post hoc* analysis showed that the groups which differed significantly in their perceptions of overall sustainability were those respondents who had apprenticeship compared with those who had post-graduate degrees. There was a statistically significant difference in the level of agreement between those with no level of education and training and those with under-graduate education and training. There

was a statistically significant difference in agreement between respondents with a post-graduate level of training and respondents with short courses and under-graduate training.

There was a statistically significant difference in the level of agreement in perceptions on overall sustainability among respondents with different years in the construction sector [X2(4,364) = 39.563, p-value = 5.33e-08]. Furthermore, certain groups among the respondents with different years in the construction sector had diverse views. Respondents with 11 to 15 years in the construction sector differed with regards to their perceptions on overall sustainability compared with those with below 5 years and 5 to 10 years in the industry. The perceptions of those with 16 to 20 years in the construction sector differed from those with 5 to 10 years and over 20 years.

There was a statistically significant difference in the perceptions of overall sustainability among respondents with different positions in firms [X2(3,364) = 39.55, p-value = 1.33e-08]. Furthermore, some people in the positions had different perceptions about sustainability. Respondents who were managers had different perceptions of overall sustainability from project managers. There was a statistically significant difference in the level of agreement between owners and owner/managers and project managers. Also, there was a difference in the perceptions of project managers and owner/managers. There was a statistically significant difference [p-value = 2.2e-16] between principal/general contractors and sub-contractors/specialist contractors regarding their perceptions on overall sustainability.

There was a statistically significant difference in perceptions of overall sustainability among respondents who were involved in different phases of projects [X2(3,364) = 27.33, p-value = 5.02e-06]. Furthermore, certain groups among the respondents who were involved in different phases of projects had different perceptions. Respondents who were involved in the closing phase and the defining phase had different perceptions regarding overall sustainability. There was a significant difference in agreement between those involved in the definition phase and the execution phase.

It was concluded that there was a statistically significant difference in the perceptions of overall sustainability between respondents with different knowledge in project

management [X2(4,364) = 31.51, p-value = 2.40e-06]. The *post hoc* result indicated a significant difference in the level of agreement between the respondents with a major extent of knowledge in project management and those with a minor extent, near minor extent, moderate extent and near major extent. There was a significant difference in agreement between those with a minor extent of knowledge in project management and those with a moderate extent.

5.2.6. Validity and Reliability of Variables

To address the objectives of the study, preliminary checks were done to determine the validity and reliability of the variables (or constructs) used in the analysis. The variables constructed for further analysis were: economic, social, and environmental sustainability as well as project life-cycle, project control cycle, templates and tools. These variables were constructed by summing up the responses of all the items relating to the specific variables. Cronbach's alpha coefficients were calculated to determine whether the variables were reliable (Bikner-Ahsbahs, Knipping and Presmeg, 2015). Generally, a Cronbach's alpha value of 0.70 and above are considered to represent that a measuring instrument is reliable (Taber, 2017). The descriptive and inferential statistics relating to the variables of the current study are presented in Tables 5.28, 5.29, 5.30, 5.31, 5.32, and 5.33.

Table 5.28: Reliability of project life-cycle variables

Variables	MS	SD	Rank
Definition			
Project goal	4.60	0.56	1
Responsibility assignment	4.34	0.56	2
Definition of deliverables	4.31	0.66	3
Identification of milestones	4.28	0.63	4
Tasks/activities identification	4.26	0.48	5
Scope definition	4.13	0.59	6
Review with customer	4.01	0.69	7
Listing of technical requirements of the project deliverables	4.00	0.63	8
Provision of limits and exclusions to project scope	3.95	0.64	9
Planning			
Resource availability	4.72	0.51	1
Budgets	4.66	0.48	2
Risk consideration	4.37	0.69	3
Schedules	4.36	0.49	4
Staffing on the project	4.21	0.68	5
Execution			

Quality of project	4.51	0.60	1
Status reporting	4.23	0.49	2
Changes to project	4.11	0.59	3
Forecasting during project	4.02	0.84	4
Closing			
Release resources	4.70	0.46	1
Evaluation of project	4.55	0.50	2
Transfer of documents	3.87	0.58	3
Training of customer	3.81	0.67	4
Identification of lessons learned	3.81	0.86	5
Cronbach's alpha: 0.90 Average inter-item correlation: 0.27			

Table 5.28 shows that the individual MSs of the variables relating to the project life-cycle could be combined safely into a single mean with internal reliability of 0.90 (Cronbach's alpha), and the variables could also be deemed to be correlated with an average inter-item correlation of 0.27.

Table 5.29: Reliability of project control cycle variables

Variables	**MS**	**SD**	**Rank**
Quality control	4.79	0.41	1
Tracking work progress	4.59	0.49	2
Holding project meetings	4.10	0.76	3
Responding to changes during project	3.93	1.00	4
Managing issues during project	3.74	1.21	5
Cronbach's alpha: 0.77 Average inter-item correlation: 0.38			

Table 5.29 shows that the individual MSs of the variables relating to project control cycles could be combined safely into a single mean with internal reliability of 0.77 (Cronbach's alpha), and the variables could also be deemed to be correlated with an average inter-item correlation of 0.38.

Table 5.30: Reliability of project templates and tools variables

Variables	**MS**	**SD**	**Ranks**
Quality assurance plan	4.60	0.49	1
Responsibility assignment matrix	4.42	0.49	2
Communication plan	4.31	0.64	3
Project priority matrix	4.25	0.70	4
Work breakdown structure	4.21	0.56	5
Risk management matrix	3.95	0.63	6

Cronbach's alpha: 0.83 Average inter-item correlation: 0.46

Table 5.30 shows that the individual MSs of the variables relating to project templates and tools could be combined safely into a single mean with internal reliability of 0.83 (Cronbach's alpha), and the variables could also be deemed to be correlated with an average inter-item correlation of 0.46.

Table 5.31: Reliability of economic sustainability variables

Variable	MS	SD	Rank
The company uses full cost accounting and real-time cost pricing to set prices and tariffs for goods and services.	4.39	0.64	1
Companies must develop a measurement and reporting system for evaluating performance and areas for improvement.	4.21	0.68	2
The company enhances competitiveness in the marketplace by adopting policies and practices that advance sustainability.	4.20	0.67	3
Improved sustainable performance is a source of productivity improvement.	4.19	0.76	4
Construction firms need to promote best practice in consumption procurement through the supply chain.	4.04	0.69	5
Construction firms need to use technology and innovation to increase the sustainability of the construction process.	4.00	0.80	6
Improved sustainable performance leads to new market opportunities.	3.94	0.75	7
Construction firms should execute projects that minimise resource consumption.	3.67	1.11	8
The company promotes employment creation through labour-intensive construction.	3.09	1.30	9
Cronbach's alpha: 0.83 Average inter-item correlation: 0.46			

Table 5.31 shows that the variables relating to economic sustainability could be combined safely into a single mean with internal reliability of 0.83 (Cronbach's alpha), and the variables could also be deemed to be correlated with an average inter-item correlation of 0.46.

Table 5.32: Reliability of social sustainability variables

Variables	MS	SD	Rank
Construction companies should protect and promote human health through a healthy and safe working environment.	4.10	0.66	1
Contractors must comply with governmental sustainability-related legislation.	4.03	0.59	2

Construction companies should have a good relationship with employees.	3.86	0.66	3
Construction companies should implement skills training and capacity enhancement to enable meaningful participation in a project.	3.73	0.69	4
Contractors should use appropriate procurement and contracting strategies to promote social sustainability.	3.72	0.56	5
There should be fair compensation for people adversely affected by construction operations.	3.68	0.67	6
Construction companies need to increase their commitment to sustainable construction through education and training of their employees.	3.64	0.64	7
Construction companies must seek fair distribution of the social costs of construction.	3.48	0.60	8
Construction companies should promote corporate social responsibility.	3.40	0.60	9
Construction companies need to seek equitable distribution of the social benefits of construction.	3.31	0.58	10
Construction companies must improve the quality of human life including poverty alleviation.	2.80	0.79	11
Cronbach's alpha: 0.75 Average inter-item correlation: 0.23			

Table 5.32 shows that the variables relating to social sustainability could be combined safely into a single mean with internal reliability of 0.75 (Cronbach's alpha), and the variables could also be deemed to be correlated with an average inter-item correlation of 0.23.

Table 5.33: Reliability of environmental sustainability variables

Variables	**MS**	**SD**	**Rank**
The company chooses environmentally responsible suppliers and contractors.	4.26	0.76	1
Contractors need to make attempts to reduce physical waste generation.	3.97	0.56	2
Construction firms should use energy- and water-efficient methods/techniques.	3.85	0.64	3
Implementation of environmental strategies will improve contractors' competencies in environmental management.	3.81	0.60	4
Construction companies should reduce carbon emissions during construction.	3.77	0.70	5
Construction firms need to support green design and construction.	3.75	0.63	6
Contractors need to use techniques that minimise the harmful effects of construction activities on the environment.	3.74	0.67	7
Improvement of environmental performance in a construction organisation leads to opportunity for increasing competitive advantage.	3.72	0.68	8
Construction companies must create a healthy, non-toxic environment.	3.71	0.69	9
Implementation of environmental strategies leads to improvements in business performance.	3.66	0.70	10

Construction companies must decrease CO_2 emissions by decreasing energy consumption.	3.51	0.90	11
Cronbach's alpha: 0.91 Average inter-item correlation: 0.50			

Table 5.33 shows that the variables relating to environmental sustainability could be combined safely into a single mean with internal reliability of 0.91 (Cronbach's alpha), and the variables could also be deemed to be correlated with and average inter-item correlation of 0.50.

Table 5.34: Correlations between the constructs

Correlations		**Sustainability**			**PMF**		
		Economic	Social	Environment	Life-cycle	Control cycle	Templates and tools
Sustainability	Economic	1					
	Social	0.35	1				
	Environment	0.65	0.29	1			
PMF	Life-cycle	0.42	0.23	0.53	1		
	Control cycle	0.51	0.11	0.57	0.71	1	
	Templates and tools	0.31	0.16	0.40	0.68	0.60	1

Table 5.34 shows the correlations between the constructs. There was a positive relationship between economic sustainability and the rest of the constructs. The correlations among the constructs were all statistically significant.

Table 5.35: Descriptive statistics

Variable	Minimum	Maximum	Mean	Std dev.
PMF	3.56	4.85	4.26	0.36
Sustainability	3.07	4.58	3.78	0.37

As shown in Table 5.35, the minimum and maximum rating, based on participants' perceptions of the use of a PMF, was 3.56 and 4.85 respectively. The average rating

was 4.26. The minimum and maximum rating, based on participants' perceptions of overall sustainability, was 3.07 and 4.58 respectively. The average rating of sustainability was 3.78.

Table 5.36: Regression model for the use of a PMF to support the sustainability of ECs

Variable	Estimate	Std error	T value	P value
Intercept	1.31068	0.21229	6.174	2.25e-09
PM Framework	0.5849	0.04973	11.763	2e-16

Table 5.36 shows a summary of the coefficients for the predictor variable in the final model. The F-statistic was 138.4 with a p-value less than 0.000. The adjusted R square was 32.14%, which was an indication that the predictor variable of "project management framework" explained 32.14% of the variability in sustainability. The Durbin Watson statistic was 2.03 with a p-value of 0.736. The non-significant p-value indicated a lack of auto-correlation and, conversely, independence of the errors. A significant p-value for the non-constant variance (p-value < 0.000) and for the Breusch Pagan test (p-value < 0.000) indicated heteroscedasticity, as illustrated in Figure 5.1.

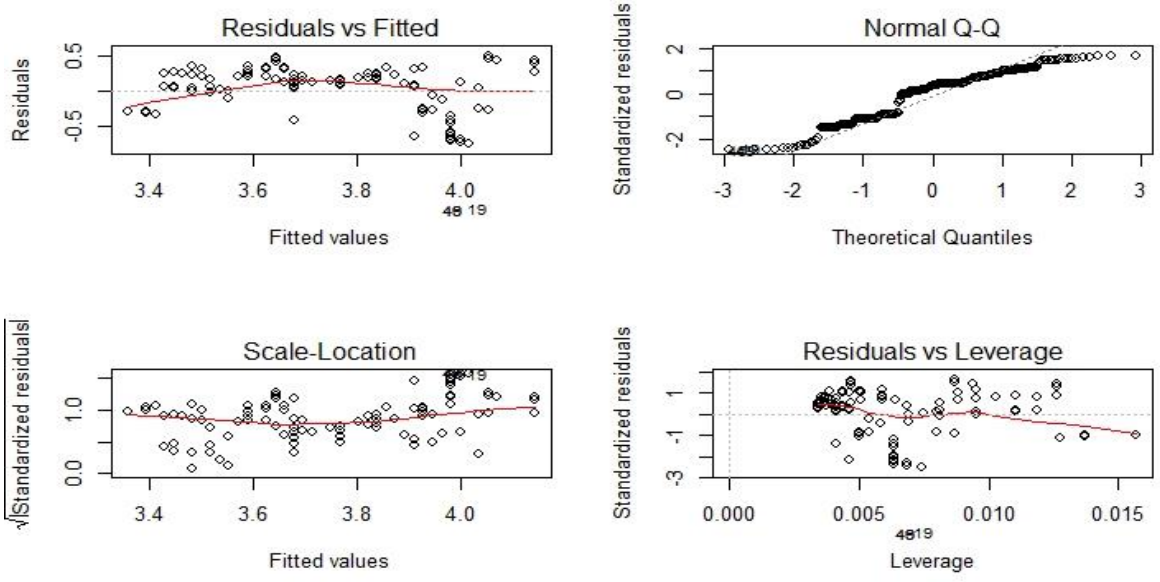

Figure 5.1: Model diagnostics

As shown in Figure 5.1, the Normal Q-Q plot (upper right) indicated that the residual values were normally distributed. From the plot of the residuals and the fitted values,

there was no observable pattern, which indicated that the error terms had a constant variance. In addition, the points in the Scale-Location graph (bottom left) were located randomly around the horizontal line, which was also an indication that the constant variance assumption had been met. From the Residuals versus Leverage plot, there was no outlier, based on Cook's distance value.

5.2.7. Exploratory Factor Analysis

As a first step in the assessment of the adequacy of scale items, exploratory factor analysis was performed using R Software, Version 4.0.0 to show whether the scale items correlated highly and reflected unique latent factors. Principal component analysis was used as the extraction method to extract an ideal amount of variance in the scale items. Also, a varimax rotation approach, with Kaiser normalisation, was used as the method of rotation of the dataset. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA) was used to assess the overall structure in the data. The KMO measure of sampling adequacy showed a high score of 0.708, which was above the required minimum value of 0.6. The Bartlett's test of sphericity was also highly significant statistically (p-value <0.000), which indicated consistency with cut-off values and indicated that factor analysis was appropriate. These results also indicated that the population matrix was not an identity matrix.

The communality analysis showed that some variables had extraction values less than 0.5 and they were therefore dropped from the analysis. Most of the variables had communalities greater than 0.5, which was an indication that factor analysis was suitable and could be conducted with the data. The analysis suggested a reduction to 6 factors, as shown in Table 5.37. The total variance explained by each factor that was extracted indicated that: component 1 accounted for 27.928 %, component 2 (10.733%), component 3 (8.005%), component 4 (6.911%), component 5 (5.072%) and component 6 accounted for 5.361%. Thus, the six factors together accounted for 64.910% of the total cumulative variance. The factor loadings for all the items were greater than 0.5, as recorded in Table 5.37. A cautious examination of the residuals (difference in correlation matrix on model and data) indicated that only a few values

were above 0.05. The values on the diagonal of the co-variance and correlation matrices were all greater than 0.5. The off-diagonal elements were all close to zero which was an indication of an accurate model.

Table 5.37: Exploratory factor analysis

	Project life-cycle	Economic sustainability	Environmental sustainability	Tools and Templates	Social sustainability	Project control cycle
Project goals	0.670					
Scope definition	0.861					
Task/activities identification	0.730					
Responsibility assignment	0.653					
Review with customer	0.819					
Provision of limits and exclusions to project scope	0.796					
Listing of technical requirements of the project deliverables	0.817					
Identification of milestones	0.675					
Definition of deliverables	0.633					
Budgets	0.777					
Resource availability	0.689					
Risk consideration	0.673					
Changes to project	0.688					
Quality of project	0.671					
Forecasting during project	0.608					
Training of customer	0.530					
Transfer of documents	0.632					
Evaluation of project	0.681					
The company uses full cost accounting and real-time cost pricing to set prices and tariffs for goods and services.		0.709				
The company enhances competitiveness in the marketplace by adopting policies and practices that advance sustainability.		0.878				
Improved sustainable performance is a source of productivity improvement.		0.843				
Improved sustainable performance leads to new market opportunities.		0.848				
Construction firms should execute projects that minimise resource consumption.		0.507				
Construction firms should promote best practice in consumption procurement through the supply chain.		0.693				

	Project life-cycle	Economic sustainability	Environmental sustainability	Tools and Templates	Social sustainability	Project control cycle
Construction firms should use technology and innovation to increase the sustainability of the construction process.		0.660				
Companies must develop a measurement and reporting system for evaluating performance and areas for improvement.		0.797				
The company chooses environmentally responsible suppliers and contractors.			0.500			
Construction companies must decrease CO_3 emissions by decreasing energy consumption.			0.597			
Construction companies must create a healthy, non-toxic environment.			0.677			
Improvement of environmental performance in a construction organisation leads to opportunity for increasing competitive advantage.			0.912			
Implementation of environmental strategies will improve contractors' competence in environmental management.			0.781			
Implementation of environmental strategies leads to improvements in business performance.			0.875			
Contractors should use techniques that minimise the harmful effects of construction activities on the environment.			0.852			
Construction firms should support green design and construction.			0.634			
Construction companies should reduce carbon emissions during construction.			0.798			
Communication plan				0.648		
Project priority matrix				0.517		
Responsibility assignment matrix				0.742		
Work breakdown structure				0.659		
Quality assurance plan				0.771		
Risk management plan				0.524		
Construction companies should protect and promote human health through a healthy and safe working environment.					0.704	
Construction companies must seek fair distribution of the social costs of construction.					0.582	
Construction companies should seek equitable distribution of the social benefits of construction.					0.529	
Construction companies should implement skills training and capacity enhancement to enable meaningful participation in a project.					0.749	

	Project life-cycle	Economic sustainability	Environmental sustainability	Tools and Templates	Social sustainability	Project control cycle
There should be fair compensation for people adversely affected by construction operations.					0.592	
Construction companies should increase their commitment to sustainable construction through education and training of their employees.					0.801	
Construction companies should promote corporate social responsibility.					0.700	
Contractors must comply with governmental sustainability-related legislation.					0.583	
Contractors should use appropriate procurement and contracting strategies to promote social sustainability.					0.609	
Quality control						0.558
Managing issues during project						0.602

5.2.8. Confirmatory Factor Analysis

A confirmatory factor analysis (CFA) model is designed to test the multi-dimensionality of a theoretical construct (Pallant, 2016; DeVellis, 2017). Specifically, this application was used to test the hypothesis that: “sustainability” is a multi-dimensional construct composed of three constructs, namely: economic sustainability, social sustainability, and environmental sustainability; and that “project management framework” is a multi-dimensional construct composed of project life-cycle, project control cycle, and project templates and tools (Pallant, 2016; DeVellis, 2017).

Confirmatory factor analysis (CFA), using Mplus, and R Software, Version 4.0.0, was conducted to test the measurement model and examine the quality of the psychometric properties of all measures used in this study. The confirmatory factor analysis considered for this study included: a measurement model, parameter estimates, goodness of fit statistics, and internal reliability and validity, and was used to analyse the data consolidated after the exploratory factor analysis.

5.2.8.1. Measurement model

After the constructs were proven to be reliable and to have uni-dimensionality, using EFA, a CFA was then performed. The maximum likelihood estimation was used to analyse the constructs. Five model-fit measures were used to assess the overall goodness of fit of the model. These included: the ratio of chi-square to degrees-of-freedom, comparative fit index (CFI), Tucker-Lewis Index (TLI), standardised root means square residual (SRMR) and root mean square error of approximation (RMSEA). The Cronbach's alpha, average variance extracted, and composite reliability were also examined to determine the reliability of the scores. The results of these analyses are presented in the next sub-sections.

5.2.8.2. Parameter estimates

Table 5.38 shows the standardised parameter estimates of the model. Each construct and the various items loaded onto, together with the standardised coefficient, Z statistic, and adjusted R square were recorded. The factor loadings of all the variables demonstrated strong evidence of reliability and convergent validity. The factor loadings also showed evidence of uni-dimensionality, since all items had acceptable factor loadings. Based on the analysis, all factor loadings were found to be above 0.5 and were positive. Results from the measurement model indicated that the relationship between the exogenous factors and the endogenous factors were statistically significant and positive. The test statistics (Z-values) were all greater than 1.96 and the estimates were statistically significant. The R squared values were all statistically significant and high, indicating that the factors explained most of the variance in the indicator variables. This indicated that the indicator variables predicted the unobserved construct significantly.

Table 5.38: Factor loading, Z statistics and R square of measurement model

Construct	Variable	Standardised coefficient	Z statistics	R square	Significant at 5% level
Economic sustainability		0.787	71.435	0.620	Yes
		0.778	58.887	0.606	Yes
		0.732	49.902	0.535	Yes
		0.718	51.224	0.515	Yes
		0.787	68.346	0.619	Yes
		0.790	72.625	0.625	Yes
Environment sustainability		0.646	40.606	0.417	Yes
		0.679	45.214	0.461	Yes
		0.776	73.328	0.602	Yes
		0.780	69.191	0.608	Yes
		0.765	66.965	0.585	Yes
		0.843	99.489	0.710	Yes
Social sustainability		0.788	60.084	0.621	Yes
		0.863	102.362	0.744	Yes
		0.755	58.043	0.570	Yes
		0.889	106.611	0.790	Yes
		0.761	56.534	0.579	Yes
Project Life-cycle		0.605	36.723	0.366	Yes
		0.695	49.258	0.484	Yes
		0.795	72.685	0.632	Yes
		0.727	53.692	0.528	Yes
		0.722	58.574	0.522	Yes
		0.709	50.564	0.503	Yes
Project Control cycle		0.836	67.594	0.699	Yes
		0.939	100.001	0.881	Yes
		0.950	96.450	0.903	Yes
		0.954	85.646	0.910	Yes
Tools and Templates		0.717	56.754	0.514	Yes
		0.768	60.325	0.590	Yes
		0.792	65.713	0.627	Yes
		0.778	64.963	0.605	Yes
		0.768	56.549	0.590	Yes

5.2.8.3. The goodness of fit statistics

The goodness of fit statistics is presented in Table 5.39. The CFI was found to be 0.937 and indicative of a good fit for the model (Hu and Bentler, 1999). This assured that the hypothesised model fits the sample data very well. The TLI value, as recorded in Table 5.39, was 0.929 and consistent with the CFI value in indicating that the hypothesised model was very well-fitting, thus representing the sample data extremely well (Hu and Bentler, 1999).

As shown in Table 5.39, the RMSEA value of 0.054 had a 90% confidence interval ranging from 0.052 to 0.055. Interpretation of the confidence interval indicated that there could be 90% confidence that the true RMSEA value in the population would fall within the bounds of 0.052 and 0.055, which represented a good degree of precision (Hu and Bentler, 1999). This implied that the hypothesised model fitted the data well enough and was sufficiently parsimonious (Hu and Bentler, 1999). The standardised root means square residual (SRMR) was found to be 0.068. In a well-fitting model, this value will be small (Maydeu-Olivares, Shi and Rosseel, 2018; Hu and Bentler, 1999). A value of 0.068 indicated a good fit (Hu and Bentler, 1999). Given that the SRMR represents the average discrepancy between the observed sample and hypothesised correlation matrices, this value could be interpreted as meaning that the model explained the correlations within an average error of 0.068.

As shown in Table 5.39, all the model-fit indices exceeded the respective levels suggested by previous studies. This demonstrated that the measurement model exhibited a good fit with the data used in this study.

Table 5.39: Goodness of fit statistics

Measure	Name	Cut-off for good fit	Estimate
CFI	Comparative fit index	CFI≥0.90	0.937
RMSEA	Root mean square error approximation	RMSEA≤0.08	0.054
SRMR	Standardised root means square residual	SRMR≤0.08	0.068
TLI	Tucker-Lewis Index	TLI≥0.90	0.929

5.2.8.4. Internal reliability and validity

To determine the internal consistency of the composition of the measurement model, the average variance extracted (AVE), Cronbach's alpha and the composite reliability were examined. The square root of AVE estimates for each construct, with the inter-construct correlations, is presented in Table 5.41 below. The square root of AVE is shown on the diagonal and the correlations are shown in the off-diagonal.

Following the recommendations of Fornell and Larcker (1981), conditions for indicating that discriminant validity is present were satisfied in the measurement model, since

the square root of all AVE values were much higher than the correlations of target factors and model variables. The AVE estimates for each construct were greater than 0.5, which was an indication that more than half of the variability observed in the items was explained by the constructs. This showed that the shared variance between constructs was lower than the average variance extracted of the individual constructs, confirming discriminant validity. This therefore indicated that the measurement items explained their respective constructs more than they explained other constructs in the model (see Table 5.41 below).

The data from the questionnaire were used to perform tests for validity and reliability. The reliability of the questionnaire was tested using Cronbach's alpha on each of the constructs. The Cronbach's alpha for each of the constructs is shown in Table 5.40 below and exceeded 0.8, indicating high level of internal consistency and reliability. Construct validity was determined by examining the magnitude of the parameter coefficients. The standardised parameter coefficients presented in Table 5.38 above showed that they were significantly high. All the factor loadings showed strong evidence of uni-dimensionality and convergent validity.

The composite reliability of all the latent constructs in the measurement model was more than 0.80, as shown in Table 5.40. This indicated that the latent constructs were reliable and consistent.

Factor loadings, Cronbach's alpha, CRs and AVEs all showed good levels of reliability and convergent validity for the measures. All factors in the measurement model had adequate reliability and convergent validity. The model demonstrated adequate convergent validity, reliability, and discriminant validity.

Table 5.40: Reliability and construct validity of the measurement model

Constructs	**Cronbach's alpha**	**AVE**	**Composite reliability**
Economic sustainability	0.88	0.59	0.89
Social sustainability	0.89	0.66	0.91
Environment sustainability	0.89	0.56	0.89
Project life-cycle	0.85	0.51	0.86
Project control	0.95	0.85	0.96
Project tools and templates	0.89	0.59	0.88

Table 5.41: Correlations and discriminant validity

	Economic sustainability	Environment sustainability	Social sustainability	Project life-cycle	Tools and template	Project control cycle
Economic	0.77					
Environment	0.75	0.75				
Social	0.46	0.55	0.81			
Life-cycle	0.54	0.64	0.69	0.72		
Template	0.44	0.50	0.63	0.71	0.77	
Control	0.20	0.26	0.36	0.41	0.49	0.92

5.2.9. Structural Equation Modelling

Structural equation modelling (SEM) was used to test the proposed model of the PMF. To test the proposed relationships among the study variables, structural equation modelling (SEM) was conducted (Tabachnick and Fidell, 2013), using R Software, Version 4.0.0. The SEM analysis followed a two-stage process. First, construct validity was assessed by running a confirmatory factor analysis (CFA) of each construct in the measurement model. Second, the structural equation model was estimated for the Conceptual Model. The Modified Conceptual Model was evaluated in terms of measures of fit, statistical significance of coefficients and interpretation (Tabachnick and Fidell, 2013). The results of the model evaluations are summarised in the following sub-sections.

5.2.9.1. Hypothesised model

The structure of the model that was tested is presented in Figure 5.2. The model formulation was derived from the review of literature relating to project management frameworks and the sustainability of construction projects. “Economic sustainability” represents the factors affecting the economic sustainability of the firm (Caradonna, 2020; Vescos and Ferrero, 2015; Mairal, 2015). Similarly, the factors affecting social and environmental sustainability were identified. The paths, and their associated signs, leading from economic sustainability, social sustainability and environmental

sustainability to overall sustainability reflect findings in the literature reviewed. Also, the paths, and their associated signs, leading from project life-cycle, project control cycle and project templates and tools to project management framework reflect findings from the literature reviewed. In terms of the model, it was expected that an appropriate project management framework would cause high levels of sustainability.

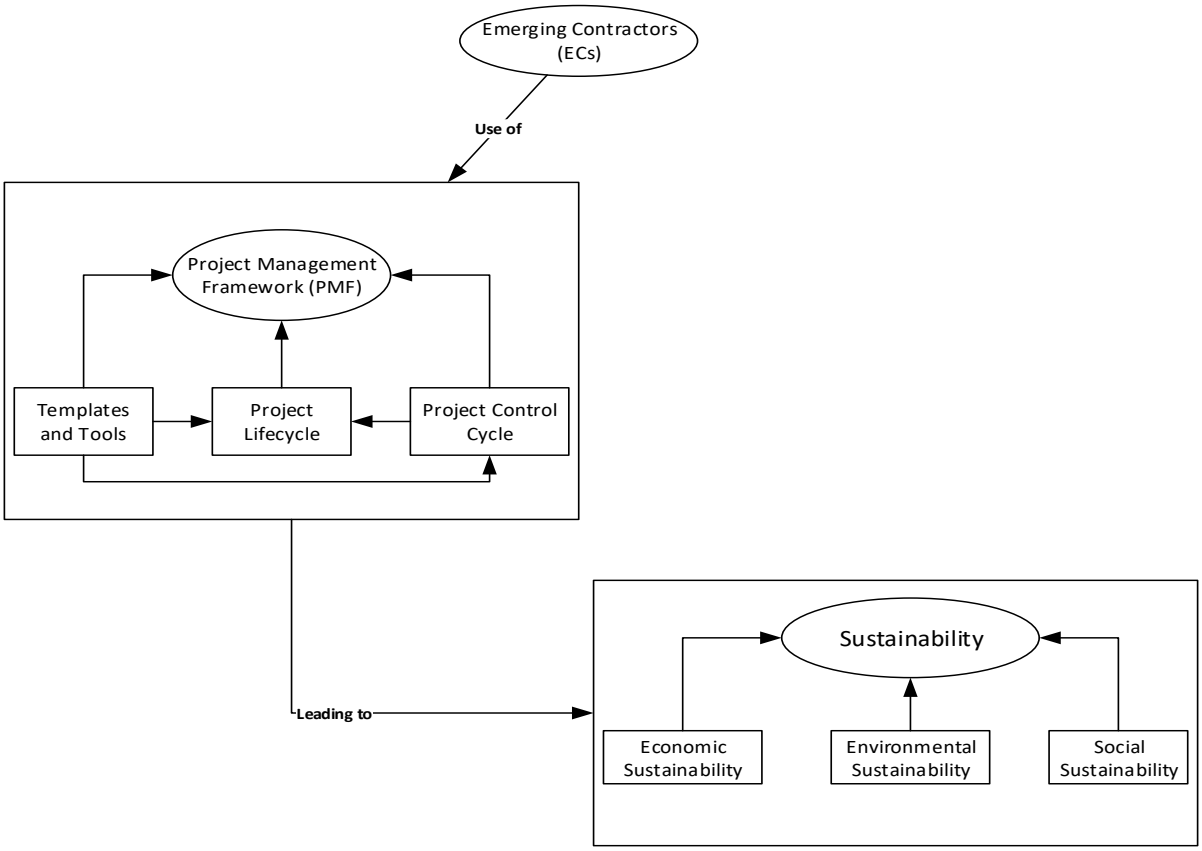

Figure 5.2: Hypothesised conceptual model of a PMF to support the sustainability of ECs (Researcher's own construction, 2020)

5.2.9.2. Structural model of goodness of fit statistics

Since the structural SEM model includes relationships among latent variables and serves to assess the extent to which these relations are valid, it was critical that the measurement of each latent variable was sound. The CFA was used to test the validity of the indicator variables and the measurement model before evaluating the structural model. The measurement model was adequate, as indicated by the parameter

estimates and goodness of fit statistics and, hence, the findings that were related to assessing the hypothesised structural model were used.

The CFI was found to be 0.937 and was considered to indicate a good fit (Hu and Bentler, 1999). This assured that the hypothesised structural model was found to exhibit exceptionally good fit to the data. The TLI value was 0.929 and was consistent with the CFI value in indicating that the hypothesised structural model was very well-fitting (Hu and Bentler, 1999) and, thus, represented the sample data extremely well. The RMSEA value of 0.054 had a 90% confidence interval ranging from 0.052 to 0.055. Interpretation of the confidence interval indicated that there could be 90% confident that the true RMSEA value in the population would fall within the bounds of 0.052 and 0.055, which represented a good degree of precision (Hu and Bentler, 1999). This implied that the hypothesised structural model fitted the data well enough and was sufficiently parsimonious.

The standardised root means square residual (SRMR) was found to be 0.068. A value of 0.068 indicated a good fit (Hu and Bentler, 1999) and indicated that the model explained the correlations with an average error of 0.068. Reported values of both the RMSEA (0.054) and SRMR (0.068) provided additional support for the other fit indices. This demonstrated that the hypothesised structural model exhibited a good fit with the data used in this study.

5.2.9.3. Internal reliability and construct validity of the SEM model

The composite reliability coefficient, the AVE and Cronbach's alpha were also examined to test the reliability of the structural model. The composite reliability was above 0.80 for all the constructs, which was above the required minimum value of 0.70. The Cronbach's alpha value was more than 0.80 for all the constructs. The AVE was greater than 0.70 for all constructs and indicative of internal consistency. The findings indicated the degree to which participants were consistent in responding to all variables.

Factor loadings, Cronbach's alpha, CRs and AVEs all showed good levels of reliability and convergent validity of the measures. All factors in the structural model had adequate reliability and convergent validity. The structural model demonstrated adequate convergent validity, reliability, and discriminant validity.

5.2.9.4. Model parameter estimation

An examination of the estimated parameters in the model revealed that all were statistically significant, as recorded in Figure 5.3. Importantly, the estimated value of the path from "project management framework" to "sustainability" was found to be positive (0.773) and statistically significant [p-value < 0.000]. As expected, the estimate for the paths from economic, social, and environmental sustainability to overall sustainability were found to be positive and statistically significant. The estimate for the paths from project life-cycle, project control cycle, and project templates and tools were found to be positive and statistically significant.

5.2.9.5. Structural hypothesis testing

The CFA model and the tested structural model constituted *a priori* the hypothesis that the use of a project management framework by ECs would support their sustainability. A diagrammatic representation of this model is presented in Figure 5.3, which shows the properties of the causal paths, including path coefficients. A review of the model fit statistics for the structural model revealed that the hypothesised model exhibited a good fit to the data. The results indicated that the use of a project management framework by ECs was statistically significant in predicting that EC sustainability would be supported. The hypothesis that the sustainability of ECs is supported by the use of a project management framework by ECs could not be rejected.

5.2.9.6. Testing the influence of the use of a PMF by ECs in supporting sustainability.

The results from the confirmatory factor analysis of the full structural model, presented in Table 5.37, yielded support for the hypothesis. There was a statistically significant

relationship between the two constructs: use of a project management framework by ECs and the sustainability of ECs. The standardised coefficient was positive and significant. The direct influence of the use of a project management framework by ECs on the sustainability of ECs was statistically significant.

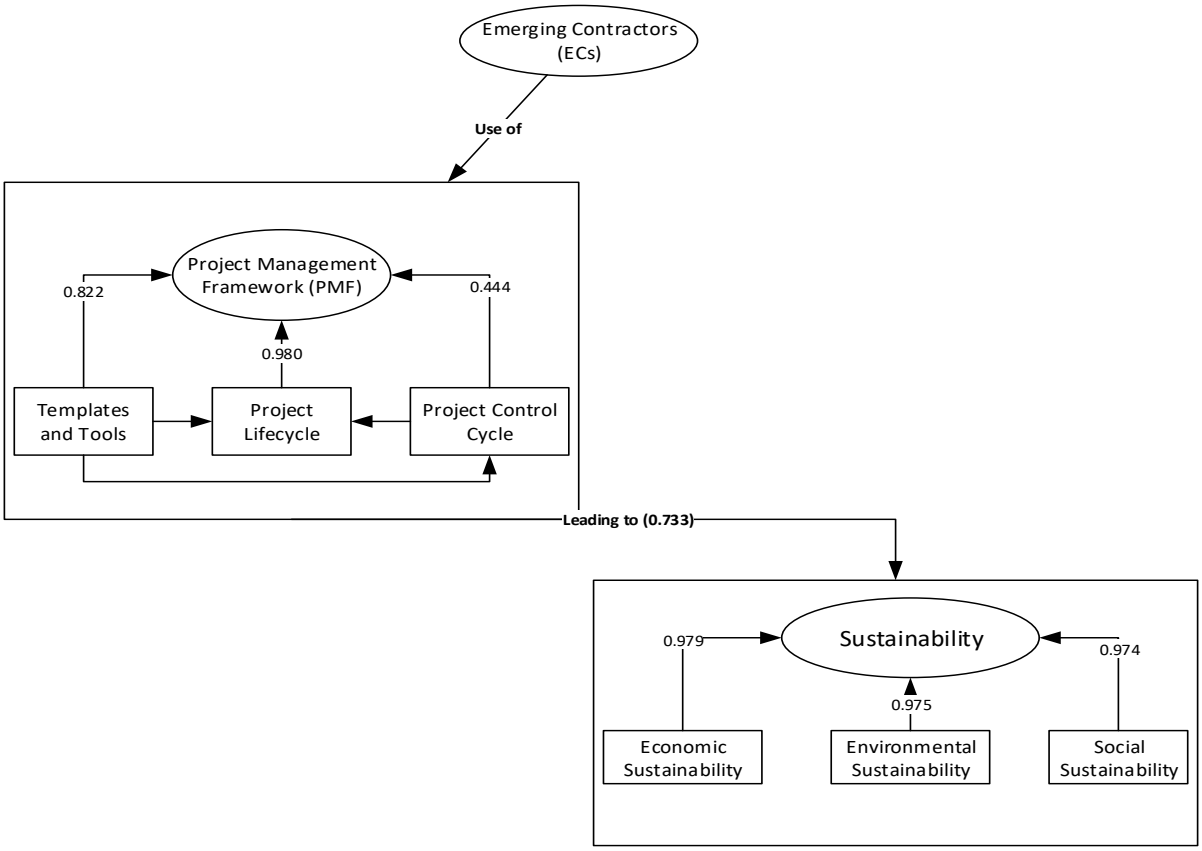

Figure 5.3: Conceptual model results

5.2.10. Summary of SEM Model

Results from the SEM model revealed that the robust fit indices, CFI, TLI, SRMR and the RMSEA values, met the cut-off index criteria, and the parameter estimates were found to be statistically significant. The model which represented the hypothesis that sustainability of ECs was directly related to the use of a PMF by ECs fitted the data adequately. Thus, the sustainability ECs can be supported with the use of the PMF developed in this study.

Table 5.42: Matrix of objectives addressed by quantitative questionnaire

Description	Sections						
	A	B	C	D	E	F	G
Primary research objective		Y	Y	Y	Y	Y	Y
Secondary research objectives:							
1					Y	Y	Y
2					Y	Y	Y
3					Y	Y	Y
4							Y
5					Y	Y	Y
6					Y	Y	Y
7					Y	Y	Y

The purpose of all the questions that were asked was to understand the dimensions that were relevant to the key variables that contributed to the main aim of the study. Furthermore, the questions were asked specifically to assist in the development of a PMF that would support the sustainability of ECs. From extant literature, it was derived that the essential components of a PMF include: project life-cycle, project control cycle, and tools and templates (McConnell, 2010; Naybour, 2010), while sustainability is considered to include the pillars of economic, social, and environmental sustainability (Caradonna, 2020; World Economic Forum, 2016; Adetunji et al., 2003).

As shown in Table 5.42 and Appendix 1, the main aim of the research was addressed through Sections B, C, D, E, F and G in the quantitative survey. In addition, Sections E, F and G were used to address the 7 research objectives.

5.3. QUALITATIVE FINDINGS, RESULTS, AND INTERPRETATIONS

The aim in this section is to present the findings, results and interpretations of the analysis of the qualitative data collected. Consistent with the explanatory sequential approach adopted, the qualitative data were collected from 25 respondents who were selected purposively and interviewed using a semi-structured questionnaire. The choice of only 25 respondents was based on the recommendation by Yin (2014) who indicated that a minimum of 25 respondents is enough for any meaningful, qualitative

data collection in a research study. The presentation in this section is divided into two major sections: the demographic profile of respondents, and the empirical findings from the interviews.

5.3.1. Demographic Profile of the Interviewees

In this section, the analysis of demographic profile of the respondents across the key characteristics taken into consideration during the interview is presented. These characteristics included: gender, age, educational level, level of training in construction, number of years in construction, sector in which projects were mainly undertaken, position in the firm, project engagement level, value of project work and the phase/stage in which the firms were involved in projects.

Table 5.43: Demographic Profile of Interviewees

Category	Classification	Frequency	Percent (%)
Gender	Male	20	80.0
	Female	5	20.0
Age	20 to 29	2	8.0
	30 to 39	10	40.0
	40 to 49	9	36.0
	50 to 59	2	8.0
	Undisclosed	2	8.0
Education Level	Below National Diploma	2	8.0
	National Diploma	11	44.0
	Degree/BTech	6	24.0
	Postgraduate	3	12.0
	Undisclosed	3	12.0
Level of training in construction	Below National Diploma	5	20.0
	National Diploma	9	36.0
	Degree/BTech	6	24.0
	Undisclosed	5	20.0
Number of years in construction	0 to 3 years	8	32.0
	4 to 6 years	3	12.0
	7 years and above	14	56.0
Sector in which undertook projects	Road and Housing	21	84.0
	Bulk Construction	2	8.0

	General Construction	2	8.0
Position in the firm	Directors	23	92.0
	Project manager	1	4.0
	Supervisor	1	4.0
Level of project engagement	Construction	19	76.0
	Project management	3	12.0
	Sub-contractor	1	4.0
	Undisclosed	2	8.0
Value of projects undertaken	Below R 1 million	1	4.0
	R 1 million to R 6 million	15	60.0
	R 7 million to R 20 million	8	32.0
	Undisclosed	1	4.0
Phase of project management involvement	Defining, planning, execution, and closure	4	16.0
	Planning	1	4.0
	Execution	20	80.0

5.3.1.1. Gender of interviewees

With regard to the gender distribution of the respondents (see Table 5.43), a total of 20 males and 5 females were interviewed. Although the sampling for the qualitative data collection was done purposively, it was no surprise that the number of males was more than females since the construction industry is noted to be male dominated (Perrenoud, Bigelow and Perkins, 2020; Sang and Powell, 2012; Agapiou, 2002). However, there could be an element of bias in this finding since the participants for the qualitative data were purposively selected, thus more males were selected than females.

5.3.1.2. Age of interviewees

The respondents were aged between 20 years and 59 years (see Table 5.43). The data revealed that 10 of the respondents were in the age group of 30 to 39 years, and 9 of the respondents were in the age group of 40 to 49 years. Furthermore, 2 respondents belong to each of the age groups 20 to 29 years and 50 to 59 years. Two respondents did not disclose their ages during the interviews.

5.3.1.3. Education level of interviewees

The data revealed a variation in the educational levels of the 25 respondents interviewed from below national diploma to a post-graduate degree (see Table 5.43). Based on the analysis of the data, 3 of the respondents had a post-graduate level of education, 6 had a degree/BTech qualification, 11 had national diploma qualifications, 2 had qualifications that were below the national diploma level and 3 respondents refused to disclose their educational levels during the interview. This result was encouraging because it is much easier for individuals with higher qualifications to make strategic business decisions that will enhance their business sustainability in the long run (Jocumsen, 2004; Huffman, 1974). This situation could pave the way for the use of the proposed PMF to enhance EC business operations for long-term sustainability.

5.3.1.4. Interviewees' level of training in construction

The analysis showed that 6 of the 25 people interviewed had a degree/BTech in construction, 9 of them had a national diploma in construction, 5 of them had training in construction below the national diploma level, while 5 of the respondents refused to disclose their level of training in construction (see Table 5.43). This level of training could be critical to the use of a PMF given that such a level of education may have exposed the individuals to a project management approach in undertaking construction projects.

5.3.1.5. Interviewees' number of years in the construction industry

Analysis of the data showed that 14 of the respondents had been in the construction industry for 7 or more years, 3 of them had been in construction for 4 to 6 years, and 8 of the respondents had been in the construction industry for up to 3 years only (see Table 5.43). Overall, 56% of the interviewees have been operating in the construction industry for 7 years and above.

5.3.1.6. Sector in which interviewees undertook projects

The activities of ECs are generally in the construction industry by default. However, the sector of construction in which ECs are active differs depending on their work capability and capacity (CIDB Act 38 of 2000). The analysis of data showed that 21 of the respondents undertook projects in the road and housing sector, 2 in the bulk construction sector, and 2 in the general construction sector within the construction industry (see Table 5.43). This finding is not surprising since ECs are individuals who operate in the construction industry. Thus one will expect all of them to be individuals who are currently operating in the construction industry. Furthermore, the purposive selection of the participants is a testatment to the findings.

5.3.1.7. Position of interviewees in firms

Apart from 1 project manager and 1 supervisor, the remaining 23 individuals interviewed to collect qualitative data were directors of the firms in which they worked (see Table 5.43). Therefore, the interviewees were placed at the decision-making level of their firms. Overall, the analysis showed that the respondents were decision-makers in their various firms. Therefore, the opinions are relevant to the objectives of the study regarding the development of the PMF that supports ECs sustainability.

5.3.1.8. Level of project engagement by interviewees

Analysis of the qualitative data showed that the individuals interviewed engaged in projects at different levels: 19 of the respondents were involved in projects at the construction level, 3 were project managers, 1 was involved at the sub-contractor level, and 2 of the respondents decided not to disclose their levels of engagement (see Table 5.43).

5.3.1.9. Value of projects undertaken by interviewees

A total of 15 respondents undertook projects that were valued between R1 million and R6 million, 8 respondents undertook projects that were valued between R7 million and R20 million, and only 1 respondent undertook projects that were less than R1 million, while 1 respondent did not disclose the value of projects undertaken (see Table 5.43). These findings are not surprising since the project values indicated here are consistent with the value of project ECs can undertake according to CIDB grade classifications.

5.3.1.10. The phase of project management involvement of interviewees

The qualitative data analysis showed that 20 of the respondents were involved in project management at the execution level, 4 of the respondents indicated that they were involved in project management at all levels (defining, planning, execution, and closure) while 1 respondent was involved during the planning phase (see Table 5.43). The results here are consistent with the contracting process involving ECs in the South African construction. According to CIDB, ECs are often engaged to undertake projects that have already been identified and selected by public sector clients that are mainly government departments. Therefore, it is obvious that they are involved at the execution level in most cases.

5.3.2. Qualitative (Textual) Data Analysis

This section contains the findings, results and interpretation of the qualitative data analysis conducted for this study. In total, 25 interviews were conducted and the transcribed data were analysed thematically. The thematic analysis involved identifying, interpreting and reporting the responses that correlated with the results and findings of the quantitative analysis conducted in the first phase of the study. The analysis of the data is presented according to the questions under their respective themes from the semi-structured questionnaire that were developed based on the outcome of the quantitative phase results and the objectives of the study.

5.3.2.1. The use of a PMF in construction activities

All the interviewees indicated that their project management activities in the construction industry were undertaken with the use of a PMF. However, one interviewee said that he was not sure what a PMF is, but he believed that he used some form of a PMF in the discharge of his project business in the construction industry. For instance, A8 stated, “I believe I do. I am unsure what project management framework is, but I do use certain tools relating to project management.” The fact that all the interviewees mentioned that they use some form of PMF in their project endeavour is encouraging, but the findings are inconsistent with studies conducted by Mavetera et al. (2015) and Thwala and Mofokeng (2012) who found that many of the ECs do not use any form of project management approach due to lack of project management literacy and competence. This inconsistency in the results could be due to the location of the study because the previous studies were not conducted in Free State Province as compared to the current study.

5.3.2.2. Essential components of the use of a PMF in project activities

Out of the 25 interviewees, 24 concurred that project life-cycle, project control cycle, and templates and tools were essential components of a PMF. According to two interviewees, although the project life-cycle and project control cycle of the PMF are critical to their work in the construction industry, they argued that the tools and templates were more applicable to the work they did in the construction industry. This was because the tools and templates provided them with already existing ways to carry out project management in their project endeavours Fernandes, Ward and Araujo, 2014). One interviewee stated that he did not regard the project life-cycle, project control cycle, and tools and templates as being essential components of the project management framework. However, the interviewee did not provide further clarity when asked what components he considered to be essential parts of the PMF. This means, that apart from the interviewee who did not regard project lifecycle, project control cycle, templates, and tools as comments of a PMF, other interviewees see these components as crucial. For example, A8 stated, “I consider tools to aid in effective project management essential for PMF. Not everything is needed to effectively manage the project.” A10 added, “Yes, but I will say tools and templates are more applicable to us.” A19 stated, “Yes, project management framework should

speak to each phase of the project." Although the interviewees believed that project life-cycle, project control cycle, templates and tools were essential components of a PMF, when asked to list what they perceived to be the essential components of a PMF, the feedback showed that the interviewees did not identify the three components commonly regarded as being essential to the PMF adopted for the study. Instead, the interviewees listed the activities that are performed under the various essential components adopted for the study. Table 5.44 shows a thematic characterisation of how the interviewees listed what they perceived to be essential components of a PMF.

Table 5.43: Thematic characterisation of responses regarding essential components of a PMF

Activities	Freq.	Project life-cycle	Project control cycle	Tools and templates
Determine project specification	4	Yes		
Determine task/activities	6	Yes		
Assign responsibilities	2	Yes		
Develop project schedule (Scheduling)	20	Yes		
Determine project budget (Project budgeting)	17	Yes		
Resources (Estimate project resources)	16	Yes		
Risks (Manage project risk)	5	Yes		
Staffing (Assign responsibility)	1	Yes		
Perform work	4	Yes		
Monitor and control progress	9	Yes		
Measure progress and performance	4		Yes	
Communication plan	4			Yes
Work breakdown structure	1			Yes
Quality journey framework	6			Yes

A major conclusion derived from the results in Table 5.44 was that, although the interviewees did not list the three essential components of the PMF specifically, they listed activities that are performed under the three essential components of the PMF. Thus, it could be concluded that the interviewees are generally aware of the three essential components of the proposed PMF that they can use in the discharge of their project activities in the construction industry. Based on the evidence presented here, the finding suggests that ECs consider project lifecycle, project control cycle, templates, and tools as the essential components of a PMF. This finding agrees with Naybour (2010) and McConnell (2010) on the essential components of a PMF which include project lifecycle, project control cycle, templates, and tools.

5.3.2.3. The use of a PMF by ECs to manage projects

All the interviewees stated that they would readily use any project management framework that is designed to support the efficient and effective performance of work on their project activities in the construction industry. For instance, A8 stated, “If it speaks to my project, yes, I will. Some of the documents are very irrelevant and confusing.” The interviewees believed that the PMF could enable them to improve how they manage their project activities in the construction industry. Two of the interviewees stated further that the PMF would be an important framework if the needs of small construction firms were taken into consideration in its development, that is, if it was well designed for their use and they could understand the components and their application easily, they would readily use it during their project management endeavours. A22 supported this by stating, “Yes, especially if it is tailored for small construction businesses.” Another interviewee claimed he would readily use the PMF if it was concise and straightforward to use. However, one interviewee was concerned about the contents and the documents that would come with the proposed project management framework. So, in theory, the interviewees were in support of using a PMF that is developed with the needs of small construction firms taken into consideration. This feedback thus supported the aim of this study which was to ensure that the PMF was developed to be suitable to the construction business needs of ECs in the construction industry of South Africa in the Free State Province. Evidently, any proposed and developed PMF for ECs needs to consider their resource constraints. As observed by Turner, Ledwith and Kelly (2009), Murphy and Ledwith (2007) and Larson, Gobeli and Gray (1991), ECs would need less elaborate and structured PMF in order to benefit from its use. Thus, the finding is consistent with a study by Ledwith, Turner and Kelly (2010) and Philips (2012) which suggest that small businesses such as ECs require a less elaborate but structured project management process that is based on a well-established project management approach that takes into consideration ECs limited resource capacity and capabilities.

5.3.2.4. Ways in which PMF can help ECs

According to the interviewees, the proposed PMF could assist them in their project business endeavours. For example, the interviewees stated that the PMF could help them in managing project performance, improving accountability, promoting effective monitoring and progress tracking, enhancing communication both internally as well as externally, and could help to meet customer expectations, and make use of appropriate documentation when reporting their project activities. A1 supported this by stating, “It will assist in managing the project performance in terms of time, resources, budget, and potential risks.” A8 added, “It will ease communication on project progress.” In support, A11 stated, “It will aid communication, collaboration, clarity, and consistency.” An interviewee contended that, by using an effective PMF, there would be no need to go back and forth during a project. A14 supported this by stating, “PMF will improve the quality of work produced, stick to timelines and budget and meet customers' expectations.” This is because communication would be easy as all project-related deliverables and milestones would be documented. For instance, A15 affirmed, “Will aid in ensuring that right tools are developed during planning and utilised effectively during the execution and monitoring.” Another interviewee mentioned that a well-documented project, using a PMF, would make it easy to communicate project status among all the project stakeholders. Furthermore, on how PMF can help ECs in delivering a successful project and business outcomes, A17 stated, “It will aid in planning, executing, and monitoring project.” A19 added, “Improve project planning, assist in resources, and budget management, and help with sound project scheduling.” A20 stated, “Will serve as flow process for project.” A23 claimed that it will aid effective documentation and reporting on the project. A21 stated, “It will ensure the smooth running of the project knowing who is responsible for what on which date and for how much.” A22 claimed, “it will ease the process of monitoring project performance.” As evident from the results as well as the quotations from the respondents, it can be argued that the PMF could aid ECs in the discharge of their duties in the construction industry. Budler and Trkman (2019) observed that a framework can provide a combination of interlinked practices that can support the achievement of a specific objective. Thus, there is a possibility of the PMF being crucial in ensuring that ECs will effectively and consistently use the project management

approach in their project endeavours thereby leading to project success which can support their sustainability.

5.3.2.5. The use of PMF to enhance effective communication

24 out of the 25 interviewees indicate that the PMF can assist with effective communication both internally and externally during the project management process. For instance, A7 stated, “Most definitely, through the proper project management framework, no need for back and forth. Communication will be easy as all project related deliverables and milestones will be documented.” A22 affirmed, “Yes, well documented project related matters make it easy to communicate project status.” One interviewee is not certain about the role of the PMF in assisting with effective communication both internally and externally during the project management process. Shi (2011) and Thomas and Mullaly (2007) assert that organisations need guidance and a structured approach on which key project management efforts they should concentrate on. Authors such as Handzic and Bassi (2018), Lewis (2011), Wysocki (2019) and Heldman (2018) all argued that communication is vital in the project management process since, without effective communication, project success is not achievable. Besides, Pritchard (2004) suggested that given the crucial nature of communication in project management, there is a need for a standard protocol to ensure and support effective communication among project stakeholders. Thus, the PMF could be a tool that ensures that ECs have a standard, structured guidance to support how communication is handled in their project management endeavour (Shi, 2011; Thomas and Mullaly, 2007).

5.3.2.6. Effective use of templates and tools associated with a PMF

Regarding the effective use of the templates and tools associated with the PMF, 21 out of the 25 interviewees were of the opinion that a PMF could promote the effective utilisation of templates and tools in their firms’ project management activities. Three interviewees argued that they were not sure whether the PMF could be used to promote the effective use of templates and tools, while one interviewee maintained

that the design of the PMF would determine whether it could be used to promote the effective use of templates and tools in project management activities of the firm. For instance, A7 stated, “It will depend on the design of the project framework.” The interviewees suggested further that the PMF should form the basis of what templates and tools are required to implement the project management process within a firm. A8 supported this by stating, “Yes, I think so. PMF should form the basis of what tools and templates are required for a project.” The feedback on what templates and tools the interviewees used in executing their projects showed that all the interviewees used some form of templates and tools in their project management endeavours. The interviewees listed: a status reporting template, Gantt chart, checklist, communication plan, Microsoft office packages, quality control plan and risk management plan as some of the templates and tools they used when their firms undertook work in construction projects. The participants in the interview agreed that the PMF can support their consistent use of templates and tools. Furthermore, the respondents have also mentioned certain templates and tools that are relevant to their project management endeavour and such templates and tools can be consistently used as a result of the PMF. Naybour (2010) and McConnell (2010) observed that a PMF should include a template and tools. As result the proposed and the developed PMF for ECs need includes six crucial templates that are deemed vital for any project management use. Consequently, the findings are consistent with the ability of PMF to support the consistent use of templates and tools as reported by Kerzner (2017b).

5.3.2.7. Customers’ understanding of the project management process used in project activities

With regard to customers’ understanding of the project management process used in project activities, 21 of the interviewees suggested that their customers understood the project management process that they used when they undertook projects. For example, A7 stated, “Most of my project clients are government entities with knowledge of project management, so they do understand.” A22 affirmed, “I believe they understand it well as there have not been any complaints.” A15 added, “Very well. PM process makes it easy to communicate with clients since everything is documented.” Yang and Peng (2008) asserted that the construction industry is made

of several related customers that need to be satisfied and as such have a direct impact on the projects that are undertaken in the industry. Thus, the customer needs to be updated consistently on the project management process and the progress of work (Kerzner, 2017b). A majority of respondents indicated that customers understand their project management process is encouraging. As result, the PMF can even make it simpler given that it will provide a structured and interlinked practice that will direct how customers should be handled during the project management process stages (Budler and Trkman, 2019). Therefore, the findings are consistent with a study by Kerzner (2017b) and Yang and Peng (2008) which indicates that the use of a structured project management process may make it easier for customers to understand the overall project management process.

5.3.2.8. Use of a PMF and promotion of supply-chain understanding during construction process

According to 24 interviewees, the PMF enables the supply-chain operators such as vendors, clients, designers, and sub-contractors to understand the construction process when they undertook their projects in the construction industry. For example, A22 stated, “Yes, it will outline exactly what needs to be done to ensure the success of the project.” A8 added, “Yes, It will ease the understanding of the project performance.” One interviewee stated that PMF outlined exactly what needed to be done to ensure project success, thus it enabled the supply-chain operators to understand every stage of project management during the construction process. Another interviewee stated that a PMF eased the understanding of the project performance during the construction process. A7 affirmed, “Yes, I believe project framework can serve as a guideline of the construction project thereby making it easy for supply-chain operators to understand the entire construction process.” Budler and Trkman (2019) observed that a framework is crucial in providing an interlink between practices that support a particular approach that leads to the achievement of objectives. Thus, it is not surprising that the respondents report that a PMF may be utilised to ease their project management process to ensure that individuals connected to the project in terms of the supply chain management process understand all the relevant details. This assertion corroborates a study by Ayers (2003) who found that

effective supply chain management is contingent on the successful application of the project management process.

5.3.2.9. The role of a PMF in maintaining focus on milestones and project deliverables

The interviewees were of the opinion that a PMF played a key role in maintaining focus on milestones and deliverables when they undertook project activities. For instance, A2 stated, “It aids in keeping track of the customer expectation in terms of quality and timeframe.” A5 added, “Helps in keeping track of the project performance if a project is behind schedule or short of resources.” Many of the interviewees listed: a guide for process flow, keeping track of customer expectations, assisting project management, keeping track of project performance, and helping in documenting project progress as some of the roles played by a PMF in maintaining focus on project milestones and deliverables when they undertook projects within their firms. In addition, interviewees contended that with a PMF in place they could maintain focus on milestones and deliverables when they undertook project activities in the construction industry. For example, A14 stated, “It assists in keeping track of the deliverables as per given timeframe.” A8 added, “Guidance on what is expected and by when.” However, another interviewee argued that even with a PMF in place, focus on milestones and deliverables was not maintained because projects always fall behind schedule owing to unforeseen circumstances. While the result is encouraging because many of the respondents see the PMF as a tool that can support their ability to maintain focus on milestones. Studies have shown that many ECs are not able to deliver projects that meet the required standard as a result many of those projects failed to conform to quality specifications (Zunguzane, Smallwood and Emuze, 2012; Thwala and Mofokeng, 2012). ECs are reported to lack project management literacy (Mavetera et al., 2015) which may be attributed to a lack of established PMF which can provide them with a structured approach to project management. Thus, there is inconsistency in terms of the findings here and the results of other studies conducted regarding ECs and their project performance (Mavetera et al., 2015; Thwala and Mofokeng, 2012; Zunguzane, Smallwood and Emuze, 2012) who found that ECs do not use project management approach in the discharge of their project and business activities in the

construction industry due to lack of project management knowledge and skills which often lead to unsuccessful project outcomes. The inconsistency may be attributed to the fact the current study is focused on the Free State province as opposed to these other studies identified in the literature. Nonetheless, the empirical findings here are encouraging and therefore imply PMF can support ECs in their project endeavours in the south African construction.

5.3.2.10. Impact of a PMF on monitoring and reporting progress and challenges

The interviewees were of the opinion that a PMF could have a positive effect on the monitoring and reporting of activities required by construction projects. A4 stated, “It will assist in the effective allocation of resources and tracking of progress.” A17 added, “It will aid in keeping track of all records regarding the project.” A1 noted, “It will create consistency and replicability. One can adopt the same approach in all projects.” Many of the interviewees argued that a PMF could promote consistency, reliability, improved accuracy, accountability, responsibility, ensure quality results, ensure effective resource allocation, tracking of progress, and enhance communication thereby reducing confusion, as well as ensure effective planning and monitoring during the project management process in the firms. For instance, A13 stated, “It will aid in tracking the progress of the project in relation to time, budget and resources.” A25 added, “Project tracking and accountability will be easy.” Regarding the challenges of monitoring and reporting on project deliverables, the interviewees identified lack of technical knowledge, poor record administration, lack of data, poor resource allocation, shortage of resources, lack of responsibility, unrealistic timeframe, and poor scope definition as some of the challenges that affected their efforts to monitor and report project progress on deliverables. Many of the interviewees argued that to overcome the challenges of monitoring and reporting project progress on deliverables, it was necessary to review the system that was currently based on any available method. In addition, the interviewers called for extensive training to provide direction on the use of the monitoring and project progress reporting systems, since the only way an effective system could work was if individuals understood the system and the processes were not difficult to understand. It was believed, therefore, that the views expressed provided a great avenue for the development of the PMF which was

sensitive to the needs of ECs in order to support their sustainability. The evidence above suggests that having a PMF in place can support effective project monitoring and control among ECs in the construction industry which can lead to a successful project outcome. This finding is consistent with Larson and Gray (2018) and Orgut et al. (2020) who found that project monitoring and control are crucial in achieving successful project outcomes. Furthermore, the findings also support Budler and Trkman (2019) who found that a framework can support a particular approach to achieve a specific objective consistently.

5.3.2.11. Additional comments or information regarding the use of a PMF by ECs

Feedback regarding additional comments showed that the interviewees suggested that any PMF that is developed to support ECs should be concise and clear, should be user-friendly and simple, should be developed specifically with small businesses in mind, and should form the basis of project management in small business. In addition, the interviewees made a case for short courses that should promote the training of ECs to implement the PMF. A summary of the additional comments is provided in Table 5.45.

Table 5.45: Summary of Additional Comments on PMF by Interview Participants

Interviewee	Additional comments
A1	The framework should be clear and concise and speak to the construction industry
A6	Project management tools should be user friendly, especially for emerging contractors.
A7	For emerging contractors, the PMF should be simplified
A8	I think the PMF should be as less technical as possible
A10	There are many tools available however we need that one that is tailored for startups
A17	The criticality of the use of PMF for emerging contractors should form the basis of the performance, this will help us grow and become responsible in our work
A18	This PMF can assist emerging contractors to effectively manage their project which will give them a chance to prove their capability
A22	The PMF should be user friendly. The less technical it is the more it will be of use to us
A23	Consider short course aimed at emerging contractors on how to implement PMF

5.4. RESEARCH QUESTIONS AND TRIANGULATED RESULTS

The research questions investigated in this study were:

1. What would be the essential components of a PMF that is responsive to the availability of resources to ECs?
2. To what extent does the developed PMF support the development and replication of accepted project management practices among ECs?
3. To what extent does the developed PMF assist effective communication within the project teams and other stakeholders of ECs?
4. To what extent does the developed PMF streamline the use of tools and templates for key project management processes?
5. To what extent does the developed PMF establish a consistent approach to facilitate customers' understanding of the project management processes?
6. To what extent could the PMF ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle?
7. To what extent do the components of the developed PMF ensure adequate monitoring of, and reporting on, project deliverables?

The various research questions above were derived from the primary research question of the study which was: How could a PMF support the sustainability of emerging contractors in the Free State Province of South Africa? Discussion is therefore provided on the various research questions which were addressed by the empirical evidence of both the quantitative and qualitative results as presented in the previous sections of this chapter. Furthermore, to answer these questions, it was necessary first to review the literature related to the questions (Chapters Two and Three). In Chapter Two, issues regarding emerging contractors were discussed. In Chapter Three, the issues related to project management and its usage among small businesses were examined to provide a basis on which to collect both quantitative and qualitative data to provide empirical evidence to answer all the research questions successfully.

5.4.1. Research Question 1: What would be the essential components of a PMF that is responsive to the availability of resources to ECs?

To answer this question, findings from the empirical results were employed. The average mean scores of statements regarding project life-cycle, project control cycle, tools and templates were calculated as shown in Table 5.46.

Table 5.44: Average mean scores of PMF components

Variable	Average mean score
Project life-cycle	4.25
Project control cycle	4.23
Tools and templates	4.29

As shown in Table 5.46, the average mean scores of statements regarding the PMF components, which included: project life-cycle, project control cycle, tools and templates, were all above the midpoint of 3.00. This indicated that most of the ECs who participated in the study agreed that project life-cycle, project control cycle, and tools and templates were the essential components of a PMF that is responsive to their resource availability. This finding corroborates the argument of Naybour (2010) and McConnell (2010) that the essential components of any PMF that supports successful project management should include project life-cycle, project control cycle, and tools and templates. In addition, the analysis of the qualitative data showed that ECs perceived project life-cycle, project control cycle, and tools and templates to be critical components that met their resource needs in undertaking their project activities. For example, 24 of the 25 interviewees who participated in providing qualitative data concurred that project life-cycle, project control cycle, and tools and templates were essential components of the PMF.

5.4.2. Research Question 2: To what extent does the developed PMF support the development and replication of accepted project management practices among ECs?

To answer this research question, the average mean scores of the statements regarding the three components of the PMF and its use among ECs were calculated.

These are presented in Table 5.46. The results showed that the means of the average mean scores of the variables measured were above the midpoint of 3.00. This indicated that the ECs who participated in the study attached importance to the project life-cycle, project control cycle and used tools and templates extensively in their project activities. The qualitative results further highlighted the importance of the PMF in promoting the replication of accepted project management practices among the ECs that participated in the study. for instance, A1 stated, “It will create consistency and replicability.” All the interviewees in the qualitative stage contended that they would readily use a PMF in their project activities on a continuous basis as long as it was responsive to their resource needs since it would support their project management process tremendously. A8 affirmed, “If it speaks to my project, yes, I will. Some of the documents are very irrelevant and confusing.” A22 stated, “Yes, especially if it is tailored for small construction businesses.” These findings supported the claim by Venter and Urban (2015) and Fernandes, Ward and Araújo (2014) that frameworks make it easier for individuals to deal with complex and confusing situations. Thus, it was concluded that the desire of ECs to use the PMF would be because it would enable them to address the difficulties of applying project management haphazardly in their project endeavours.

5.4.3. Research Question 3: To what extent does the developed PMF assist effective communication within the project teams and other stakeholders of ECs?

To address this research question, the mean and average mean scores of the statements regarding the three components of the PMF were calculated as presented in Tables 5.17, 5.18, 5.19, and 5.46. Overall, the average mean scores of project life-cycle, project control cycle, and tools and templates were above the midpoint of 3.00, which meant that ECs who participated in the study regarded these components as part of the PMF. This finding showed that all the variables under consideration for the PMF were critical in promoting effective communication within the project teams and with all other stakeholders (Wysocki, 2019; Kerzner, 2017b). In support of these

results, the qualitative results showed that ECs perceived that the PMF assisted in both internal and external communication during the project management process in their firms. A7 supported this by stating, “Most definitely, through the proper project management framework, no need for back and forth. Communication will be easy as all project related deliverables and milestones will be documented.” A22 added, “Yes, well documented project related matters make it easy to communicate project status.” A8 affirmed, “It will ease communication on project progress.” Larson and Gray (2018) and PMI (2013) affirmed that using a project management approach in business is crucial in enhancing overall communication among both project team members and all other stakeholders.

5.4.4. Research Question 4: To what extent does the developed PMF streamline the use of tools and templates for key project management processes?

To address this research question, the average mean score of the statements regarding the use of tools and templates was calculated as shown in Table 5.45.

Table 5.45: Average mean score of perception of the use of templates and tools

Variable	Average mean score
Tools and templates	4.29

The average mean score of the perception of items related to tools and templates (see Table 5.47) was greater than the midpoint score of 3.00, indicating that most of the ECs who participated in the study used tools and templates extensively in the discharge of their project management activities in the construction industry of South Africa. In support of this result, the ECs who were interviewed explained that a PMF supported the effective use of tools and templates in their project management activities. Furthermore, interviewees suggested that a PMF should form the basis of the tools and templates that are required to adopt a project management approach in their firms. A8 supported this by stating, “Yes, I think so. PMF should form the basis of what tools and templates are required for a project.” The major conclusion was that the PMF could promote the use of tools and templates among ECs in the discharge of their project management activities in the South African construction industry. This

observation agrees with Shivakumar's (2018) study which found that the use of a project management approach may promote the efficient and consistent use of templates and tools as well as enhances the use of project management approaches among organisation undertaking projects.

5.4.5. Research Question 5: To what extent does the developed PMF establish a consistent approach to facilitate customers' understanding of the project management processes?

The results from the analysis of the quantitative data, as shown in Tables 5.17 and 5.19 indicated that: a review with the customer, train customer and communication plan all had mean scores that were above the midpoint of 3.00, indicating the overall importance of these activities. In project management terms, these three variables promote the customers' understanding of the project management processes (Larson and Gray, 2018; Dobson, 2015), since they provide an avenue for the project management to network or link with the customers during the project management process (Badewi, 2021; Yang and Peng, 2008). The findings from the qualitative data analysis showed that the use of PMF could promote customers' understanding of the project management process. For example, A15 stated, "Very well, PM process makes it easy to communicate with clients since everything is documented." A7 added, "Most of my project clients are government entities with knowledge of project management, so they do understand." The findings are in line with Badewi (2021) who found that there is a strong relationship between the use of project management approach and customers' understanding of the project management process since the use of project management approach by organisations enables them to network with customers during the project management process.

5.4.6. Research Question 6: To what extent could the PMF ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle?

To address this research question, the average mean score of all the variables related to the three essential components of PMF was calculated, as presented in Table 5.46.

As shown in Table 5.46, all the essential components had average mean scores that were greater than the midpoint of 3.00, indicating the importance that ECs attached to all the variables under consideration. The main argument for the adoption and use of a project management approach by many authors is the ability of the process to enhance successful project delivery (Badewi, 2021; Greenwood and Hinings, 1996). Thus, based on the results in Table 5.46, it could be concluded that the PMF could ensure that ECs maintain focus on the milestones agreed upon. In addition, this conclusion was supported by the qualitative result which showed that ECs regarded the use of PMF components as being key in discharging their project activities successfully by maintaining focus on the agreed milestones. For instance, A2 stated, “It aids in keeping track of the customer expectation in terms of quality and timeframe.” A14 added, “It assists in keeping track of the deliverables as per given timeframe.” This finding is consistent with the findings of Badewi (2021) and Clegg and Courpasson (2004) who found that frameworks may guide individuals or organisations in sticking to the appropriate guidelines in the achievement of their project objectives consistently. Furthermore, Badewi and Shehab (2016) and Pollack, Costello and Sankaran (2013) found that PMF may support the maintenance of focus on what was to be achieved in terms of the project objectives and milestones.

5.4.7. Research Question 7: To what extent do the components of the developed PMF ensure adequate monitoring of, and reporting on, project deliverables?

To answer this research question, the average mean score was calculated for the perceptions of the importance of the project control cycle (Table 5.48) as well as the mean score of the perceptions of the importance of status reporting and forecasting during projects as presented in Table 5.17.

Table 5.46: Average mean score of the perceptions of the importance of the project control cycle

Variable	Average mean score
Project control cycle	4.23

As indicated in Table 5.48 the average mean score of the perceptions of the importance of the project control cycle was above the midpoint of 3.00, and the mean score of the perceptions of the importance of status reporting and forecasting during projects, as presented in Table 5.17, were also above the midpoint of 3.00, all indicating the importance attached to these variables by the ECs who participated in the study. The finding here is consistent with Larson and Gray (2018), McConnell (2010), and Naybour (2010) on the importance of the project management process in enhancing the activities that are undertaken during the project monitoring and control phase in project management. In addition, the qualitative results showed that the interviewees stated that the components of the PMF provided consistent, reliable, accurate, accountable, and responsible ways to enable the project team to deal with issues pertaining to monitoring and control during the project, thereby ensuring effective and efficient resource allocation and communication which led to a reduction in confusion during project execution. A13 supported this by stating, “It will aid in tracking the progress of the project in relation to time, budget, and resources.” A23 added, “Project tracking and accountability will be easy.” A4 stated, “It will assist in the effective allocation of resources and tracking of progress.” A17 added, “It will aid in keeping track of all records regarding the project.” The findings resonate with the study of Orgut et al. (2020) and Larson and Gray (2018) who found that using a project management approach provides a better chance of performing effective monitoring and control, and reporting on projects. Thus, having a PMF that is developed based on a well-established project management approach should be able to support and ensure effective project monitoring, control, and reporting. According to Badewi (2021), the use of a PMF can provide a structured guideline which may lead to a consistent and efficient approach to applying project control and monitoring in the project management process.

5.5. VALIDATION OF PROJECT MANAGEMENT FRAMEWORK

The validation of the PMF that would support the sustainability of ECs in the Free State Province of South Africa was conducted by means of a questionnaire survey of conveniently selected ECs. The survey questionnaires were distributed in person and by email. The use of the survey questionnaire was to ascertain the consensus of ECs

regarding the framework, based on a set of pre-determined criteria to indicate how they view the framework. The respondents were required to evaluate the framework based on its logical structure, clarity, coherence, practical relevance, applicability, and meaningfulness. In addition, the respondents were asked to provide further comments that they thought could be useful to develop the framework so that it would support their project delivery endeavours leading to sustainability. The possible scores for these criteria in the questionnaire were 5 (excellent), 4 (good), 3 (fair), 2 (below average) and 1 (poor).

5.5.1. Results from the PMF Validation Survey

Table 5.49 shows the background information of the respondents who participated in the framework validation survey.

Table 5.47: Background information of respondents to validation survey

Category	Classification	Frequency	Percentage
Gender	Male Female Missing	19 15 2	55.9 44.1
Years in construction	Below 5 Years 5 -10 Years 11 – 15 Years 16 – 20 Years Over 20 Years	0 6 9 13 8	0.0 16.7 25.0 36.1 22.2
Highest educational qualification	No formal education Primary Middle school High school Under-graduate Post-graduate	0 0 2 12 11 11	0 0 5.5 33.3 30.6 30.6
Professional designation	Project manager Construction manager Business owner Business manager Other (specify)	8 7 15 2 4	22.2 19.4 41.7 5.6 11.1

Table 5.49 shows the background information of the respondents to the validation survey, which includes gender, years in the construction business, highest educational qualification, and professional designation. Of the 70 survey questionnaires administered by email and in person, a total of 36 were returned and deemed to be

useful for the intended purpose. This represented a response rate of approximately 51%.

Table 5.50: Validation of PMF based on the scoring method

Criterion	Response (%)					MS	Rank
	Excellent ..... Poor						
	5	4	3	2	1		
Logical structure	30.6	44.4	25.0	0.0	0.0	4.06	1
Meaningfulness	25.0	55.6	19.4	0.0	0.0	4.06	2
Coherence	25.0	52.8	22.2	0.0	0.0	4.03	3
Clarity	27.8	44.4	27.8	0.0	0.0	4.00	4
Practical relevance	25.0	44.4	30.6	0.0	0.0	3.94	5
Applicability	19.4	55.6	25.0	0.0	0.0	3.94	6

Table 5.50 showed the results of the scoring method used to validate the PMF. The respondents were asked to assess the framework according to a set of pre-determined measures which included: logical structure, meaningfulness, coherence, clarity, practical relevance, and applicability. These criteria were used to assess whether the PMF adequately reflected its intended objective of supporting the sustainability of ECs (Murray-Smith, 2015; Meyer and Quell, 2011). The criteria were ranked using the mean score (MS) values calculated for each. Overall, the feedback from the validation survey was encouraging because the MS for each criterion was greater than the midpoint of 3.00. This meant that the respondents considered the framework to be appropriate for its intended objective. The MSs for logical structure and meaningfulness were both 4.06, suggesting that the respondents agreed that the arrangement of the components of the framework was rational and relevant. The MS of 4.03, which is above the midpoint of 3.00, for coherence showed that the respondents agreed that the logical flow of the components of the framework was appropriate. The respondents considered the framework to be easy to understand as indicated by an MS of 4.00 which was greater than the midpoint of 3.00. Furthermore, practical relevance and applicability both had an MS of 3.94 which was above the midpoint of 3.00, indicating that the respondents agreed that the framework was suitable for use and would be appropriate in supporting the sustainability of ECs.

Table 5.51: Additional comments/suggestions from the PMF validation survey

Comments and suggestions directly related to the PMF.

- Quality management could be added to the project control cycle to ensure all the various elements of the project are properly coordinated to enable quality assurance.
- The inclusion of procurement and contract plan under tools and templates could assist ECs to familiarise themselves with proper procurement processes and their contractual obligations.
- The inclusion of a tool dedicated to financial management will be helpful to ECs in dealing with project accounts and cashflows.
- The incorporation of cost management as one of the pre-and post-project management activities could help ECs.
- Incorporation of Agile methodology where the project phases are blurred and intertwined could help avoid delays in project timelines.
- Inclusion of contract information with project sponsors as part of the framework can assist also with periodic progress determination.
- The introduction of key measurable indicators to measure project success could be helpful.
- Evaluation of key metrics should be included in every phase of the project life-cycle.

Comments and suggestions not directly related to the PMF.

- Incubation of ECs by large construction firms to ensure sustainability and development.
- Poor workmanship and abandonment must not be tolerated.
- The need for pollical buy-in from local communities.
- Strict implementation of 30% community development, labour, and equitable distribution of resources.
- Materials should be delivered on time and their quality assured.
- Project team should be kept together to ensure teamwork that enhances project work.
- Project managers should ensure communication is enhanced to ensure successful project outcomes since communication is important.
- Ability of project managers to predict challenges that could affect project progress and success.
- The need to ensure political understanding among stakeholders to ensure successful project outcomes.
- The need for consequence management of fraud and corruption in the project life-cycle.
- The use of appropriate risk management through planning and collection of project information in advance.
- Project managers need to work on project team differences and different personality traits.
- Welfare and skill development of workers must be nurtured to improve loyalty and performance.
- Community involvement in the early and the last phases of the project life-cycle.
- Continuous adherence to project specifications always.
- Project team members should uphold good standards of practice.
- Project manager to ensure project team members acquire skills and expand their knowledge to ensure positive project outcomes.
- Expand the retention period of guarantees from 1 year to 3 or 4 years to ensure quality workmanship.

• The project manager and team members need to analyse setbacks and failures continuously and implement lessons learned. • Framework should be able to address the loss of funds on projects to ensure project quality. • The need to look at the issues of unqualified people getting tenders which leads to fraud and corruption. • Skill transfer and development of employees through related short courses and training. • Framework comprehensive since it covers everything, except that most projects are not completed on time. • Most things are covered in the framework. • Avoidance of financial kickbacks in the acquisition, implementation, and completion of projects. • Employees should be paid in accordance with skills and work performed to enhance handwork and commitment. • Need for flexible communication channel with project stakeholders to ensure successful project outcomes. • Lack of knowledge and understanding of project implementation processes leading to financial and quality issues since ECs struggle with tendering and cost management.
Concerns from respondents regarding the overall PMF usage. • Most ECs do not have a clear and formal organisational structure. How can that be addressed with the PMF to ensure sustainability? • ECs project management process needs to be holistic to achieve sustainability. That is, it should include managing projects in terms of time, cost, and quality as well as managing the social, environmental, and economic impact. • Practical relevance could be a challenge since the implementation agents and clients need to be conversant with the framework. • Current systems that are in place to assist ECs are not understood by the clients resulting in their disregard.

Table 5.51 contains additional comments and suggestions provided by respondents regarding general ideas that should be incorporated into the PMF. Overall, the 36 respondents provided general comments that are divided into those directly related and not directly related to the PMF under consideration (See Table 5.51). Even though some of the comments were not directly related to what could improve the PMF, it is believed that the comments or suggestions are still helpful in providing information for further studies related to the use of the PMF in the construction industry to enhance the performance of ECs, thus they are included in Table 5.51. Furthermore, careful evaluation of the comments did not warrant the modication of the current PMF, thus the PMF was not modified after the validation process.

5.6. CHAPTER SUMMARY

Findings from the primary quantitative survey, qualitative interviews and the PMF validation survey showed that the proposed PMF should be able to support the sustainability ECs if it is adopted and used. The statistical analysis results indicated that there was a statistically significant relationship between the PMF and sustainability. Furthermore, the qualitative findings showed that ECs would favour the framework on the grounds that it was cognisant of their resource needs and capabilities. Furthermore, from the validation survey, the findings were positive, since the respondents believed that the framework could suit the project management needs of ECs in the construction industry and thus could support their sustainability.

6. CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. INTRODUCTION

The aim of this study was to develop a project management framework that would support the sustainability of emerging contractors in the Free State Province of South Africa. This chapter contains a summary of the research, conclusions based on the objectives, contribution to the body of knowledge, recommendations and limitations of the research.

6.2. SUMMARY OF THE RESEARCH

This thesis was presented in six chapters. Chapter One contained the background of the study in sections that included the introduction, problem background, problem statement, motivation for the study, research questions, the aim and objectives of the study, the conceptual framework, assumptions, delimitation of the study, limitations, the significance of the study, and the scope of the study. Overall, Chapter One provided the platform for an overview of the research problem as a whole and the need to find rigorous solutions to the problem.

Chapter Two contained the literature review of the study. The chapter was structured to include an introduction, definition of a small business, the role of emerging contractors in South Africa, overview of construction contracting in South Africa, challenges facing emerging contractors, the project management framework for emerging contractors, project management application among emerging contractors, effective project communication using a project management framework, project management framework and project stakeholders, project tools and techniques using a project management framework, the project management framework and customers' understanding of project management, the project management framework and project milestones, using a project management framework to ensure monitoring and reporting on project deliverables, survival and sustainability of

emerging contractors, benefits of project management application, challenges of using a project management approach, theoretical framework, sustainability, achieving sustainability, resource constraints, Pareto's Law, the case for a project management framework, project management and sustainability, project management and resource constraints, and gaps in knowledge.

Chapter Three contained the second part of the literature review on the project management framework to include an introduction, conceptualising of project and project management, a conceptual framework, project management frameworks, the proposed project management framework, a project management framework and successful project delivery, and the benefits of a project management framework.

Chapter Four contained the methodology that was used in the study. The presentation included an introduction, elements of the research process, research philosophy, research approach, research design, validity in mixed research study, reliability in mixed methods, quantitative and qualitative data collection procedures, ethical considerations, and data analysis procedures.

Chapter Five contained the results of the quantitative and qualitative data analysis and interpretation, as well as the PMF validation process. The chapter was structured to include an introduction, quantitative findings, results and interpretation, qualitative findings, results and interpretation, research questions and triangulated results. In addition, the chapter concluded with results from the validation process.

Chapter Six contains a summary of the report with concise conclusions and recommendations.

6.3. CONCLUSIONS ON RESEARCH OBJECTIVES

In this section, results from both the quantitative and qualitative analysis are used to show that the research objectives were achieved.

Research Objective 1: Determine the essential components of a PMF that would be responsive to availability of resources to ECs

Considering the result of the confirmatory factor analysis from the quantitative analysis, it appeared that the essential components of PMF are the three elements: project life-cycle, project control cycle, and project tools and templates. Furthermore, the findings based on the qualitative data from interviews with selected ECs revealed that the project life-cycle, project control cycle and project tools and template are what ECs considered to be key components that they use in managing their project activities. This finding corroborates the suggestion by McConnell (2010) and Naybour (2010). The authors suggest that the essential components of any PMF that may support the project management process of any organisation should consist of project life-cycle, project control cycle, templates and tools.

It was therefore concluded that the essential components of a PMF that is responsive to the availability of resources to ECs are the project life-cycle, project control cycle and project tools and templates.

Research Objective 2: Establish the extent to which a PMF would support the development and replication of accepted project management practices among ECs.

This objective was examined through the analysis of several possible factors based on the quantitative and qualitative findings and results. The factors considered were part of the three essential components of the PMF. The results of the analysis of all these factors are shown in Tables 5.17 to 5.19. The quantitative results showed that most ECs considered the factors to be critical to their project activities in the construction industry. That is, the use of a PMF may lead to the replication of the project management process. This result was explained further by the qualitative results, which indicated that ECs attached importance to these factors in the PMF because they supported the development and replication of accepted project management practices in their project and business activities in the construction industry. This finding appears consistent with the views of Ragbir and Pun (2018) and Fernandes, Ward and Araujo (2014) who contended that having a framework such as

PMF in place may ensure that organisations or firms use project management process consistently and repeatedly in undertaking projects.

Therefore, it was concluded that the proposed PMF can be used to support the development and replication of accepted project management practices among ECs in the discharge of their project and business activities in the construction industry.

Research Objective 3: Establish the extent to which a PMF would assist effective communication within the project teams and other stakeholders of ECs

The quantitative data used in realising this objective indicated that the proposed PMF was important in supporting effective communication among project teams and all other stakeholders of ECs (See Tables 5.17 to 5.19). The qualitative data indicated that the PMF supported ECs in communicating with the project team as well as stakeholders during the discharge of their project mandates in the construction industry. This finding agrees with Pritchard (2004). The author argues that having a framework in place may support effective project communication since the framework can provide a standard protocol of how project communications are handled during the project management process. Furthermore, Rajhans and Shah (2012) found that having standard procedures and manuals ensures that effective communication was guaranteed in undertaking an oversea information technology projects.

Hence, it was concluded that the proposed PMF can be used to support effective communication among ECs, project teams as well as all stakeholders during the discharge of project activities by ECs, which could lead to successful project outcomes.

Research Objective 4: Establish the extent to which a PMF would streamline the use of tools and templates for key project management processes

Quantitative data used in answering questions related to this objective indicated that ECs used tools and templates extensively in the discharge of their projects (see Table 5.19). The tools used extensively were considered to be critical components of the proposed PMF. The qualitative data supported this and showed that the use of tools

and templates made it easy for ECs to use key project management processes when discharging their project activities. The finding here appears to be consistent with the study of Shivakumar (2018) who found that there exists a positive relationship between having a structured project management approach in place and the consistent and efficient use of templates and tools during a project management process.

Therefore, it was concluded that the developed PMF can be used to streamline the use of tools and templates for key project management processes in the project activities of ECs leading to consistent, and successful project performance.

Research Objective 5: Establish the extent to which a PMF facilitates customers' understanding of the project management processes

The findings from the quantitative data indicated that ECs attached importance to the use of the elements of the components of the developed PMF that supported the appropriate use of project management practices that support customers' understanding of the overall project management process (see Tables 5.17 to 5.18). In explanation, the qualitative data revealed that the use of the developed PMF could support the project management activities of ECs by making it simpler for them to communicate effectively with customers about the project management process, thereby providing the customers with an understanding of the overall project management processes that they were using in the discharge of projects to make them successful. The finding agrees with Badewi (2021) and Yang and Peng (2018) who found that there is a positive relationship between using a framework during the project management process and the customers' understanding of the overall project management process.

Therefore, it was concluded that the developed PMF can be used to support the customers' understanding of the project management processes being used by ECs to achieve successful project outcomes.

Research Objective 6: Establish the extent to which a PMF would ensure that focus is maintained on agreed milestones at the early stages of the project life-cycle.

Results from the quantitative data showed that ECs considered the dimensions of the PMF measured to be important in achieving the essential components of the PMF (see Tables 5.17 to 5.18). The qualitative data explained further that ECs considered a PMF to be critical in maintaining focus on agreed milestones at the early stages of the project life-cycle, since it provided them with a proactive approach to managing their projects. The finding appears to be consistent with a study by Badewi (2021) and Clegg and Courpasson (2004). The authors found that a framework may guide individuals or organisations in sticking to the appropriate guidelines in the achievement of project objectives on a consistent basis. Also, Badewi and Shehab (2016) and Pollack, Costello and Sankaran, 2013) suggest that a framework can enable project team members to focus on project objectives and milestones when undertaking projects.

It was therefore concluded that the proposed PMF can help to ensure that ECs maintain focus on agreed milestones at the early stages of the project life-cycle.

Research Objective 7: Determine the extent to which the components of a PMF would ensure adequate monitoring of, and reporting on, project deliverables.

Based on the quantitative data collected for this study, ECs considered the three essential components of the developed PMF to be critical in their project management endeavours in the construction industry (see Tables 5.17 to 5.19). In the explanation of the results of the quantitative data, the qualitative data showed that ECs believed that the components of the developed PMF could ensure adequate monitoring and reporting on their project activities. This finding agrees with Orgut et al. (2020) who found out that without a consistent, reliable and objective approach to project monitoring and control, it is impossible to achieve an effective and efficient process of monitoring, controlling and reporting on project objectives. Furthermore, Badewi (2021) argues that having a framework in place may provide a structured guideline on project monitoring, controlling, and reporting which can ensure a consistent and efficient project management process.

It was therefore concluded that the components of the developed PMF can be used to ensure adequate monitoring, controlling, and reporting on project deliverables.

6.4. IMPLICATIONS OF THE STUDY

Implications are ideas about the importance of a study to various audiences (Creswell, 2015). The results and findings of this study have implications for research, practice, and theory within the field of project management and sustainability, with specific attention to ECs, who operate their business and project activities in the construction industry of South Africa.

6.4.1. Theoretical Implications

The study developed and validated a framework to enhance the sustainability of ECs in South Africa through PMF which is made up of project lifecycle, project control cycle, template, and tools. Apart from contributing to the paucity of literature, the developed PMF, if well implemented, will enhance ECs sustainability, and contribute to the body of knowledge. Also, other developing countries with similar ECs challenges in the construction industry can modify the developed framework and adapt it to enhance their ECs sustainability.

6.4.2. Practical implications

From a practical viewpoint, the study confirms that the PMF are relevant for the progressive performance of ECs in South Africa and the developed PMF with the components will address the resource needs of ECs in undertaking project activities in the South African construction industry. The developed PMF components are inclusive because the three main components of project lifecycle, project control cycle and templates and tools are based on well established project management methodologies and have been integrated for efficient performance in the discharge of project activities. Therefore, the findings in this study have meaningful and practical implications for stakeholders, especially ECs and policymakers.

- The developed PMF should expand the knowledge of ECs towards innovation and sustainability with the requirements tailored towards productivity and profitability

and promote the implementation of PMF for construction activities in the South African construction industry.

- The developed framework will provide a meaningful direction for optimising and sustaining ECS in the South African construction industry.
- The PMF will help practitioners and policymakers to promote ECs sustainability. Therefore, the study will contribute to creating employment and promote the economic empowerment of previously disadvantaged population groups across South Africa.
- South Africa's ECs can use the developed PMF as a guideline to mitigate failures and maximise success in the construction and business activities.
- The developed PMF may be employed to evaluate ECs' compliance with the project management process in undertaking their project and business activities in the future.

6.4.3. Implications for future research

While the study attempted to consider how the developed PMF and its components can be used to support the sustainability of ECs, some gaps, which were beyond the scope of this study remain. The findings of the study have identified the following issues that have implications for future research:

- This study is limited in scope as it only covers one province in South Africa. Thus, the findings and results of this study should spark the interest of other researchers to undertake future research on similar topics in all the provinces of South Africa so that the findings can be generalised across South Africa.
- The study should also stir up other interested researchers positively and emerge new openings for future studies such as economic, environmental, and social sustainability regarding ECs in the South African construction industry.

6.5. RECOMMENDATIONS

In this section, recommendations are made for the adoption and use of the developed PMF to support the project and business activities of ECs and build their sustainability. A number of issues were revealed in the study pertaining to project management and its use among ECs, and how this affected their project delivery outcomes. The EC Programme is a vehicle used by the South African Government to empower individuals economically from the previously disadvantaged population groups through the construction industry. Thus, there is necessary for ECs to achieve consistent project and business success which can lead to their sustainability. As indicated in Chapters Two and Three, the project and business activities of ECs continue to be met with complaints from clients and stakeholders. Moreover, the application of project management techniques and methods has been reported to be helpful in achieving successful project outcomes in the construction industry. Since the business and project activities of ECs are carried out in the construction industry where such activities or businesses are project oriented, there is a strong case for a project management approach to be adopted in undertaking such projects to achieve successful and consistent project outcomes that can lead to business sustainability. Therefore, the following recommendations are made based on the research results and findings in Chapter Five as well as conclusions from the previous section.

6.5.1. Recommendation for Practice

As indicated in both the quantitative and qualitative findings, most of the respondents considered the elements of the three components of the proposed PMF in their project and business activities. Furthermore, the structural equation modelling used in the development of the PMF has shown that the use of the framework can lead to the business sustainability of ECs. It is therefore recommended that the developed PMF be considered as a requirement for ECs in the project business activities if they are to deliver successful projects and build their sustainability.

6.5.2. Recommendation for Research

This research study provides ECs with a framework which should support their business sustainability in the construction industry. Future research should be expanded to other provinces as well as to determine the actual results of the use of the framework by ECs in supporting their sustainability.

6.6. CONTRIBUTIONS TO KNOWLEDGE

This section contains an outline of the contribution made to the body of knowledge through this research study. The extent to which this research thesis is considered to be a contribution to the body of knowledge is the key assessment criterion. The three main indicators that demonstrate the contribution of knowledge include: the relationship with existing literature (Chapters One, Two and Three), awareness of research methodology (Chapter Four), and scholarly research findings (Chapter Five, and Six).

6.6.1. The Relationship with Existing Research

Relevant literature was reviewed to determine existing gaps in knowledge as outlined in Chapters One, Two and Three. The knowledge gaps provided the rationale to examine rigorously the role of emerging contractors in the construction industry, the project management practices of emerging contractors, and the project management framework and sustainability of emerging contractors. It was observed that ECs play a critical role in the construction industry and are considered by the government to be a key vehicle for economic emancipation of individuals from the previously disadvantaged population groups through the construction industry. However, their inability to deliver projects successfully results in the lack of sustainability of their businesses which can affect the government's goal. Furthermore, it was found that the use of a project management approach is a critical factor in delivering successful project outcomes in the construction industry, since activities in the construction industry are typically project oriented. Thus, the findings in Chapters One, Two and Three provided a theoretical framework within which to explain: the role of emerging contractors in the construction industry, the sustainability of emerging contractors, the

use of project management in construction industry, the role of a project management framework in supporting project management practices of emerging contractors and the development of a project management framework that can support the project businesses of ECs. The review of these concepts and their relationship is novel in the research domain of the construction industry. It can, therefore, be argued that a contribution has been made to knowledge in this regard.

6.6.2. Awareness of Research Methodology

Seven research questions were formulated to address the primary research question (Section 1.5). The questions required a pragmatic approach that used an explanatory sequential, mixed-methods research design that would produce original scholarship. The method adopted made it possible to collect quantitative data using a survey questionnaire administered to emerging contractors who worked in the construction industry. Thereafter, the analysed quantitative data were used to determine the collection of qualitative data. The qualitative data were collected using semi-structured interviews conducted with purposively selected emerging contractors who took part in the quantitative data collection phase. Thus, essentially, an explanatory sequential, mixed-methods research design was used to collect quantitative data which were validated by using qualitative data collected during semi-structured interviews conducted with emerging contractors.

Awareness of research methodology was demonstrated using quantitative and qualitative approaches in a complementary manner to ensure the breadth and depth of knowledge required to achieve the objectives of this study.

6.6.3. Scholarly Research Findings

The scholarly contribution to knowledge was based on the findings from achieving the research objectives of this study. While taking into account contextual factors, other research can now build on the following findings:

- The essential components of the proposed PMF that is responsive to availability of resources to ECs should include: the project life-cycle, project control cycle, project tools and templates.
- The proposed PMF can be used to support the development and replication of acceptable project management practices among ECs during project management.
- The proposed PMF can be used to support effective communication among ECs, project team as well as all other stakeholders.
- The use of tools and templates during project management can be streamlined by using the proposed PMF.
- Customer understanding of the project management process used by ECs can be enhanced with the use of the proposed PMF.
- ECs can maintain focus on the agreed milestones during early stages of the project life-cycle by using the proposed PMF.
- The proposed PMF can be used to ensure adequate monitoring and reporting of project deliverables without excessive bureaucracy.

Perhaps, the most significant contribution to knowledge is the project management framework. In particular, the proposed PMF could be used to assist emerging contractors to:

- Determine the critical activities that must be considered during each phase of their project management process in the construction industry.
- Adopt and continuously use a project management approach in all their project management endeavours to enhance their project delivery outcomes.
- Determine how effectively each stage of the project management process can be adopted to ensure their sustainability in the construction industry.
- Support the overall project management approach of the ECs in the construction industry by providing a structured approach to how each project should be managed to ensure a successful outcome.

The goal of the PMF is to support the sustainability of ECs in the construction industry in the Free State Province. In the construction industry, sustainability can only be achieved if projects are delivered according to the requirements of all the

stakeholders associated with the project. Thus, the use of the framework should provide an avenue to satisfy all these stakeholders, thereby increasing the chances of project success by ECs.

6.7. LIMITATIONS OF THE STUDY

According to Creswell (2015), a study's limitations are the potential flaws and faults of the study as discovered by the researcher. The limitations of the present study are outlined below and should be carefully considered in order to appreciate this study in its proper context. Despite the benefits of mixed research methods, the approach does present a researcher with several challenges (more work, more financial resources, and more time than singular methods) which could affect the results of the study (Molina-Azorin, 2010). The researcher acknowledged the following limitations which could have affected the reliability and the generalisability of the results of this study and should therefore be noted.

First, the study was conducted solely in the Free State Province and therefore the extrapolation of its findings to other South African provinces, which have different business climates, and different population dynamics may be limited. Consequently, there is no guarantee that the findings from this province can be generalised to other provinces unless they share similar contextual, socio-cultural, and business climates and dynamics as those reported in this study. Furthermore, the views elicited may not be sufficiently representative of all ECs in South Africa. Further studies on a similar topic can focus on other provinces of South Africa, which are not covered in the present study.

Second, the results and findings of the study were based on only ECs in the construction industry, However, a study among all other construction stakeholders such as subcontractors, suppliers, customers, project team members and clients may have generated a more robust data in exploring the impact of PMF in overall ECs business sustainability in the South African construction industry. It is recommended for further research be carried out to explore how the PMF can benefit all other

construction stakeholders given that they play a crucial role in the performance of ECs in the construction industry.

Finally, limited time and resources restricted the scope of the current study because the study was for academic degree purposes. As a result, the collection of qualitative, follow up data was limited to a few individuals through purposive sampling, although this decision was supported by Yin (2014). It is recommended that extensive coverage is given to qualitative data on a similar topic in future research in order to generate rich information that can provide a deeper insight.

6.8. FINAL CONCLUSIONS

In this chapter, conclusions have been drawn about the development of a PMF that supports the sustainability of ECs in the FS Province of South Africa, based on a literature review and empirical findings. Most of the findings of the study indicated that use of a PMF by ECs can support their business sustainability in the construction industry. The implication of this conclusion for policy makers is that ECs should be encouraged to use the PMF in their project activities. The chapter further contained various recommendations that could be factored into policy design and implementation. Recommendations for practice and further research were also made (see Section 6.4). It is expected that ECs will benefit from the use of the developed PMF if they adopt and use it in their project management activities in the construction industry.

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APPENDIX 1: QUANTITATIVE QUESTIONNAIRE

Dear Sir/Madam,

FACULTY OF MANAGEMENT SCIENCES

Re: Developing a project management framework for supporting the sustainability of emerging contractors in the Free State

My name is Julius Akaba, a Doctor of Business Administration (DBA) candidate at the Central university of Technology, Free State (CUT). The title of the DBA thesis is mentioned above. The study addresses the development of project management framework to support the sustainability of emerging contractors (ECs) in the Free State. I am kindly inviting you to participate in this research by completing the enclosed questionnaire.

The questionnaire will require approximately 15 minutes to complete. There is no compensation for responding nor is there any known risk. To ensure that all information will remain confidential, please do not include your name or any other identification information. Participation is strictly voluntary, and you may refuse to participate. If you choose to participate in this project, please answer all questions as honestly as possible.

The completion and return of the questionnaire indicate your willingness to participate in this study. If you require additional information, please contact me on the number and email address listed below.

Thank you for taking the time to assist me in my educational endeavours.

Your Sincerely,

Mr Julius Akaba

DBA Candidate

0720547319; julakaba@gmail.com

Prof FA Emuze, PhD, Pr. CM, MSAICE, ICIOB, GMICE

Promoter

Dr EK Agbobli, DTech

Co-Promoter

SECTION A: DEMOGRAPHIC DATA							
Please fill in the following general information about you and your firm by indicating the appropriate response with (X)							
1	Please indicate your age	1 (Under 18)	2 (18-34)	3 (35-45)	4 (46-59)	5 (60+)	
2	Please indicate your gender	1 Male			2 Female		
3	Please indicate your highest level of qualification	1 No formal Education	2 Primary	3 Middle School	4 High School	5 Undergraduate	6 Postgraduate
4	Please indicate your highest level of education and training in construction	1 None	2 Apprenticeship	3 Short Courses	4 High School	5 Undergraduate	6 Postgraduate
5	Please indicate the number of years you have been in Construction	1 (Below 5)	2 (5-10)	3 (11-15)	4 (16-20)	5 (Over 20)	
6	Please indicate the sector you mainly undertake projects	1 Building Construction	2 Civil Construction	3 Mining Construction	4 Others		
7	Please indicate the category that best describes your position in the firm	1 Owner	2 Manager	3 Owner/Manager	4 Project Manager		
8	Please indicate the category that best describes the project management activities in which you work?	1 Principal/General contractor		2 Subcontractor/Specialist contractor			
9	Please indicate the project value of most of your work?	1 Small size (less than R1m)	2 Medium size (R1m to R10m)	3 Large size (more than R10m)			
10	Please indicate the stage of a project you are most involved in	1 Defining stage	2 Planning stage	3 Execution stage	4 Closing stage		

11	Please indicate the extent of project management knowledge on your contracts.	1 Minor extent	2 Near minor extent	3 Moderate extent	4 Near major extent	5 Major extent	

SECTION B: ECONOMIC SUSTAINABILITY							
Please indicate the level of concurrence with the following statements regarding the economic sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.							
		5 Strongly agree	4 Agree	3 Neutral	2 Disagree	1 Strongly disagree	
12	The company chooses environmentally responsible suppliers and contractors						
13	The company promotes employment creation through labour intensive construction						
14	The company uses full cost accounting and real-cost pricing to set prices and tariffs for goods and services						
15	The company enhances competitiveness in the marketplace by adopting policies and practices that advance sustainability						
16	Improved sustainable performance is a source of productivity improvement						
17	Improved sustainable performance leads to new market opportunities						
18	Construction firms should execute projects that minimize resource consumption						
19	Construction firms need to promote best practice consumption procurement through the supply chain						
20	Construction firms need to use technology and innovation to increase the sustainability of the construction process						
21	Companies must develop a measurement and reporting system for evaluating performance and areas for improvement						
22	Construction companies must decrease co_2 emissions through decreasing energy consumption						

SECTION C: SOCIAL SUSTAINABILITY							
Please indicate the level of concurrence with the following statements regarding the social sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.							
		5 Strongly agree	4 Agree	3 Neutral	2 Disagree	1 Strongly disagree	
23	Construction companies should protect and promote human health through a healthy and safe working environment						
24	Construction companies must seek fair distribution of the social costs of construction						
25	Construction companies need to seek equitable distribution of the social benefits of construction						
26	Construction companies should implement skills training and capacity enhancement to allow meaningful participation in a project						
27	There should be fair compensation for people adversely affected by construction operations						
28	Construction companies should have a good relationship with employees						
29	Construction companies need to increase their commitment to sustainable construction through education and training of their employees						
30	Construction companies should promote corporate social responsibility						
31	Contractors must comply with governmental sustainability related legislation						
32	Contractors should use appropriate procurement and contracting strategies to promote social sustainability						
33	Construction companies must improve the quality of human life including poverty alleviation						
SECTION D: ENVIRONMENTAL SUSTAINABILITY							
Please indicate the level of concurrence with the following statement regarding the environmental sustainability of your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.							
		5 Strongly agree	4 Agree	3 Neutral	2 Disagree	1 Strongly disagree	

34	Construction companies must create a healthy non-toxic environment						
35	Improvement of environmental performance in a construction organization leads to opportunity for increasing competitive advantage						
36	Implementation of environmental strategies will improve contractor's competencies in environmental management						
37	Implementation of environmental strategies lead to improvements in business performance						
38	Contractors need to use techniques that minimize the harmful effects of construction activities on the environment						
39	Contractors need to make attempts to reduce physical waste generation						
40	Construction firms need to support green design and construction						
41	Construction firms should use energy and water efficient methods / techniques						
42	Construction companies should reduce carbon emissions during construction						

SECTION E: PROJECT LIFECYCLE

Please indicate the degree of importance attached to the following activities during the **definition stage** of project management activities in your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

		5 Very important	4 Important	3 Somewhat important	2 Neutral	1 Not important	
43	Project goals						
44	Scope definition						
45	Task/Activities identification						
46	Responsibility assignment						
47	Review with customer						
48	Provision of limits and exclusions to project scope						
49	Listing of technical requirements of the project deliverables						
50	Identification of milestones						
51	Definition of deliverables						

Please indicate the degree of importance attached to the following activities during the **planning stage** of project management activities in your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

		5 Very important	4 Important	3 Somewhat important	2 Neutral	1 Not important
52	Schedules					
53	Budgets					
54	Resource availability					
55	Risk consideration					
56	Staffing on the project					

Please indicate the degree of importance attached to the following activities during the **execution stage** of project management activities in your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

		5 Very important	4 Important	3 Somewhat important	2 Neutral	1 Not important
57	Status reporting					
58	Changes to project					
59	Quality on project					
60	Forecasting on project					

Please indicate the degree of importance attached to the following activities during the **closing stage** of project management activities in your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

		5 Very important	4 Important	3 Somewhat important	2 Neutral	1 Not important
61	Training of customer					
62	Transfer of documents					
63	Release of resources					
64	Evaluation on project					
65	Identification of lessons learned					

SECTION F: PROJECT CONTROL CYCLE

Please indicate the degree of importance attached to the following activities during the **project control** of project management activities in your firm. The weight of your selected response corresponds to the value of the response. That is (5) representing the highest weight and (1) the lowest weight.

		5 Very important	4 Important	3 Somewhat important	2 Neutral	1 Not important

66	Quality control						
67	Holding project meetings						
68	Responding to changes on project						
69	Managing issues on project						
70	Tracking work progress						

SECTION G: PROJECT TEMPLATES AND TOOLS							
Please indicate the extent of use of the following project management tools and templates in your project management endeavour. The weight of your selected response corresponds to the value attached the response. That is (5) representing the highest weight and (1) the lowest weight.							
		5 Very extensive	4 Extensive	3 Limited	2 Very limited	1 Not used	
71	Communication plan						
72	Project priority matrix						
73	Responsibility assignment matrix						
74	Work breakdown structure						
75	Quality journey plan						
76	Risk management matrix						

THANK YOU FOR YOUR TIME.

APPENDIX 2: QUALITATIVE INTERVIEW GUIDE

Dear Sir/Madam,

FACULTY OF MANAGEMENT SCIENCES

Re: Developing a project management framework for supporting the sustainability of emerging contractors in the Free State

My name is Julius Akaba, a Doctor of Business Administration (DBA) candidate at the Central university of Technology, Free State (CUT). The title of the DBA thesis is mentioned above. The study addresses the development of project management framework to support the sustainability of emerging contractors (ECs) in the Free State.

May I request an interview with your regarding my research. The interview will last for about one hour. With your permission and consent, I will ask you questions and record your answers. Your personal information will remain confidential and will not be shared with any individuals or organisations. There is no compensation for participation in the interview nor is there any known risk. To ensure that all information will remain confidential, your name and location as well as all other personal details will not be attached to the response. Participation is strictly voluntary, and you may agree or disagree to participate. However, your participation will be welcome since it will help me fulfil my academic endeavour successfully.

If you require additional information, please contact me on the number and email address listed below.

Thank you for taking the time to assist me in my educational endeavours.

Your Sincerely,

Mr Julius Akaba

DBA Candidate

0720547319; julakaba@gmail.com

Prof FA Emuze, PhD, Pr. CM, MSAICE, ICIOB, GMICE

Promoter

Dr EK Agbobli

Co-Promoter

INTERVIEW PROTOCOL

SECTION A: GENERAL INTERVIEW INFORMATION	
A1. Date of interview:	
A2. Duration of interview:	
A3. Mode of interview:	
A4. Method of interview recording:	

SECTION B: PERSONAL INFORMATION OF INTERVIEWEE	
B1. Code name of interviewee:	
B2. Gender:	
B3. Age:	
B4. Education Level:	
B5. Level of training in construction:	
B6. Number of years in construction:	
B7. Sector you mainly undertake projects:	
B8. Your position in the firm:	
B9. What level do you engage in project?	
B10. What is the value of most of your project work?	
B11. Which stage/phases of project are you involved in?	

SECTION C: INTERVIEW QUESTIONS

C1. Do you use any project management framework in your construction activities?

C2. Which components do you consider essential for a project management framework in your project activities?

C3. Do you consider project lifecycle, project control cycle and templates and tools as essential elements of project management framework to you?

C4. Would you readily use a project management framework if it is developed to help you in your endeavours?

C5. Do you opine that the proposed project management framework can help you in managing your projects?

C6. How will the developed project management framework help you? Please cite examples.

C7. Do you think the project management framework can assist with effective communication (internal and external)?

C8. What project management templates and tools do you use to execute your construction work?

C9. In your opinion, will a project management framework to effectively use relevant templates, tools and techniques?

C10. How well do your customers understand the project management process you used in your project activities?

C11. Based on your experience, can the project management framework promote supply chain (clients, designers, vendors, subcontractors) understanding of the construction process?

C12. Are you able to maintain focus on project milestones and deliverables?

C13. What is the role of the project management framework regarding the need to maintain focus on milestones?

C14. What are the challenges you constantly encounter when monitoring and reporting on project deliverables?

C15. What is your view on the current approach for monitoring and reporting project progress in your firm?

C16. What would be the impact of a project management framework on monitoring and reporting activities required by your construction projects?

C17. What other elements, comments or information would you like to add or share on the regarding the use of a project management framework by emerging contractors?

THANK YOU FOR YOUR TIME

APPENDIX 3: FRAMEWORK VALIDATION QUESTIONNAIRE

Dear Sir/Madam,

FACULTY OF MANAGEMENT SCIENCES

Re: Developing a project management framework for supporting the sustainability of emerging contractors in the Free State

I would like to take this opportunity to express my appreciation to you for taking the time to respond to this questionnaire survey in line with the subject. The research is conducted in partial fulfilment of the requirement for the award of a Doctor of Business Administration (DBA) at the Central university of Technology, Free State (CUT) South Africa.

The aim of the questionnaire is to validate a project management framework (PMF) that has been developed to support the sustainability of emerging contractors (ECs) in the Free State province of South Africa. As a requirement of the study, an engagement with experts considered experienced on the subject is considered appropriate as a means of receiving feedback which is anticipated to increase the credibility of the study. It is in line with this that you are contacted. The entire process should not exceed 30 minutes of your time. Responses are treated with utmost confidentiality and will be used for only research purposes.

Should you have any queries, please do not hesitate to contact the researcher on via:

Mobile: 0720547319 or Email julakaba@gmail.com /jakaba@cut.ac.za

Your Sincerely,

Mr Julius Akaba: MTech, DBA Candidate

Researcher

.....

Prof FA Emuze: PhD, Pr. CM, MSAICE, ICIOB, GMICE

Promoter

Dr EK Agbobli

Co-Promoter

INSTRUCTIONS:

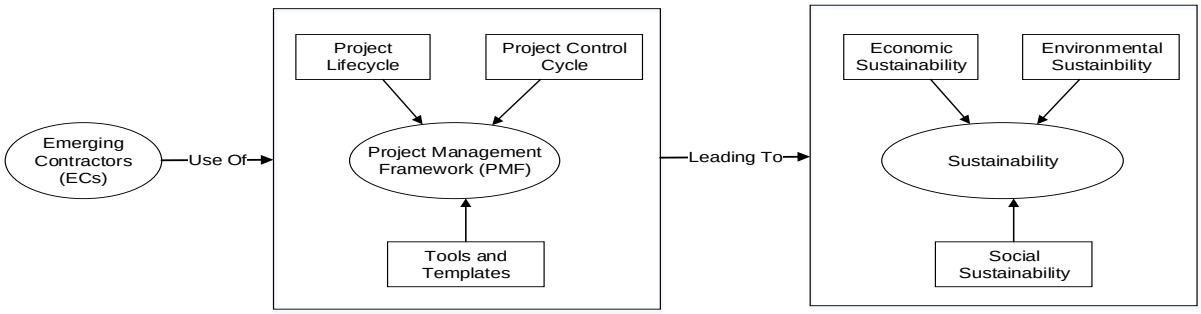
Please answer the following questions by crossing (X) in the relevant space provided.

Section A: Background information

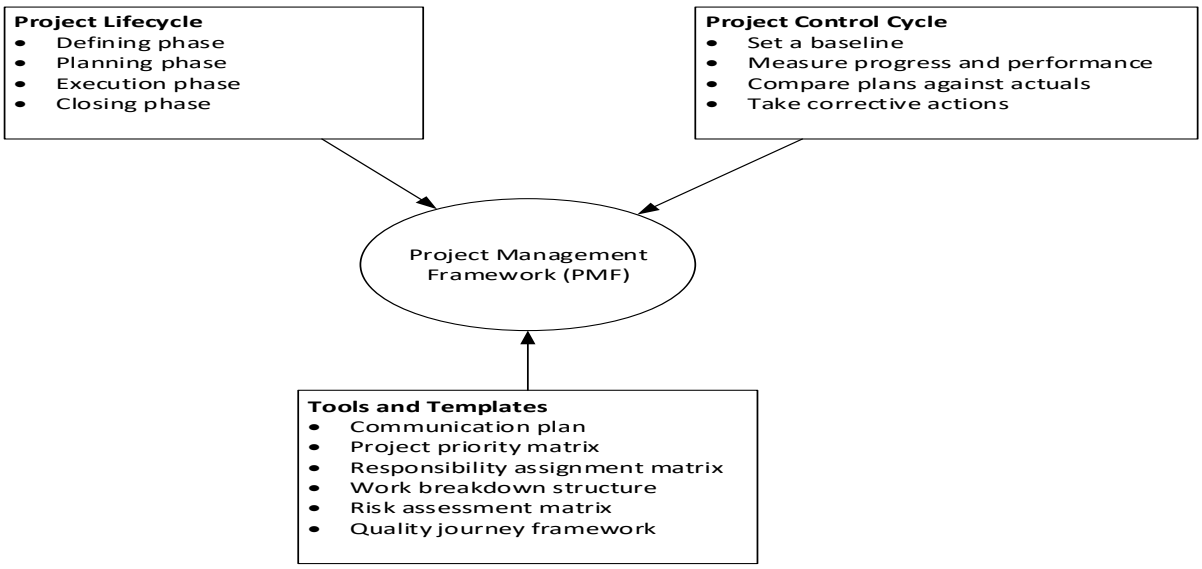
This section of the questionnaire refers to your biographical information required for statistical purposes only.

1	Please indicate your gender	1 Male				2 Female					
2	Please indicate the number of years in the industry	1 (Below 5)		2 (5 - 10)		3 (11-15)		4 (16 – 20)		5 (Over 20)	
3	Please indicate your highest educational qualification	1 No formal education		2 Primary		3 Middle school	4 High School		5 Undergraduate	6 Postgraduate	
4	Please indicate your professional designation	1 Project Manager		2 Construction Manager		3 Business Owner	4 Business Manager			5 Others: Specify	

The Project Management Framework



The sustainability of ECs using a dedicated PMF – The proposed conceptual Framework.



The proposed project management framework and its three essential components

The project management framework (PMF) was developed based on the current project management processes that are in use in managing projects across industries including the construction industry. Project management is seen as the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements successfully (PMI, 2013). It is anticipated that the proposed framework should support the sustainability of emerging contractors (ECs) in the Free State province of South Africa in undertaking their projects in the construction industry. A brief description of components of the framework is presented in Table 1.

Table 1 Brief description of the project management framework.

Components	Description
Emerging contractors (ECs)	This are small businesses owned and run in the construction industry by individuals from the previously disadvantaged population groups in South Africa. Generally, these businesses are classified as small business in South Africa.
The project management framework (PMF)	The PMF is basically considered as the combination of processes, tasks, and tools used to manage a project from the start to a finish (McConnell, 2010). PMI (2013) consider PMF as a basic structure of understanding project management. Thus, the proposed framework is anticipated to promote an easier understanding of project management processes by ECs who are resourced constrained during the discharge of their project management processes therefore needs a structure that makes it simpler and easier for them to discharge project successful thus supporting their

	sustainability. The proposed PMF consist of project life cycle, project control cycle, tools and templates.

Project Lifecycle	Project lifecycle is considered as series of phases that a project goes through from its initiation to its closure (Larson and Gray, 2018; PMI, 2013). The project lifecycle for the PMF consist of four phases of defining, planning, executing and closure.
	• Defining phase,
	  ○ Determine project goals.
	  ○ Determine project specifications.
	  ○ Determine tasks/activities.
	  ○ Assign responsibilities.
	The goal of this phase is to provide the starting point for the project management agenda of the firm after the contract to undertake the project. Thus, this phase supports the development of all the critical elements that are relevant for ECs to start their project management process.
	• Planning phase
	  ○ Develop project schedule.
	  ○ Determine project budget.
	  ○ Estimate project resources.
	  ○ Manage project risks.
	  ○ Staffing on project
	The goal of this phase is to enable ECs develop detailed planning of how the project will be accomplished based on the goals or objectives stipulated by the client.
	• Execution phases
	  ○ Perform work.
	  ○ Monitor and control progress.
	  ○ Control changes
	The goal of this phase is to provide details on how actual work after the planning phase will be accomplished by ECs. This phase is where actual work will be accomplished, however, the work must not only be performed but provision made for progress monitoring and control as well as how changes will be dealt with.
	• Closing phase
	  ○ Evaluate and recognise staff.
	  ○ Collect and make final payments.
	  ○ Conduct post project evaluation.
	  ○ Document lessons learned.
	  ○ Achieve project documents.
	The goal here is to ensure that before the project is finally handed over to the client all works are totally completed, and all relevant closing phases are performed.

Project control cycle	This component of the PMF provides a repeated approach to how project control is undertaken by ECs in order to achieve successful project outcome. Thus, the ECs use

	of this component provide a formal structure that guides project control during project execution. The elements considered for this component consists of: • Set a baseline. • Measure progress and performance • Compare plans against actuals. • Take corrective actions. The goal here is to ensure that ECs have a structured approach to how their project activities are measured and controlled during project execution.
Tools and templates	This component provides ECs with existing guidelines on how project management processes can be handled. Since most ECs are faced with resource constraints, it is imperative that they have in place already prepared tools and templates that can be easily modified to support their project management activities instead of developing a new tool each time for new projects. The tools and templates considered for this component includes: • Communication plan • Project priority matrix • Responsibility assignment matrix • Work breakdown structure • Risk assessment matrix • Quality journey framework The is to ensure that ECs can easily use critical tools and templates that complement their project management activities.
Sustainability	The aim of the framework is to support the sustainability of ECs in the construction. For ECs to achieve sustainability, the project management process needs to be socially, economically and environmentally sustainable. Social sustainability is achieved when ECs undertake projects in a manner that: • Promote healthy and safe working environment. • Comply with government sustainability legislation. • Provide skill training for project team members to enhance their participation in the project. • Ensure fair compensation for work affected on the project. • Promote social corporate responsibility. Economic sustainability is achieved when ECs undertake projects in a manner that: • Real cost pricing methods are used to budget for projects. • Use of technology and innovation to increase construction process sustainability. • Minimisation of resource consumptions Environmental sustainability is achieved when ECs undertake projects in a manner that: • Reduce physical generation of waste.

	• Ensure efficient energy and water use. • Reduce carbon emission. • Support green design in construction. • Minimise harmful effects of construction activities

Based on your review of the PMF, please assess the framework according to the following criteria (5 – excellent, 4 – good, 3 – fair, 2 – below average, 1 – poor)

Criteria	Response				
	5 Excellent	4 Good	3 Fair	2 Below Average	1 Poor
Logical Structure					
Clarity					
Coherence					
Practical relevance					
Applicability					
Meaningfulness					
Based on your expert knowledge, what general ideas should be incorporated into the project management framework.					

THANK YOU FOR YOUR TIME

APPENDIX 4: PROOF OF LANGUAGE EDITING

Colliers Corporate Communications

Creative, targeted, memorable

Mr Des Collier
B.A. Hons., H.D.E. (P.G.) Sec.
3 Dorset Close
First Avenue
Harfield Village
Cape Town
7708

27 April 2021

To whom it may concern

Confirmation of Language Editing and Proofreading

This is to certify that I have language edited and proofread the accompanying thesis, titled: **Developing a Project Management Framework to Support the Sustainability of Emerging Contractors In the Free State.**

I hold a B.A. Honours Degree in English, obtained from Rhodes University in 1977. I did an elective course in Linguistics in my second year. I proceeded to obtain a Higher Diploma in Education with English as my main teaching subject.

I have 14 years' experience in teaching and lecturing in English in both public and private institutions from Grade 8 to post Matric.

I am currently self-employed as a freelance writer with over 15 years' experience in copywriting, editing and proofreading.

Documents were supplied to me concerning the style requirements of Department of Business Support Studies at the Central University of Technology, Free State
.

Yours faithfully
D.M. Collier

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Web: http://collierscorporatecommunications.webs.com/