



**MANAGING STAKEHOLDER COMPLEXITIES: A MODEL TO
CURB PROJECT COST OVERRUNS IN THE CONSTRUCTION
INDUSTRY IN SOUTH AFRICA**

By

**Moses Nyathi
218035350**

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Doctor of Business Administration**

**Graduate School of Business and Leadership
College of Law and Management Studies**

Supervisor: Prof. Cecile Gerwel Proches


Co-Supervisor: Dr. Simon Michael Taylor

2022

DECLARATION

I, **Moses Nyathi**, declare that

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DEDICATION

This thesis is dedicated to Mr Zedekia Madumbu Nyathi, Nomsa Lorencia Nyathi, and my late grandmother Roma Nyathi for believing in my capabilities and laying a foundation for my achievements.

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ABSTRACT

Project cost overruns present major economic problems for financiers, governments, clients, companies, the supply chain, and the community. Meeting the project's budget is one of the major objectives in completing a project successfully, and the exhaustion of finances may result in project discontinuation. It is alarming that previous and current studies have shown on-going project cost overruns within the construction industry. Joint project interdependency complexities between diverse project stakeholders in the project life cycle are implicated as one of the major causes of project budget overruns. However, there has been limited research and available literature on project stakeholder complexities' impact on the project budget within the South African construction industry.

Therefore, this study focused on project-stakeholder cost overruns causes and established the extent to which construction project managers can effectively and efficiently liaise with stakeholders to curb stakeholder complexities and cost overruns. Construction project managers registered with the Construction Professional board participated in this study. The mixed method research approach was employed for this study by integrating both quantitative and qualitative research paradigms in data collection and analysis to draw inferences. A quantitative research approach focused on positivism paradigm, which utilises mathematical procedures and methods to statically explain the research phenomena. A qualitative research approach focused on interpretivism paradigm, which draws research phenomena understanding, emanating from numerous behavioural trends, processes, reflections, cultural and social contexts.

Concurrent triangulation design was used by simultaneously collecting and discussing quantitative and qualitative approaches, aimed to better understand the study of interest by comparing and contrasting study findings to produce well-validated conclusions. Here, online questionnaires and structured interviews were the applied data collection techniques guided by a pragmatism philosophical worldview. One-hundred and fifty-two online questionnaires were completed and analysed, using SPSS to obtain quantitative data. To obtain qualitative data, thirteen interviewees participated and NVivo was used to analyse transcribed responses. The findings showed that the number of projects completed and scope changes, are central to stakeholders-related complexities contributing to budget overruns. Furthermore, the findings showed that factors comprising incompetency, local community strikes or unrest, market conditions, South African regulatory framework, reworks and contract misunderstanding,

significantly contribute to project budget overruns. An iterative project-stakeholder budget overrun mitigation model was developed, and a template incorporating all the stages of the construction project life cycle was included, which will be jointly used to alleviate project-stakeholder budget overruns.

Keywords: Stakeholders' complexities, Stakeholder liaison, Project cost overruns, Construction industry, South Africa

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENTS.....	iv
ABSTRACT	v
LIST OF FIGURES	xv
LIST OF TABLES.....	xvi
LIST OF APPENDICES.....	xvii
ABBREVIATIONS AND ACRONYMS	xviii
CHAPTER ONE – INTRODUCTION.....	1
1.1 Introduction	1
1.2 Background of the study.....	1
1.3 Research gap.....	2
1.4 Problem statement.....	4
1.5 Research aim and objectives	6
1.6 Research questions	6
1.7 Research methodology overview	7
1.8 Ethical considerations	8
1.9 Expected contribution to knowledge.....	8
1.10 Delimitations of the study	9
1.11 Thesis outline and structure of the chapters	9
1.12 Conclusion	13
CHAPTER TWO - PROJECT MANAGEMENT BACKGROUND AND PROJECT INCEPTION	14
2.1 Introduction	14
2.2 Project management historic overview	14
2.3 Attributes of a project	16
2.3.1 One-time process and complex	16
2.3.2 Budget, schedule, and resources limitations.....	16
2.3.3 Meet customer or client needs.....	17
2.3.4 Project purpose	17

2.4 Project management processes	18
2.5 Project life cycle - Initiation	18
2.5.1 Construction project feasibility study	18
2.5.1.1 Economic financial feasibility study	19
2.5.1.2 Operational and market feasibility study	23
2.5.1.3 Technical and technological feasibility study	24
2.5.1.4 Scheduling feasibility study	24
2.5.1.5 Regulatory feasibility study	25
2.5.1.6 Social feasibility study	26
2.6 Business case	27
2.7 Project charter	29
2.7.1 Project title	31
2.7.2 Project background	31
2.7.3 Project purpose and objectives	32
2.7.4 Project budget and resources estimates	32
2.7.5 Project scope overview	33
2.7.6 Project milestone schedule	33
2.7.7 Projects risks	34
2.7.8 Constraints and assumptions	35
2.7.9 Project approval and commitment signatures	35
2.8 Conclusion	36
CHAPTER THREE - PROJECT REALISATION PROCESS.....	38
3.1 Introduction	38
3.2 Construction project design planning.....	38
3.2.1 Construction schematic design	40
3.2.2 Construction design development.....	41
3.2.3 Construction project documents.....	43
3.2.4 Construction bidding	46
3.3 Construction project execution and administration	49
3.4 Construction project commissioning and closure.....	51
3.5 Construction project manager’s role, competencies, and knowledge areas’ integration	53
3.6 Conclusion	59

CHAPTER FOUR - THEORETICAL FRAMEWORK.....	60
4.1 Introduction	60
4.2 Stakeholder theory	60
4.3 Goal-setting theory.....	68
4.4 Systems theory	72
4.5 Complexity theory	75
4.6 Conclusion	79
CHAPTER FIVE - CONSTRUCTION COST OVERRUNS AND STAKEHOLDERS' COMPLEXITIES	80
5.1 Introduction	80
5.2 Global construction project cost overruns phenomenon perspective	80
5.3 African construction project cost overruns phenomenon perspective	84
5.4 South African construction project cost overruns phenomenon perspective	86
5.5 Prominent global, Africa and South African construction cost overruns causes.....	90
5.6 Impacts of construction project cost overruns.....	90
5.7 Proposed solutions to construction project cost overruns	92
5.8 Construction stakeholder complexities	95
5.9 Conclusion	102
CHAPTER SIX - RESEARCH METHODOLOGY	103
6.1 Introduction	103
6.2 Philosophical paradigm	103
6.3 Mixed methods research paradigm	105
6.4 Mixed methods research design.....	108
6.5 Population and study sample	109
6.5.1 Quantitative sample determination.....	110
6.5.2 Qualitative sample determination.....	111
6.6 Sampling method	111
6.6.1 Stratified sampling and simple random method	112
6.6.2 Purposive sampling method.....	114

6.7 Data collection	115
6.7.1 Data collection instrument.....	115
6.7.1.1 Questionnaire development and pilot study.....	116
6.7.1.2 Interviews.....	118
6.7.2 Quantitative data collection.....	118
6.7.3 Qualitative data collection.....	119
6.7.3.1 Interview appointments and place	119
6.7.3.2 Voice recording equipment.....	120
6.7.3.3 Interview conduction.....	121
6.8 Data analysis	121
6.8.1 Quantitative data capturing.....	122
6.8.2 Quantitative data cleaning	122
6.8.3 Quantitative descriptive statistics.....	122
6.8.4 Quantitative inferential statistics.....	123
6.8.5 Qualitative data transcriptions.....	123
6.8.6 Common Method Variance test	124
6.8.7 Linear correlation and regression analysis.....	124
6.8.8 Cronbach's Alpha test.....	125
6.8.9 Content and thematic analysis.....	125
6.8.9.1 Transcription thematic development and coding in NVivo	127
6.9 Reliability, Validity, and Trustworthiness	128
6.9.1 Reliability	128
6.9.2 Validity.....	128
6.9.2.1 Content validity.....	129
6.9.2.2 Criterion validity.....	129
6.9.2.3 Convergent and divergent validity	130
6.9.3 Trustworthiness in qualitative research.....	130
6.9.3.1 Credibility	130
6.9.3.2 Transferability	131
6.9.3.3 Dependability	131
6.9.3.4 Confirmability	132
6.9.3.5 Authenticity	132
6.10 Ethical considerations	132

6.11 Conclusion	135
CHAPTER SEVEN - QUANTITATIVE DATA PRESENTATION AND ANALYSIS	136
7.1 Introduction	136
7.2 Population response rate and construction project location.....	136
7.3.1 Gender	138
7.3.2 Level of education	138
7.3.3 Age group.....	139
7.3.4 Educational background	140
7.3.5 Work experience.....	141
7.3.6 Educational background, experience and perceptions	141
7.3.7 Construction projects completed.....	142
7.3.8 Construction projects completed with cost overruns	143
7.4 Construction project cost overruns logistic regression model	144
7.5 Project stakeholder complexities contribution to project cost overruns	146
7.5.1 Construction project stakeholders' involvement in the budget.....	146
7.5.2 Construction project stakeholders' accountable for the budget overruns.....	147
7.5.3 Construction project stakeholders' impact on the budget	148
7.5.4 Construction project cost effectiveness on the budget	150
7.5.5 Factors impacting construction project budget	152
7.5.6 Construction project cost estimation and control.....	153
7.6 Construction project life cycle – Stakeholder involvement	155
7.6.1 Construction project stakeholders' involvement in project initiation	155
7.6.2 Construction project stakeholders' involvement in project planning.....	156
7.6.3 Construction project stakeholders' involvement in project execution	157
7.6.4 Construction project stakeholders' involvement in project controlling and monitoring..	157
7.6.5 Construction project stakeholders' involvement in project closure.....	158
7.7 Project stakeholders' influence on the project budget: Project managers' experiences	159
7.7.1 Construction projects stakeholders posing a threat to the project budget.....	159
7.7.2 Construction project managers' experiences and perceptions	160
7.7.3 Construction project manager's responsibilities	162
7.8.1 Tests of normality - Likert-scale means.....	164
7.8.2 Multinomial logistic regression model fitting information and goodness-of-fit	166

7.8.3 Multinomial logistic regression Pseudo R-Square values.....	166
7.8.4 Multinomial logistic regression likelihood ratio tests	166
7.8.5 TEE, SIB, FIB, TSL and EP Pearson correlation.....	167
7.9 Conclusion	168

CHAPTER EIGHT - QUALITATIVE DATA PRESENTATION AND ANALYSIS169

8.1 Introduction	169
8.2 Data presentation and analysis	169
8.2.1 Project scope change variables	170
8.2.1.1 Client project alterations.....	172
8.2.1.2 Architect and engineers project alterations.....	174
8.2.1.3 End-user project alterations.....	175
8.2.1.4 Quantity surveyors project alterations	176
8.2.1.5 Consultants project alterations	177
8.2.1.6 Contractors project alterations.....	178
8.2.1.7 Health and safety practitioners' obligations to the project	178
8.2.1.8 Government as a client: project alterations.....	179
8.2.1.9 Political office bearers project alterations	179
8.2.1.10 Community project alterations	180
8.2.2 Stakeholders' experience and training	180
8.2.3 Stakeholders' involvement in project budget development.....	183
8.2.4 Stakeholders' communication regarding the project budget.....	189
8.2.5 Project managers' experiences: factors that influence the project budget.....	192
8.2.5.1 Market conditions	193
8.2.5.2 Local community strikes or unrest	195
8.2.5.3 South African regulatory framework	195
8.2.5.4 Inadequate time allocated to budgeting.....	196
8.2.5.5 Contract misunderstanding.....	197
8.2.5.6 Delayed corrective action	197
8.3 Conclusion	198

CHAPTER NINE – DISCUSSION AND MODEL	200
9.1 Introduction	200
9.2 Socio-demographic information.....	200
9.3 Project stakeholders' complexities contribution to project budget overruns	202
9.4 Stakeholders' experience and training.....	204
9.5 Construction project budget stakeholders' involvement and communication	205
9.5.1 Construction project life cycle stakeholders' involvement.....	206
9.5.2 Stakeholders' involvement in developing the project budget	209
9.6 Project managers' experiences: factors that influence the project budget	210
9.7 Construction project management model to curb stakeholder-related cost overruns	211
9.9 Construction project-stakeholder budget overrun mitigation model	214
9.9.1 Step 1: Identify the relevant stakeholders	215
9.9.2 Step 2: Profile the stakeholders	215
9.9.3 Step 3: Impact on the budget.....	215
9.9.4 Step 4: Stakeholders' strategy-plan of action implementation	216
9.10 Conclusion	221
CHAPTER TEN - CONCLUSION AND RECOMMENDATIONS	223
10.1 Introduction	223
10.2 Overview of the study chapters	223
10.2.1 Chapter 1 Introduction	223
10.2.2 Chapter 2 Project management background and project inception	223
10.2.3 Chapter 3 Project realisation process	224
10.2.4 Chapter 4 Theoretical framework.....	224
10.2.5 Chapter 5 Construction cost overruns and stakeholders' complexities.....	224
10.2.6 Chapter 6 Research methodology	225
10.2.7 Chapter 7 Quantitative data presentation and analysis	225
10.2.8 Chapter 8 Qualitative data presentation and analysis	225
10.2.9 Chapter 9 Discussion and model	226
10.2.10 Chapter 10 Conclusion and recommendations	226
10.3 Addressing the research objectives.....	226
10.4 Recommendations	228
10.4.1 Recommendation 1 - Construction tender process amendment.....	228

10.4.2 Recommendation 2 - Scope development completion	229
10.4.3 Recommendation 3 - Health and safety management	229
10.4.4 Recommendation 4 - Technical training facilities/Schools.....	229
10.4.5 Recommendation 5 – Promote assistant construction project manager positions	230
10.4.6 Recommendation 6 – “Jack of all trades” adaptable project leadership style	230
10.5 Limitations of the study.....	231
10.6 Future studies considerations.....	231
10.7 Conclusion	232
REFERENCES	233

LIST OF FIGURES

Figure 4.1: Business/Company stakeholder theory	63
Figure 4.2: Construction project stakeholder theory	64
Figure 5.1: Global construction project cost overruns causes.....	83
Figure 5.2: African construction project cost overruns causes.....	86
Figure 5.3: South African construction project cost overruns causes.....	89
Figure 5.4: Impacts of construction project cost overruns.....	91
Figure 5.5: Construction project stakeholders' network	101
Figure 6.1: Mixed methods research paradigm	109
Figure 6.2: Online questionnaire consent form.....	135
Figure 7.1: Gender profile	138
Figure 7.2: Level of education	139
Figure 7.3: Age group	139
Figure 7.4: Educational background.....	140
Figure 7.5: Work experience	141
Figure 7.6: Educational background, experience and perceptions.....	142
Figure 7.7: Construction projects completed	143
Figure 7.8: Construction projects completed with cost overruns.....	143
Figure 7.9: Construction project budget accountability	148
Figure 7.10: Construction project stakeholders' involvement in cost estimations.....	154
Figure 7.11: Construction project stakeholders' involvement in cost control	154
Figure 7.12: Construction project stakeholders' involvement in project initiation.....	155
Figure 7.13: Construction project stakeholders' involvement in project planning	156
Figure 7.14: Construction project stakeholders' involvement in project execution	157
Figure 7.15: Construction project stakeholders' involvement in project controlling and monitoring.....	158
Figure 7.16: Construction project stakeholders' involvement in project closure.....	159
Figure 7.17: Construction projects stakeholders posing a threat on the project budget.....	160
Figure 7.18: Tests of normality - Scatterplot normality test	165
Figure 8.1: Core themes	170
Figure 8.2: Level of participation on the project scope variables	171
Figure 8.3: Stakeholders' contribution to scope alterations	172
Figure 8.4: Construction stakeholders' involvement framework list.....	185
Figure 9.1: Construction project-stakeholders' budget overrun mitigation model	216

LIST OF TABLES

Table 3.1: Construction project manager’s duties and application of knowledge areas in the construction life cycle	58
Table 5.1: Proposed solutions to construction project cost overruns	94
Table 6.1: Likert-scale question variables	118
Table 6.2: Construction project managers participants’ list, location and interview date	120
Table 7.1: Population, sample and response rate	137
Table 7.2: Common Method Variance test	137
Table 7.3: Construction project cost overruns binary logistic regression variables.	144
Table 7.4: Construction project cost overruns logistic regression output.	146
Table 7.5: Construction project stakeholders’ involvement in project budget meetings.....	147
Table 7.6a: Construction stakeholders' impact on the project budget.....	149
Table 7.6b: Cronbach's Alpha: Stakeholders' impact on the project budget	150
Table 7.7a: Construction project cost effectiveness on the budget.....	151
Table 7.7b: Cronbach's Alpha: Project cost effectiveness on the budget.....	152
Table 7.8a: Construction project activities and factors impacting the budget.....	152
Table 7.8b: Cronbach's Alpha: Project activities and factors impacting the budget.....	153
Table 7.9: Construction project managers' experiences and perceptions	161
Table 7.10a: Construction project manager's responsibilities	162
Table 7.10b: Cronbach's Alpha: Project managers' experiences and perceptions.....	163
Table 7.11: Tests of Normality - Kolmogorov-Smirnova and Shapiro-Wilk.....	164
Table 7.12: Multinomial logistic regression model fitting information and goodness-of-fit	166
Table 7.13: Multinomial logistic regression pseudo r-square values	166
Table 7.14: Multinomial logistic regression likelihood ratio tests.....	167
Table 7.15: TEE, SIB, FIB, TSL and EP Pearson correlation	167
Table 8.1: Project scope and competency variables	182
Table 8.2: Project stakeholders’ involvement in budgeting	188
Table 8.3: Deduced construction project stakeholders	188
Table 8.4: Factors that influence the project budget.....	198
Table 9.1: Construction project stakeholders’ findings.....	211
Table 9.2: Construction project-stakeholder budget overrun alleviation model template.....	217

LIST OF APPENDICES

Appendix A: Consent forms for the questionnaire and interview.....	299
Appendix B: Research instruments – Questionnaire and interview schedule	303
Appendix C: Gatekeeper consent letter.....	317
Appendix D: Language editor proofreading certificate	318
Appendix E: Ethical clearance certificate.....	319

ABBREVIATIONS AND ACRONYMS

ANC	African National Congress
BCR	Benefit-Cost Ratio
BEE	Black Economic Empowerment
BOQ	Bill of Quantities
BOSCARD	Background, Objectives, Scope, Constraints, Assumptions, Risks and Deliverables
CPA	Critical Path Analysis
DA	Democratic Alliance
EFF	Economic Freedom Fighters
EP	Experience and Perceptions
FIB	Factors Impacting the Budget
FIFA	Fédération Internationale de Football Association
IRR	Internal Rate of Return
ISO	International Organisation for Standardisation
NPV	Net Present Value
OR	Odds Ratios
PERT	Program Evaluation Review Technique
PMBOK	Project Management Body of Knowledge
PMI	Project Management Institute
PP	Payback Period
QS	Quantity Surveyor
RDP	Reconstruction and Development Programme housing projects
SACPCMP	South African Council for Project and Construction Management Professions Board
SIB	Stakeholder Impact on Budget
SME	Small and Medium Enterprises

SPSS	Statistical Package for the Social Sciences
TSL	Task Satisfaction Levels
TEE	Task Execution Effectiveness
UKZN	University of KwaZulu-Natal
WBS	Work Breakdown Structure

CHAPTER ONE – INTRODUCTION

1.1 Introduction

Project management is a developing profession. Historically, project management was practised in the following industries: Information Technology, petrochemical, defence procurement, and the construction industry (Burke, 2013; Kerzner & Kerzner, 2017; Burke, 2018). The project management profession has recently been integrated into the government departments and commercial business organisations, due to the ongoing re-structuring of work into projects (Burke, 2013; Kerzner & Kerzner, 2017; Portny, 2017). Project management is defined as the process of guiding the project from start to end through the application of skills, knowledge, techniques and tools to project activities, to accomplish the project success requirements (Burke, 2013; Portny, 2017; Burke, 2018). The common underlying project success requirements are that it should be completed within the specified time, be of good quality, and within budgetary boundaries (Burke, 2013; Portny, 2017; Burke, 2018).

For the purpose of this study, project management practise within the construction industry focusing on the project budget success requirement, will be considered. To this effect, the purpose of this chapter is to introduce the research title, which is “Managing stakeholder complexities: A model to curb project cost overruns in the construction industry in South Africa” and justify the reasons for undertaking the study. The chapter highlights the study’s agenda, i.e. the purpose of the research as captured by the study title, background of the study, rationale of the study, problem statement, research gap, research objectives, research questions, ethical considerations, expected contribution to knowledge, and an outline of the proceeding chapters.

1.2 Background of the study

In Africa, Southern Africa is ranked the highest in terms of the number of construction projects, and in particular, South Africa is the country that executes the majority of those projects (Labuschagne, 2017). The construction industry significantly contributes to the South African economy through employment and infrastructure provision (Marnewick, 2013; Labuschagne, 2017). In 2016, the construction industry was responsible for projects above

US\$20 billion in value, from both public and private sector funding, and employed 16 percent of the South African labour force (Labuschagne, 2017). Despite the contribution, the construction industry has been facing challenges in completing projects within the budget (Marnewick, 2013; Osei-Kyei & Chan, 2016; Labuschagne, 2017). Extant literature shows that the causes of cost overrun in the South African construction industry are as a result of: incomplete design at tender stage, inadequate cost planning, onsite scope of work changes, inadequate monitoring of funds, contractual claims, and penalties (Ramabodu & Verster, 2013), inadequate planning, contractors inexperience, contractors inefficiency, time extension, project abandonment, poor project management, under-utilisation of human resources, unsatisfactory workmanship, and shortage of skilled site workers (Mukuka et al., 2014).

Considering the above causes of cost overruns in the South African construction industry, some scholars have recommended several strategies to alleviate cost overruns. Ramabodu and Verster (2013), and Khabisi et al. (2017) advised that factors that influence construction cost should be identified at the beginning of the project to decrease cost overruns, while Gaetsewe et al. (2015) propounded the proper financial allocation of finances and improvement of the client's internal processes to prevent overspending. Recently Dlamini and Cumberlege (2021) offered the solution of equipping construction project managers and the relevant stakeholders with financial planning, budgeting, and cash flow skillsets to alleviate project overspending. Despite the identified causes and recommendations of cost overruns by a few researchers in South Africa, project cost overruns remain a challenge in the South African construction industry. This study identifies stakeholders as a central denominator in regard to the identified causes of cost overrun in the South African construction industry. However, project stakeholder complexities that impact the project budget have rarely been explored within the South African construction industry. Therefore, this study aimed to establish the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholder complexities and cost overruns.

1.3 Research gap

Significant project cost overruns have been experienced over the years within the construction industry (Flyvbjerg et al., 2005; Love et al., 2009; Verma et al., 2014; McLain & Wu, 2016; Gbahabo & Ajuwon, 2017). Love et al. (2012) identified the following projects with severe

overruns: Denver's airport with 200% cost overrun, DKK Oresund bridge with 68% cost overrun, Scottish parliament building with greater than 900% cost overrun, and Western Australian Perth arena with 300% cost overrun. In India, most construction projects have cost overruns of more than 20% (Kenny, 2012; Sen, 2022). In the same notion, Ismail et al. (2014) argued that the cost overrun of construction projects is a global concern that is more acute in developing economies, and South Africa is no exception. A typical example of a construction project cost overrun in South Africa was the construction of the stadia for the FIFA 2010 World Cup event. The entire project resulted in a massive cost overrun, which amounted to about USD267 million (40% more than the initial provision) – as confirmed by the then-South African Minister of Finance in 2010 (Baloyi & Bekker, 2011).

Further to stadia for the FIFA 2010 World cost overrun in South Africa, other several notable projects with similar project cost overruns were the Nkandla presidential residence project with an initial budget of R27 million, resulting in more than 900% project overrun (R246 million spent), the Kusile project with an initial budget estimate of R69.1 billion in 2007, resulting in an estimation of R460 billion at completion, and the Kimberly Mental Hospital budget that ballooned from R290 million to R1.86 billion (Medical Brief, 2018 Aigbavboa et al., 2019; Tshidavhu & Khatleli, 2020; Areff, 2021). Smith (2014) acknowledged that high-profile projects that attract the wider community, experience significant cost overruns globally, resulting in broader social and economic ramifications presenting major problems for financiers, governments, clients, companies, and the supply chain. However, the reasons why projects experience cost overruns remain unresolved for international governments (Love et al., 2012; Mahmud et al., 2021; Dolage & Dasantha, 2022). Lack of project stakeholder involvement and stakeholder maladministration have been implicated as significant contributions to the complexities faced by project managers in completing the project successfully (Heravi et al., 2015; Alaloul et al., 2020).

According to Yang, (2014, p. 847), "Stakeholders are individuals or organizations who affect or are affected by the achievement of the project". Joint project interdependency complexities among diverse project stakeholders (local authorities, financiers, engineers, contractors, suppliers, lawyers, architects, etc) lead to difficulties in meeting the project success outcomes (Clough et al., 2005; De Brucker et al., 2013). Doloi (2012) found scheduling and planning deficiencies of clients, consultants, and contractors' performance heavily contribute to project cost overruns.

Similarly, Martinsuo and Killen (2014), found that minimal involvement of contractors and designers in the early stages of project execution significantly contributes to project failures. Hwang and Tan (2012), pinpoint a lack of communication among project stakeholders, as one factor resulting in project failures. Eskerod and Vaagaasar (2014) emphasised the importance of knowing and managing all project stakeholders' involvement and connection in the project life-cycle. It is the researcher's opinion that the indicated multiple stakeholders objectives and joint interdependency have a direct impact on the project budget.

Project stakeholders control the flow of resources during project execution (Martinsuo & Killen, 2014; Lin, McKenna, & Shen, 2019). Stakeholder involvement is essential during the project planning stage and strongly impacts the project budget (Martinsuo & Killen, 2014; Yang, 2014; Rathenam et al., 2016). During the project's planning phase, accurate project cost estimation is key to preventing project cost overruns (Baloi & Price, 2003; Martinsuo & Killen, 2014; Yang, 2014; Holm & Schaufelberger, 2021). On the same basis, the researcher argues that the flow of resources during project execution depends on the project budget. To date, there have been limited efforts to establish and implement solutions to resolve project cost failures associated with project stakeholders' complexities. Findings by Eskerod and Huemann (2013) revealed that project stakeholders are expected to comply with the project needs rather than being involved in the project planning, hence the deficiency of project mutual interest. To this end, Eskerod and Huemann (2013) recommended a management-for-stakeholders approach that encourages stakeholder's involvement. Mazur et al. (2014) inferred that project managers' emotional intelligence, cognitive flexibility, and systemic thinking promote effective project stakeholder relationships. Sunder (2016) developed the inform-involve-influence model for dealing with multiple stakeholders at different project stages in the banking and financial services. Furthermore, Sunder (2016) recommends further studies on the model applicability and customisation in other industries.

1.4 Problem statement

Project cost overruns present major economic problems for financiers, governments, clients, companies, the supply chain, and the community at large (Smith, 2014; Shoar et al., 2021; Dolage & Dasantha, 2022). Meeting the project budget is one of the major objectives in completing a project successfully, and exhaustion of finances may result in project discontinuation (Portny,

2017; Idrees & Shafiq, 2021). The findings by Marnewick (2013) report that small construction projects have a higher cost failure rate compared to large projects in South Africa. Arguably, Labuschagne (2017) and Tshidavhu and Khatleli (2020) indicated that large to mega construction projects have a higher failure rate in South Africa. In support, Labuschagne (2017) and Tshidavhu and Khatleli (2020) lamented that the 2010 FIFA Soccer World Cup resulted in a US\$267m project budget overrun of the construction or upgrading of the ten stadiums. The most significant 2010 FIFA Soccer World Cup stadiums, which were over the budget, are: Soccer City Stadium over the budget by 174%, Green Point Stadium over the budget by 483%, and Moses Mabhida Stadium over the budget by 267% (Labuschagne, 2017; Tshidavhu & Khatleli, 2020). Based on Marnewick (2013) and Labuschagne (2017), project cost overruns are prevalent in both small and large construction projects in South Africa. It is clear that project cost overruns threaten construction project financial sustainability in South Africa.

Project managers seldom achieve project success objectives due to stakeholder complexity (Martinsuo & Killen, 2014). A project is deemed successful when completed within the established timeframe, quality and budget boundaries (Lloyd-Walker & Walker, 2011; Beringer et al., 2013; Davis, 2014; Badewi, 2016). Recently, academic authors have recommended further studies on the integration of project stakeholders and their potential linkages affecting the project success (De Brucker et al., 2013; Martinsuo & Killen, 2014; Yang, 2014; Heravi et al., 2015; Pacagnella Júnior et al., 2015; Lehtinen & Rajala, 2017; Mashali et al., 2022). Pacagnella Júnior et al. (2015) affirmed that while project stakeholder management has increasingly been a topic of interest in the current literature, there are still large existing gaps to be filled. Moreover, Lehtinen and Rajala (2017) proposed that project stakeholder management strategies lack in existing literature. In particular, the study aimed to establish project stakeholders' linkages affecting the project budget, ultimately affecting project success.

Project stakeholders play a crucial role in project outcome delivery (Hammad, 2013). It is alarming that both previous and current studies have shown ongoing project overruns within the construction industry, and project stakeholders' related issues are implicated as one of the main causes of project cost overruns (Marnewick, 2013; Rathenam et al., 2016; Labuschagne, 2017; Tshidavhu & Khatleli, 2020). Joint project interdependency complexities between diverse project stakeholders in the project life cycle, affect the project budget (Clough et al., 2005; De Brucker et

al., 2013). However, in South Africa, there is a gap in research and literature on how project stakeholder complexities impact the project budget within the construction industry. Previous studies focused on the generic causes of construction project cost overruns and provided recommendations that neglect the role and influence of stakeholders on construction project costs (Ramabodu & Verster, 2013; Khabisi et al., 2017). Therefore, this study aimed to develop a model to be used in addressing project-stakeholder-related cost overrun causes in South Africa informed by the following research aim and objectives.

1.5 Research aim and objectives

The study was aimed at establishing the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholders' complexities and cost overruns. Therefore, the aim of the study was realised through the following specific objectives:

- To investigate the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa.
- To determine the level of project stakeholders' involvement and communication with regard to the project budget within the construction industry in South Africa.
- To explore project managers' experiences with regard to the factors that influence the project budget, in relation to project stakeholders within the construction industry in South Africa.
- To develop a model which project managers may use to curb stakeholder-related project cost overruns.

1.6 Research questions

The study was aimed at answering the following research questions:

- What is the extent of project stakeholder complexities' contribution to project cost overruns within the construction industry in South Africa?
- What is the level of project stakeholders' involvement and communication with regard to the project budget within the construction industry in South Africa?
- What are the project managers' experiences regarding the factors that influence the project budget, associated with project stakeholders within the construction industry in South Africa?

- What model can be implemented by project managers, to curb stakeholder-related project cost overruns?

1.7 Research methodology overview

This section provides brief background information on the research philosophy and research methodology underpinning this study. Research philosophy refers to the researcher's worldview in which research data should be collected, interpreted, analysed and utilised to gain knowledge (Creswell, 2014; Chan, 2017; Tomaselli, 2018). On the other hand, research methodology refers to the systematic process in employing different instruments, tools, and procedures in order to gather data and obtain a more adequate solution to a problem than would be possible under ordinary means (Creswell, 2014; Masegare, 2016). Research philosophy and methodology start with a problem, followed by data collection, then critical analysis of data, and concludes with inferences and decisions on resolving the problems based on the actual evidence (Masegare, 2016). In order to propose a model for resolving the study research problem pertaining to stakeholder-related project cost overruns within the construction industry, a pragmatism philosophical standpoint was followed, and a mixed methods approach was used in data collection and analysis. Pragmatic research philosophy aims to find answers and practical solutions to problems by specifically selecting appropriate complementary methods (Chan, 2017; Wong & Cooper, 2017; Allemang et al., 2022). Therefore, mixed methods research approach, which complements quantitative and qualitative research methods, was adopted for this study for data collection and analysis.

A quantitative sample of one-hundred and fifty-two (152) respondents and a qualitative sample of thirteen (13) interviewees of project managers registered with the South African Council for Project and Construction Management Professions (SACPCMP), were used in data collection. Firstly, in quantitative data collection, the stratified random sampling technique was used in categorising project managers' SACPCMP registration per province in South Africa. Then, project managers from each province completed the online questionnaire based on a simple random sampling technique informed by the voluntary will to participate in the study. For qualitative data collection, a list of the most senior construction project managers, which included mentors within the professional board, was provided to the researcher by the gatekeeper of the professional board database. Thereafter, the researcher purposively selected potential interviewees from the four provinces where construction projects are concentrated, namely; Gauteng, KwaZulu Natal,

Western Cape, and Eastern Cape. An online questionnaire was used to collect quantitative data, and face-to-face interviews were conducted to collect qualitative data. Chapter six (Research methodology) provides a comprehensive discussion of the research philosophy justification, the sampling process, data collection, pilot testing, and more research methodology aspects used in the current study.

1.8 Ethical considerations

Ethical issues such as honesty, safety, plagiarism, informed consent, and respect for the rights of entities carry legality implications, therefore, need to be taken into consideration and are crucial when undertaking a research project (Welman & Kruger, 2001; Hennink et al., 2010; Du Plooy-Cilliers, Davis & Bezuidenhout, 2015; Tomaselli, 2018). The South African Council for Project and Construction Management Professions (SACPCMP) Board was contacted to request an umbrella gatekeeper consent letter for the participation of construction project managers registered in their database, and approval was granted. During the data collection stage, each first question of the online questionnaire requested that participants consent prior to answering the questionnaire. All participants were guaranteed anonymity and confidentiality in their responses. Ethical clearance approval was obtained from the University of KwaZulu-Natal before the data collection. All the contents of the research project, gathered from diverse authors, were referenced.

1.9 Expected contribution to knowledge

It is anticipated that the findings of the study will provide information and solutions in resolving construction project management stakeholders' complexities. The findings are valuable to the South African Council for Project and Construction Management Professions (SACPCMP) board towards achieving their organisational goals, improving operational effectiveness and efficiencies within the construction industry. Furthermore, the study findings enabled the researcher to develop a model that project managers may use to curb stakeholder-related project cost overruns within the construction industry. In a broader spectrum, the study findings will benefit project management personnel, policymakers and other industries in identifying training gaps related to incurred cost overruns, due to stakeholder malfunctions. The research study also adds value to the body of knowledge, particularly literature on construction project management stakeholders in relation to the project budget, within the South African context.

1.10 Delimitations of the study

The study was only conducted with the South African Council for Project and Construction Management Professions (SACPCMP), in particular with the registered construction project managers. SACPCMP-registered candidate construction project managers were excluded from the study due to their inadequate experience in the construction industry. Furthermore, registered SACPCMP construction practitioners, such as Health and Safety officers, professional construction managers, and candidate construction managers, were excluded from the study.

Health and Safety officers focus mainly on safety-related issues, while professional construction managers and candidate construction managers are mostly involved during the project execution phase. Therefore, their insights on project managerial aspects throughout the project life cycle would have been biased based on their specialization and project phase involvement. Also, construction project managers practicing in South Africa, registered with other professional boards within the construction industry, were excluded because their inclusion could have hampered the sample size representativeness and feasibility of the study, due to time and financial constraints. The aforementioned delimitations did not understate the quality of the findings, because construction project managers revealed significant evidence of the extent of knowledge managing stakeholder complexities and cost overruns in the construction industry in South Africa.

1.11 Thesis outline and structure of the chapters

This thesis consists of ten chapters, namely:

Chapter 1 Introduction: This chapter introduced the research study by providing a brief description of the background, rationale, and the problem statement of the study being investigated, followed by the research gap. Afterwards, it provided the research objectives, questions, ethical considerations, and expected study contribution. The chapter is concluded by providing the thesis chapter mapping outline.

Chapter 2 Project management background and project inception: This chapter provided the clarification of concepts underpinning project management and construction project inception. Firstly, a construction project conceptual framework project management profession was defined and discussed. From the onset, the historical project management overview was discussed pertaining to the project management profession's origins and progression. After that, the 'project' concept was defined based on extant literature to provide an understanding of construction project attributes. Subsequent to the 'project' conceptual description, the project initiation stage, which is the first phase of the project life cycle and pertains to project inception, is detailed. The project initiation stage entails project feasibility studies, business case development, and a project charter. Feasibility studies are the prerequisites for construction project execution approvals and input to the business case and project charter. Insights with regards to reasons to undertake construction projects are provided in the business case. The last section of the chapter provided information about the project charter, which plays a critical role in the approval and realisation of construction projects.

Chapter 3 Project realisation process: This chapter is the continuation of the conceptual framework focusing on construction project realisation. The chapter commenced with an explanation of the project design planning phase comprising construction schematic design, design development, construction documents, and construction bidding, followed by an elaboration of the construction project execution and project closure. Next, a discussion on the construction project manager's roles, competencies, and the integration of project management knowledge areas into the construction project life-cycle was covered. As an overview, the design phase comprises of the following key stakeholders; the architect, client, and consultants, who compile and finalise all the project information emanating from both schematic design and design development phases, to produce construction documents. Construction documents are used for the bidding process and as guidelines for project execution. The execution phase entails the implementation of the project plan based on the construction documents. Subsequently, the closure phase follows after the physical construction of the building project has been completed and comprises of handing over the finalised construction building to the client as well as documenting lessons learned. Construction project managers play a crucial role in executing multifaceted responsibilities toward construction project realisation. Construction project managers work with various stakeholders to apply project management skills, technical

skills, and integration of project management knowledge areas on different project life cycle stages, to accomplish construction project realisation.

Chapter 4 Theoretical framework: This chapter provided the theoretical framework which underpins this research. Here the stakeholder, goal-setting, systems, and complexity theories were discussed in relation to the study's objectives and the nature of the construction projects. Firstly, the stakeholder theory was discussed with a focus on construction project stakeholders and their impact on the project budgetary goals. Secondly, the goal-setting theory was discussed in relation to the set construction budgetary project goals. Thirdly, the systems theory was outlined, elaborate on the construction projects' systematic nature. Lastly, the complexity theory was discussed to elaborate on the complex nature and agility of construction projects considering the diverse stakeholders and their impact on the project's budgetary goals and ultimate project success.

Chapter 5 Construction cost overruns and stakeholders' complexities: This chapter reviewed the literature on construction project cost overruns and stakeholders. On the one hand, the literature on cost overruns based on the global, African, and South African contexts, focusing on the causes, impact, and possible solutions to curb construction budget overruns provided a background. On the other hand, construction stakeholders' complexities literature was reviewed by focusing on the identification of stakeholders within a construction project and their diverse expectations, which influence the project budget and ultimate project outcomes.

Chapter 6 Research methodology: This chapter explained the study's philosophical worldview and the research methodology paradigm, undertaken in data collection and analysis, to answer the research questions, and to understand how construction project cost overruns may be resolved in South Africa. Firstly, the research philosophy paradigm is defined, explained and contextualised to the study from the researcher's worldview. Secondly, the research methodology and the mixed method research paradigm selected for this study were discussed, followed by the underlying research design, study population, sampling technique, data collection and analysis process. Furthermore, an explanation and discussion on the reliability, validity and trustworthiness

of data collection and analysis was covered. The chapter concluded with an explanation of the ethical clearance issues undertaken for this study.

Chapter 7 Quantitative data presentation and analysis: This chapter presented and analysed quantitative data, summarised into meaningful descriptive and inferential statistics. The quantitative data was presented in pie charts, graphs, and tables. Firstly, the socio-demographic information was presented and analysed, followed by project stakeholders' complexities that contribute to project cost overruns and stakeholders' involvement in different construction project life cycle phases. Lastly, project stakeholders' influence on the project budget based on project managers' experiences was presented and analysed. The chapter concluded with a summary drawn from the key quantitative research findings.

Chapter 8 Qualitative data presentation and analysis: This chapter included a presentation and analysis of qualitative data, narratively presented and analysed with interviewees' quotation extracts, data visualisation figures extracted from NVivo, and tables summarising the key findings. Firstly, a table with a list of themes and sub-themes was presented, and thereafter all the themes listed in the table were presented, analysed and substantiated with quotations from the participants. The chapter concluded with a summary of the qualitative findings.

Chapter 9 Discussion and model: This chapter provided a comprehensive discussion and interpretation of the findings triangulated from chapters seven and eight, concurrently correlating with the research objectives and literature review substantiation. The chapter was organised as follows: firstly, the socio-demographic information of the construction project managers operating in South Africa were discussed. Secondly, the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa, was outlined. Thirdly, the level of project stakeholders' involvement and communication concerning the project budget development within the construction industry in South Africa, was outlined, followed, fourthly, by the model inputs centered on the diverse construction project stakeholders. Furthermore, a detailed explanation of the model in light of the overall research objective was explained. Lastly, the chapter's overall summary was provided.

Chapter 10 Conclusion and recommendations: This chapter concluded the study by firstly providing an overview of the study chapters in a summarised format, followed by a recap on the achievement of the research objectives in correlation with the findings. Thereafter, the recommendations and limitations of the study were provided. Lastly, future study suggestions were outlined.

1.12 Conclusion

In conclusion, this chapter covered the background of the study and justified the reasons for undertaking this research captured in the rationale of the study, problem statement, and research gap. Subsequently, the aims that the research sought to address were clearly defined in the research questions and objectives. Furthermore, ethical considerations, and the expected contribution to knowledge aspects were highlighted. The chapter concluded by providing an outline of the proceeding chapters. The next chapter includes a discussion on the conceptual framework focused on project management background, concepts, and project inception processes in relation to the construction industry.

CHAPTER TWO - PROJECT MANAGEMENT BACKGROUND AND PROJECT INCEPTION

2.1 Introduction

The previous chapter introduced the research by providing a rationale and overview of the study. The chapter was concluded by providing the thesis chapter mapping. The purpose of this chapter is to provide project management background, concepts, and project inception processes in relation to the construction industry. At the onset, the historic project management overview pertaining to the project management profession's origins and progression, is discussed. After that, the 'project' concept is defined, based on extant literature to provide an understanding of construction project attributes. Cooper and Schindler (2011) define a concept as a collection of attributes and meanings associated with objects. Subsequent to the 'project' conceptual description, the project initiation stage, which is the first phase of the project life cycle and pertains to project inception, is detailed. The project initiation stage entails project feasibility studies, business case development, and project charter. Feasibility studies are prerequisites for construction projects, and input to both the business case and project charter. Insights regarding reasons to undertake construction projects are provided in the business case. The last section of the chapter provides information about the project charter. The latter plays a critical role in the approval and realisation of construction projects.

2.2 Project management historic overview

Historically, project management was originally developed in the United States of America (USA) for planning large projects, and was practised in the following industries: Information Technology, petrochemical, defence procurement, and the construction industry (Burke, 2013; Seymour & Hussein, 2014; Kerzner, 2017; Burke, 2018). During this time, project management was principally used for determining project schedules, by understanding how work activities should be completed (Kloppenborg et al., 2018). Project management emerged as a formal practised and studied discipline in the USA after the 1960s (Seymour & Hussein, 2014; Kloppenborg et al., 2018). It has gradually developed globally as a profession, and has modified ways to plan and manage projects ranging from small, medium, large and complex projects (Burke, 2013; Seymour & Hussein, 2014; Kerzner, 2017; Lopez & Alexander, 2022). In the same notion, this study focused on planning and managing construction projects ranging from small, medium, large and

complex projects from the project manager's lens, regarding the budget and stakeholder's complexities.

To date, numerous software entities have introduced easier and more powerful methods for planning and monitoring diverse project activities (Kloppenborg et al., 2018). The project management profession has recently been adapted to the government departments, non-profit and commercial business organisations due to the on-going restructuring of work into projects (Burke, 2013; Seymour & Hussein, 2014; Kerzner, 2017; Portny, 2017; Kloppenborg et al., 2018; Lopez & Alexander, 2022). In addition to historic project management fields, nowadays, a wide-range of different fields such as insurance, healthcare, hospital administration, banking, retailing and numerous other fields, turn to project management for planning, controlling and managing of project activities to meet their unique demands (Seymour & Hussein, 2014; Portny, 2017; Burke, 2018; Kloppenborg et al., 2018; Tuo, 2022). Contrary to the modern project management fields, this study focused on the historic project management field in the construction industry taking into consideration of diverse software applications used for planning and monitoring.

Project management is the process of guiding the project from start to end through applying skills, knowledge, techniques, and tools to project activities to accomplish the project's success requirements (Burke, 2013; Portny, 2017; Burke, 2018; Okereke, 2020). The standard underlying project success requirements are timeous completion, specified quality and budget boundaries (Burke, 2013; Portny, 2017; Burke, 2018; Okereke, 2020). Kloppenborg et al. (2018) state that project management is the science and art of effectively and efficiently utilising techniques, skills, information, and tools to meet project stakeholders' expectations and needs. This science and art of using different skillsets involves the following underlying work processes, namely: project initiation, project planning, project execution, project monitoring and controlling, and project closure (Portny, 2017; Burke, 2018; Kloppenborg et al., 2018). To meet project stakeholders' expectations and needs, trade-offs with respect to scope, costs, time, and quality, have to be made during the project lifecycle (Portny, 2017; Burke, 2018; Kloppenborg et al., 2018).

2.3 Attributes of a project

A project is a time-bound effort governed by performance specifications, budget, and resources to achieve a unique outcome (PMI, 2014; Kerzner, 2017; Burke, 2018; Kloppenborg et al., 2018). Beleiu et al. (2015) describe a project as a planned approach involving coordinated undertaking of interrelated activities, with a defined start and end followed, to achieve a project output. A collection of inputs and primary deliverables results in a project output that can either be in the form of a product or service, or simultaneously a product and service (Burke, 2018; Kloppenborg et al., 2018). According to Pinto (2020), a project refers to a unique endeavour with a start and end, undertaken by people to achieve established objectives within quality, schedule, and cost parameters. The unique nature of a project is associated with risks of unknowns and uncertainties (Andersen, 2016). Projects are result-oriented and require an organised work effort to accomplish the predefined goal (Beleiu et al., 2015; Pinto, 2020). In the same vein, Kloppenborg et al. (2018) lament that projects are accomplished through a series of tasks and activities characterised by specific objectives, finite duration, funding limitations, and resource restrictions. Pinto (2020) identifies four attributes of project characterisation, namely: one-time process and complex; budget, schedule, and resource limitations; meeting customer or client's needs, and developing projects to resolve set goals.

2.3.1 One-time process and complex

The project arises to meet a specific stated purpose through a once-off process, achieved through coordinated inputs of the organisation's stakeholders (Pinto, 2020). The project stakeholders in the once-off process may consist of internal members from one functional area, different departments, or other organisational units (Pinto, 2020). Thus, a project is temporary, and exists until the intended purpose has been met or fulfilled.

2.3.2 Budget, schedule, and resources limitations

Members of project work are required to achieve project outcomes within a specific timeframe, limited human resources and financial parameters (Pinto, 2020). Moreover, project activities are not indefinitely executed and are constrained by budget limitations and availability of personnel until project completion (Pinto, 2020). Consequently, project team disbandment occurs once the project has been completed (Pinto, 2020).

2.3.3 Meet customer or client needs

In addition to completing the project within budget and time parameters, organisations have realised that customer satisfaction is a project's primary goal. Pinto (2020) upholds that meeting and satisfying clients' needs is one of the major purposes for organisations to pursue projects. Therefore, to meet customers' needs, organisations respond by engaging in projects that can improve the organisation's internal processes and exploit market opportunities (Pinto, 2020). Failure to meet clients' needs poses a threat of losing market and potential future projects, which might result in business failure (Pinto, 2020).

2.3.4 Project purpose

Lastly, Pinto (2020) pinpoints that a project is developed with an underlying purpose and goal that ultimately informs the nature of the project and its stakeholders. Projects are designed and organised with an intention to yield specific results in fulfilling project goal/s (Pinto, 2020). In the construction industry, a municipality might have a project goal to meet a specific community's accommodation needs. In order to fulfil the project goal, a residential housing project will have to be executed to fulfil the community accommodation needs (Pinto, 2020).

Projects are pursued due to an entity's strategic goals or varied operational necessities such as customer requests, market demand, crisis situations, regulatory compliance, legal requirements, technological advancement, social needs, environmental consideration, and replacing obsolete technology, system, equipment, or physical facility (Andersen, 2016; Sanchez & Terlizzi, 2017; Kloppenborg et al., 2018; Pinto, 2020). Taking into consideration all the features, projects are all, to a certain degree, unique and temporary in nature, constrained by resources (Burke, 2013, PMI, 2014; Kloppenborg et al., 2018; Okereke, 2020; Mohsen et al., 2021). Projects are pursued to benefit varied stakeholders, and project outputs are distinct from one project to another (Burke, 2013; PMI, 2014; Kloppenborg et al., 2018). Despite the uniqueness of projects, the project management processes application during the project life cycle is consistent regardless of the industry and type of project (Burke, 2013; PMI, 2014; Andersen, 2016). Generally, all projects are initiated, planned, executed, closed, and monitored throughout the project life cycle (Burke, 2013; PMI, 2014; Kloppenborg et al., 2018; Aroral, 2021).

2.4 Project management processes

Project management processes help break down the project into smaller manageable and digestible work activities known as project stages, project phases, or project steps, used interchangeably (PMI, 2013; Liu et al., 2015; Aroral, 2021). The work associated with the project management process from the start to the end of the project is called a project life cycle, which is represented by a linear sequence of phases to achieve set project goals (Liu et al., 2015). The application of project management processes may differ from one construction project to another, depending on the project's nature and the project owner's philosophy (Liu et al., 2015). However, the project life cycle's generic project management group processes are; project initiation, project planning, project execution and project closure, and each project management group is monitored and controlled (PMI, 2017; Kloppenborg et al., 2018; Aroral, 2021). Although project monitoring and controlling apply to all project development stages in the project life cycle sequence, it is usually placed as the fourth phase of the project management group process (PMI, 2017; Kloppenborg et al., 2018).

2.5 Project life cycle - Initiation

The first stage of project development along the project life cycle sequence is called project initiation or construction inception (Burke, 2013; PMI, 2017). Project initiation denotes the first stage where all projects begin, and it entails the conceptualisation and development of preliminary goals and specifications of a construction project (Burke, 2013; PMI, 2017; Janhunen, 2022). During this stage, the proposed project's value is determined (Burke, 2013; Mukherjee & Roy, 2017; Janhunen, 2022). Various factors are considered and documented during project value determination (Abou-Zeid et al., 2007; Schafrik & Kazakidis, 2011; Okereke, 2020). The process of project value determination is called a feasibility study, which informs the decision to proceed with the proposed project or abandon the project (McKeever, 2006; Schafrik & Kazakidis, 2011; Mukherjee & Roy, 2017; Okereke, 2020).

2.5.1 Construction project feasibility study

The feasibility study is undertaken during the earliest stages of the construction project and forms part of the preliminary project initiation phase (Heralova, 2017; Mukherjee & Roy, 2017). A construction project feasibility study is a forecasting procedure aimed at determining the project/s'

viability (Mukherjee & Roy, 2017; Okereke, 2020). Burke (2013) defines feasibility as a process undertaken to assess the possibility of whether the project meets the organisation or project owner's requirements and can be performed with the available organisational resources and constraints (Burke, 2013; Young, 2016). Adding to this view, Heralova (2017) posits that a feasibility study helps determine the alternatives and rationality of the project. Accordingly, the construction project feasibility study process entails an investigation, assessment, and evaluation of varied factors associated with the proposed project to predict outcome (Shen, Li Hao, Tam & Yao, 2007; Mukherjee & Roy, 2017; Newaz et al., 2022).

During the feasibility study, research associated with the project is conducted by varied stakeholders such as designers, contractors, suppliers, occupational health and safety practitioners, engineering consultants, financial advisors, and government, to gain valuable information (Abou-Zeid et al., 2007; Shen et al., 2007; Patil & Patil, 2015; Mukherjee & Roy, 2017; Okereke, 2020). Hence, the feasibility study's information plays a significant role in deciding whether to proceed with the proposed project. Financial, technical, operational, and legal issues are among the varied factors considered when conducting a feasibility study (Heralova, 2017; Mukherjee & Roy, 2017). The major attributes of a construction project feasibility study are economic benefits, social aspects, environmental effects, technological and engineering options (Shen et al., 2007; Mukherjee & Roy, 2017; Okereke, 2020). Based on extant literature, the most important attribute of construction projects is the economic benefits (Park et al., 2014; Mukherjee & Roy, 2017; Okereke, 2020).

2.5.1.1 Economic financial feasibility study

An economic project benefit feasibility study focuses on financial issues related to the project (Shen et al., 2007; Park et al., 2014; Mukherjee & Roy, 2017; Okereke, 2020). In this construct of the feasibility study, all financial aspects associated with the project, such as expenditures and return on investment, are considered (Heralova, 2017). The intention is to document the entire project costs; therefore, all anticipated project input resources which directly and indirectly contribute to the project realisation, are considered (Kumari 2016). The initial aspect of the financial feasibility study is to determine the project's affordability. Thus, project affordability determination is a process of approximating all project expenditures compared to available financial resources (Mukherjee & Roy, 2017). At this stage, the intended project is not yet detailed;

therefore, approximated expenditures are usually inaccurate or erroneous (Hyari & Kandil, 2009; Kloppenborg et al., 2018). However, the intent is to consider all the project expenditures as accurately as possible (Hyari & Kandil, 2009; Kloppenborg et al., 2018). To improve reliability, recurring feasibility studies at different project stages are encouraged, to increase the levels of cost accuracy (Hyari & Kandil, 2009; Heralova, 2017). After project cost expenditure determination and prior decision-making, the subsequent step is to determine the project return on investment (Mukherjee & Roy, 2017; Heralova, 2017). Project expenditure costs are input in determining project return-on- investment, and the exercise of return-on-investment determination is called cost-benefit analysis (Kloppenborg et al., 2018).

Cost-benefit analysis is used to determine the project return on investment (ROI) by comparing the expected project financial benefits against its costs (Heralova, 2017; Kloppenborg et al., 2018; Magni & Marchioni, 2020). In the same vein, Awojobi and Jenkins (2015) posit that expected project expenditures are compared with the expected project financial benefits, to determine the ROI. There are varied financial models used to determine the project ROI, namely; net present value (NPV), internal rate of return (IRR), benefit-cost ratio (BCR), and payback period (PP) (Remer & Nieto, 1995; Minasowicz, 2009; Mukherjee & Roy, 2017; Kloppenborg et al., 2018; Okereke, 2020; Sibuea et al., 2022). The NPV is the overall difference between the project cost value and benefit value, dependent on the discount rate and cost-earning growth over the construction project's life span (Gumilang et al., 2016). Similarly, Dinagar and Kamalanathan (2015) define NPV as the addition of discounted net benefits over the project life span of investment. It must be noted that the NPV is the most commonly utilised approach to evaluate construction project investment effectiveness (Dinagar & Kamalanathan, 2015).

The NPV approach determines the project's future financial value and benefits based on discounted cash flows (Minasowicz, 2009; Dinagar & Kamalanathan, 2015; Kloppenborg et al., 2018). The financial future project value will not be worth the same when the project is completed (Kloppenborg et al., 2018). NPV takes into consideration the time value of the currency by calculating future cash flows to determine the project's future value (Gallo, 2014; Magni & Marchioni, 2020). Based on the NPV calculation rule of thumb, an NPV of zero translates to project cash inflows, which match the cash outflows, and the project will neither be profitable nor a loss. A project with a positive NPV translates to a feasible investment, whereby cash inflows

are greater than cash outflows (Sibuea et al., 2022). Conversely, a project with a negative NPV, in which case cash inflows are less than cash outflows, are not viable, and most likely will be discontinued during the feasibility stage (Awojobi & Jenkins, 2015; Siagian & Surbakti, 2015; Gumilang et al., 2016; Leyman & Vanhoucke, 2017; Magni & Marchioni, 2020). Therefore, NPV helps project owners make an insightful decision on whether to proceed or reject the construction project, based on its future value.

The IRR approach can also be used to determine the project's viability (Park et al., 2009; Kloppenborg et al., 2018; Magni & Marchioni, 2020). The IRR financial feasibility study is conducted by calculating the approximate percentage of the project return on investment (El Tahir & El Otaibi, 2014; Bora, 2015). Similar to NPV, a positive IRR percentage means that the project is favourable and likely acceptable, while a negative IRR percentage means that the project is unfavourable and likely unacceptable to investors (El Tahir & El Otaibi, 2014; Bora, 2015; Magni & Marchioni, 2020). Therefore, decision-makers will accept a project with a positive (net gain) IRR, provided it is greater than the required project owner's rate of return. Findings from numerous research data reveal that IRR is unreliable, and hence disdained by decision-makers (Bonnafous & Jensen, 2005; Pasqual et al., 2013; Bora, 2015; Magni & Marchioni, 2020). IRR utilises the percentage value and uses a static single discount rate (Pasqual et al., 2013; Magni & Marchioni, 2020). Realistically, discount rates change over time; hence IRR is deemed unreliable (Pasqual et al., 2013; Magni & Marchioni, 2020). Decision-makers prefer NPV, which is deemed reliable or IRR in combination with NPV. (Bonnafous & Jensen, 2005; Pasqual et al., 2013; Bora, 2015; Magni, 2020). Contrary to IRR, the NPV approach focuses on the currency value and considers the discount rate changes over a period of time. In addition to NPV and IRR, approaches such as the BCR and PP are used by decision-makers to conduct a financial feasibility study, in order to determine the project return on investment.

The BCR is used to determine the project feasibility study by examining the relationship between the relative benefits and costs of the proposed construction project (Teng et al., 2010; Prakash & Mitchell, 2015; Hartadi et al., 2017). Hartadi et al. (2017) point out that the BCR relative benefits and costs of the proposed project can be expressed in monetary and qualitative terms. The qualitative information on the proposed project benefits is commonly converted to, or supported by, quantitative data (Holt & Goulding, 2014; Shively & Galopin, 2013). Expressed quantitatively

in monetary terms, an economically feasible project is reflected by the BCR calculation of greater than one ($BCR > 1$) and is most likely to be approved by decision-makers (Kahraman, 2001; Shively & Galopin, 2013; Hickman & Dean, 2018; Sibuea et al., 2022). On the other hand, a BCR calculation of less than one ($BCR < 1$) indicates that the project is not viable; therefore, it should be rejected (Kahraman, 2001; Shively & Galopin, 2013; Hickman & Dean, 2018). In contrast to NPV, IRR, and BCR models, the project PP approach calculates the amount of time it will take to recoup the cost of investment (Heralova, 2017; Omrani et al., 2019; Kloppenborg et al., 2018). In the construction industry, the PP timeframe is normally expressed in 'years' (Heralova, 2017).

According to Masud et al. (2017), the PP is the timeframe in which the initial investment cash outflow is expected to be recovered from the investment cash inflows. Specifically, when decision-makers use the PP approach to determine feasibility, the concern is about the length of the period it will take to break-even, and the project starts making net gains (Heralova, 2017; Masud et al., 2017). A proposed construction project with a shorter PP is deemed economically feasible and most likely would be approved by decision-makers (Heralova, 2017; Masud et al., 2017; Omrani et al., 2019; Sibuea et al., 2022). In comparison, a proposed construction project with a longer than expected PP is deemed unfeasible and most likely would be disapproved at the feasibility stage by decision-makers (Firmansyah et al., 2006; Heralova, 2017; Masud et al., 2017; Omrani et al., 2019; Sibuea et al., 2022).

In general, economic feasibility study establishes the project viability from a holistic financial viewpoint based on the available budget, and considers aspects such as loan access, investments, expenses, taxation, liabilities, present and future values, return on investment, and profits. Firstly, the NPV calculates the project's monetary value by factoring in the time preference to determine feasibility. Construction projects with a positive NPV would be considered economically viable, while projects with a negative NPV would be considered not viable (Awojobi & Jenkins, 2015; Siagian & Surbakti, 2015; Gumilang et al., 2016; Leyman & Vanhoucke, 2017; Magni & Marchioni, 2020). Secondly, the IRR calculates the project's value using a static single discount rate, and the results are expressed in percentage (Magni & Marchioni 2020). Feasible projects are reflected by larger IRR, in comparison with the expected IRR from the decision-makers (Pasqual et al., 2013; Magni & Marchioni, 2020). Thirdly, the BCR examines the relationship between relative benefits and costs of the proposed construction project. Thereafter,

qualitative benefits and costs are expressed and calculated quantitatively (El Tahir & El Otaibi, 2014; Bora, 2015; Magni & Marchioni, 2020).

Projects with a positive BCR would be considered viable and economically advantageous, while projects with a negative BCR would be considered not feasible (Teng et al., 2010; Prakash & Mitchell, 2015; Hartadi et al., 2017). Lastly, PP calculations show the amount of time it would take for a proposed project to be profitable (Heralova, 2017). The project with shorter PP is preferable and deemed feasible compared to a project with longer PP (Heralova, 2017; Masud et al., 2017; Omrani et al., 2019) A valuable project feasibility study should be more than just a set of financial projections (Heralova, 2017). Therefore, additional financial feasibility studies such as operational and market feasibility, technical feasibility, scheduling feasibility, regulatory feasibility, and social feasibility are conducted in determining the project's viability (Abou-Zeid et al., 2007; Jo et al., 2015; Mukherjee & Roy, 2017; Mohammed, Naji, & Ali, 2019; Okereke, 2020). All feasibility studies are embedded with financial implications (Schafrik & Kazakidis, 2011; Anees, et al., 2018). Prior to or concurrently to the aforementioned feasibility studies, a final decision to pursue the construction project would be based on the project financial viability and return on investment therein.

2.5.1.2 Operational and market feasibility study

In the construction industry, operational feasibility study and market feasibility study are relative terms that are normally used interchangeably. The operational feasibility study examines the overall anticipated operational benefits that the project will bring to the organisation. Šerman et al. (2017) affirm that a market feasibility study examines how the proposed project investment meets and aligns with the organisation's strategic goals. Furthermore, an operational feasibility study considers how well the project's outcome will meet the stakeholders' needs (Šerman et al., 2017). From a broad perspective, factors related to clientele's perceptions, demand, and supply, the anticipated economic life span of the construction building, and the organisation's market position are considered (Abou-Zeid et al., 2007; Heralova, 2017). Considerations such as pricing, market share, marketing strategies, and market targets are emphasised during a market feasibility study for property projects (Mohammed et al., 2019). Thus, there is a direct relationship between economic-financial feasibility and market feasibility (Abou-Zeid et al., 2007; Mohammed et al., 2019).

2.5.1.3 Technical and technological feasibility study

A technical feasibility study is concerned with technology and systems that are available and required in order to achieve the project objectives (Mukherjee & Roy, 2017). Technical feasibility study and technological feasibility study are commonly used synonymous with reference to the project's technical and technological requirements (Šerman et al., 2017; Mukherjee & Roy, 2017). Mukherjee and Roy (2017) inform that a technical feasibility study is generally conducted by a group of engineers with the technical expertise required for the construction project. In addition, the technical feasibility study focuses on technical aspects associated with the construction project capacity, site location, design, type, the construction process and method, planning schedules, and the required technology (Abou-Zeid et al., 2007; Šerman et al., 2017). Anees et al. (2018), stipulate that an emphasis on integrating the latest technology and updated equipment should be considered during technical feasibility, to enhance the efficiency and effectiveness of the project's technical aspects. Based on the technical feasibility results, the project inceptors and technical experts decide whether the proposed project is technically and technologically doable (Šerman et al., 2017; Anees et al., 2018). Furthermore, the availability of in-house technical experts and the project's outsourcing requirements are determined (Šerman et al., 2017; Anees et al., 2018). Generally, a technical feasibility study examines the project's technical requirements based on the project owner's systems and capabilities on how well the construction project objectives can be achieved.

2.5.1.4 Scheduling feasibility study

The schedule feasibility study aims to approximate the timeframe required to complete the construction project, considering tasks to be executed simultaneously, and all other time-related factors (Kim et al., 2016). During the schedule feasibility study, various project individual task completion durations are predicted, to determine the entire project completion time requirements (Kim et al., 2016; Mukherjee & Roy, 2017). Along with the budget, the project completion timeframe is regarded as one of the most relevant performance and success criteria of construction projects (Boukendour, 2009; Doloi et al., 2012; Mukuka et al., 2015; Durdyev et al., 2017). A construction project completed beyond the stipulated timeframe is deemed unsuccessful (Mukherjee & Roy, 2017). Therefore, realistic project timeframes should be emphasised to avoid project schedule overruns (Šerman et al., 2017). Furthermore, Šerman et al. (2017) state that

the schedule feasibility study indicates whether the project is viable and achievable within the given deadline. Ultimately, the schedule feasibility study is concerned with whether there will be enough time to complete the construction project, considering other current organisational projects and initiatives.

2.5.1.5 Regulatory feasibility study

Geographical areas where construction projects are executed are governed by different regulatory laws, directly or indirectly affecting projects (Abou-Zeid et al., 2007; Robbaniy, 2018). The regulatory feasibility study focuses on existing laws, regulations, or standards (Abou-Zeid et al., 2007; Mukherjee & Roy, 2017; Mohammed et al., 2019). Project originators should pay attention to local and international legal requirements to ensure that the construction project objectives are aligned to legislative requirements (Sepasgozar et al., 2015). The general literature supports the premise that a regulatory feasibility study is concerned with evaluating and determining whether the proposed construction project will meet local, national or international laws, regulations, or standards (Abou-Zeid et al., 2007; Jo et al., 2015; Mukherjee & Roy, 2017). A construction project which conflicts with local, national, or international legal requirements may be discontinued by authorities, translating into project failure (Sepasgozar et al., 2015; Šerman et al., 2017).

Alternatively, project owners may be required to adjust the project objectives to meet legislative requirements before continuity (Abou-Zeid et al., 2007; Mohammed et al., 2019). However, both project discontinuation and adjustment, emanating from legislative non-compliance, result in financial losses such as exorbitant fines and legal representation fees (Sepasgozar et al., 2015). Also, failure to adhere to regulatory requirements may dent the organisation's reputational image (Sepasgozar et al., 2015). To enhance success, the project should not violate any existing legislative requirements (Shen et al., 2010; Sepasgozar et al., 2015; Šerman et al., 2017). It is, therefore, the responsibility of project originators and an organisation's senior team to ensure that the proposed project is aligned to the existing zoning and statutory regulatory requirements (Šerman et al., 2017; Anees et al., 2018; Mohammed et al., 2019). Globally, individual countries are guided by established national construction building codes and/or local regulations (Listokin & Hattis, 2005; Ching & Winkel, 2018). In South Africa, the National Building Regulations and Building Standards Act no. 103 of 1977 and local building by-laws are used by project originators

to determine the legalities of the proposed construction building project (Crafford et al., 2021; De Villiers et al., 2021). Similarly, construction project managers and key stakeholders involved in decision making should ensure that construction projects are approved, and informed by both South African and international relevant regulatory obligations.

2.5.1.6 Social feasibility study

According to Perrett (1983), a social feasibility study focuses on social context assessments aimed to bridge the gap between the technical and social side of the proposed project. Similarly, Holopainen et al. (2016) state that the social feasibility study examines the community-based aspects that might impact the proposed project. Cultural typologies and environmental aspects, embedded within the geographical area where the proposed construction project is intended to be executed, play a critical role in the project's societal acceptance (Jo et al., 2015; Holopainen et al., 2016; Silva & Simões Gomes, 2019). Typically, geographical locations differ broadly in terms of environmental characteristics, culture, and shared attitudes towards construction projects (Schafrik & Kazakidis, 2011; Jo et al., 2015; Holopainen et al., 2016).

The social feasibility study helps ensure that the proposed project fits in with the social habits, culture, attitudes, and expectations (Perrett, 1983; Holopainen et al., 2016; Kivilä et al., 2017; Mohammed et al., 2019). To increase the proposed project societal acceptance and compatibility, social feasibility study enables the decision-makers and key stakeholders to respond proactively, address and integrate the community's interests and typologies in the project plan (Perrett, 1983; Schafrik & Kazakidis, 2011; Holopainen et al., 2016; Silva & Simões Gomes, 2019). In general, the social feasibility study establishes the extent to which the proposed construction project will likely meet society's expectations and typologies at different levels of the project life span (Perrett, 1983; Holopainen et al., 2016; Jo et al., 2015; Kivilä et al., 2017; Silva & Simões Gomes, 2019).

In summary, a project feasibility study analysis details how a project can be completed by conducting economic financial feasibility, operational and market feasibility, technical and technological feasibility, scheduling feasibility, regulatory feasibility and social feasibility studies that might affect the proposed project realisation (Abou-Zeid et al., 2007; Jo et al., 2015;

Mukherjee & Roy, 2017; Mohammed et al., 2019; Okereke, 2020). Furthermore, risks associated with the proposed project are identified during feasibility studies (Choudhry et al., 2014). Decision-makers and decision influencers rely on the aforementioned feasibility studies in order to approve or reject the proposed construction project. In some instances, it is common for decision-makers and key stakeholders to engage in a pre-feasibility study, a simplified viability assessment of the project idea prior to the detailed feasibility studies (Abou-Zeid et al., 2007; Mohammed et al., 2019). To promote accuracy, decision-makers and key stakeholders conduct feasibility studies more than once at different stages of the project development (Abou-Zeid et al., 2007; Jo et al., 2015; Mohammed et al., 2019).

Schafrik and Kazakidis (2011) posit that all feasibility study aspects have some level of financial impact on the proposed construction project. Similarly, findings by Anees et al. (2018) show that the financial implications of the proposed project are the most important and prioritised aspects of feasibility studies in the construction industry. Consequently, a construction project approved based on inaccurate and erroneous feasibility studies may be completed over the budget, or terminated before completion (Anees et al., 2018). Therefore, stakeholders must practice due diligence in feasibility studies to ensure project implementation success (Abou-Zeid et al., 2007; Anees et al., 2018). The project feasibility studies help develop the project charter, and forms the basis of the business case in justifying why a project has been selected (Mukherjee & Roy, 2017; Kloppenborg et al., 2018). Globally and locally, it should be noted that organisations and project owners differ, hence project feasibility studies are conducted in varied sequences or parallel, depending on the entity's culture, location of the construction project, and client's philosophy (Abou-Zeid et al., 2007; Jo et al., 2015; Mukherjee & Roy, 2017; Anees et al., 2018).

2.6 Business case

The business case describes what the organisation aims to achieve from the proposed project (Somachandra & Sylva, 2018; Kloppenborg et al., 2018; Pinto, 2020). Anticipated project benefits, such as return on investment and future opportunities, are provided in the business, to justify the reason for selecting a particular construction project (Mukherjee & Roy, 2017; Pinto, 2020). Similarly, Okereke (2020) states that the business case details what the organisation can achieve from the proposed project delivery. In addition, high-level risks associated with the proposed project investment are outlined in the business case (Burke, 2013; Okereke, 2020).

The feasibility studies' results that show the project value is used to formulate the business case (Mukherjee & Roy, 2017). From a holistic, organisational perspective, the latter provides information on the available resources and capabilities to perform the proposed construction project (Kloppenborg et al., 2018; Pinto, 2020).

The project's purpose is justified in a project business case and helps key stakeholders understand why the construction project is pursued (Takim, 2009; Burke, 2013; Opping et al., 2017; Einhorn et al., 2021). In this regard, the project's necessity is justified and aligned with the organisation's strategy or project owner's goals (Donovan et al., 2018; Kloppenborg et al., 2018). The project's anticipated benefits to meet the project owner's goals are explained as a motivation to authorise the project (Burke, 2013; Somachandra & Sylva, 2018). Relatedly, ethical and emotional reasons for pursuing the project are sometimes included in the business case, particularly on construction projects resulting from a crisis, social needs, residential property, environmental considerations, or legal requirements projects (Koushki et al., 2005; Moolla et al., 2011; Kloppenborg et al., 2018). A project business case should be well-written to persuade decision-makers to support and approve the project (Marnewick & Einhorn, 2019). Furthermore, the project business case should motivate and inspire key stakeholders and project teams to successfully complete the project (Mok et al., 2015; UI Musawir et al., 2017; Einhorn et al., 2021).

To meet business needs, the business case clearly articulates the benefits that outweigh the disadvantages of the proposed construction project (Burke, 2013; Mukherjee & Roy, 2017; Pinto, 2020). Furthermore, the business contains information on how the project will meet stakeholders' needs (Kloppenborg et al., 2018; Okereke, 2020). The business case study shows how the proposed project aligns with the organisational strategic goals or governmental infrastructural obligations, or the client's private property's expectations (Koushki et al., 2005; Moolla et al., 2011; Hermarij, 2013; Gosselin et al., 2017; Kloppenborg et al., 2018; Okereke, 2020). Most importantly, the business case provides the utmost critical motivational information required for a construction project to be approved and started (Burke, 2013; Mason, 2017; Kloppenborg et al., 2018; Pinto, 2020). Findings by Nnaji et al. (2018) support that the business case is the driver and engine in project approval decision-making. The business case triggers the project charter development, which authorises and formalises the project (Kloppenborg et al., 2018; Ahmed et al., 2019).

2.7 Project charter

The project charter or project proposal is a document that provides the expected project benefits, reasons for undertaking the project, high-level budget, high-level schedule estimations, and high-level approval for the project (Suchcicki, 2012; Donovan et al., 2018; Janhunen, 2022). Furthermore, the project charter assigns the project manager, authorises the project manager to use allocated project resources, and simultaneously formalises the project's existence (Suchcicki, 2012; Donovan et al., 2018; Janhunen, 2022). The project charter development and approval are the responsibility of the project sponsor. However, in practice, in-house project managers develop, or are involved in, developing the project charter with assistance from the project sponsor and executive team (McKeever, 2006; Suchcicki, 2012; Kloppenborg et al. 2018). Complex and technical-oriented construction projects require project sponsor/s, project manager/s, and experts from diverse field/s specific to the project, to be involved in developing the project charter (Suchcicki, 2012; Kloppenborg et al., 2018). The project sponsor is central to the project charter's development and approval (Burke, 2013; Donovan et al., 2018).

The project charter is not a one-size-fits-all; therefore, project charter elements may differ from project to project, depending on the project's nature, location, and the project key stakeholders' philosophies. In addition to components' differentiation, a project charter is also called the 'Terms of reference' or 'Project brief'; hence the terminologies are used interchangeably by different project management practitioners and stakeholders (Linger, 2002; McKeever, 2006; Burke, 2013; Donovan et al., 2018). Consensus exists in the general literature that illustrates overlaps and integration of project charter elements to ensure the proposed project is holistically presented (Knack & Clark, 2004; McKeever, 2006; Kumar & Sosnoski, 2009; Wei et al., 2010; Suchcicki, 2012; Donovan et al., 2018). Most importantly, the project charter should be adequately detailed to the satisfaction of decision-makers, regarding the proposed project (McKeever, 2006; Suchcicki, 2012; Daddey & Watt, 2021).

According to McKeever (2006), there are fourteen project charter components, namely; project name, project purpose, project scope, project objectives, project roles and responsibilities, project approach, project deliverables, project constraints and assumptions, project references, project terminology, project risks, project facilities and resources, project performance measures and

project approval. Similarly, Kloppenborg et al. (2018) populated eleven elements of a project charter which are: project title, project scope overview, project business case, project background, project milestone schedule, projects risks, project resources, project stakeholder list, project team operating principles, previous projects lessons learned and commitment signatures of key stakeholders. In the same vein, several scholars and project management practitioners acronym-ed project charter elements to BOSCARD, abbreviated from; 'Background, Objectives, Scope, Constraints, Assumptions, Risks and Deliverables' (Haughey 2011; Subrt & Brozova, 2012; Ziolkowski, 2016; Donovan et al., 2018).

Based on Suchcicki's (2012) research findings, the project charter aspects and elements can be broken down into twenty-two components, which are: the project name, objectives, purpose, constraints, assumptions, risk, budget, milestones schedule, duration (commencement/closure), resources and facilities, team roles and responsibilities, stakeholders, approach, performance measures, high-level requirements, references, terminology, subject matter experts/consultants, project manager, customer/client, sponsor/owner, and approval. Team roles and responsibilities, terminology, and references are the least utilised components of the project charter. However, team roles and responsibilities, together with operating principles, are generally detailed during the project planning phase after the project has been approved (Suchcicki, 2012; Kloppenborg et al., 2018).

Project charter aspects about key stakeholders such as the subject matter experts/consultants, project manager, customer/client, sponsor/owner, together with their underlying infused expectations, expertise, and authority, are typically not included as sub-topics, but represented in the project charter content (McKeever, 2006; Suchcicki, 2012; PMI, 2013; Donovan et al., 2018; Kloppenborg et al., 2018; Daddey & Watt, 2021). Next, the project title/name, background, purpose, and objective, budget and resources, scope, milestone schedule, risks, constraints, assumptions, and approval project charter elements prevalent in the existing literature, are explained in relation to the proposed construction project and key stakeholders (McKeever, 2006; Haughey 2011; Suchcicki, 2012; PMI, 2013; Ziolkowski, 2016; Donovan et al., 2018; Kloppenborg et al., 2018).

2.7.1 Project title

The first item in the project charter is commonly the project name, which identifies the unique project (Krainski, 2004; McKeever, 2006; Zambruski, 2008; Suchcicki, 2012; Bonghez, 2015). A project title has to be short, and is commonly restricted to a one sentence name (Kloppenborg et al., 2018). Furthermore, Kloppenborg et al. (2018) state that a project must be given a proper title that holistically describes the assignment and will be a reference point. Bonghez (2015) and Kloppenborg et al. (2018) accord that the project's main goal and attributes are reflected in the project name for stakeholders to understand project work and deliverables. Consequently, the following are amongst the main characteristics incorporated in determining an ideal project title, thus: the description of the project assignment, representation of the organisation or project owner's goals, professionalism and creativity, incorporation of the client's needs, and should be informed by the type of the project (PMI, 2004; Gareis, 2005; McKeever, 2006; Zambruski 2008; Suchcicki, 2012; Bonghez, 2015; Kloppenborg et al., 2018). Moreover, a project title should be understandable, easily pronounced, recognised, and remembered by the stakeholders (Bonghez, 2015; Kloppenborg et al., 2018). In the construction industry, project names are commonly titled and informed by the project's type, location, and what is intended to be built or constructed (Baloyi & Bekker 2011; PMI, 2015; Hosseini et al., 2016).

2.7.2 Project background

The project background details information about the project origins and the rationale for undertaking the project (Reddy, 2011; Suchcicki, 2012). In practice, the description of the project prerequisites, high-level project features, and the methodology to achieve the project is contained in the background (Reddy, 2011; Suchcicki, 2012). The project background forms part of BOSCARD, and extant literature shows that the project background is a prevalent attribute of a project charter (Haughey, 2011; Subrt & Brozova, 2012; Ziolkowski, 2016; Donovan et al., 2018; Guan, 2020). Arguably, Kloppenborg et al. (2018) state that the project business case should provide adequate information which key stakeholders should know about the project, and should be knowledgeable about, after reviewing the project business case. Therefore, the business background is developed as an additional statement on optional cases when there is a necessity (Kloppenborg et al., 2018). A project background serves as a reference document to support the business case and scope overview statements (Suchcicki, 2012; Kloppenborg et al., 2018).

2.7.3 Project purpose and objectives

In the project charter, the project purpose section briefly details the project's intentions, motives, and expectations (McKeever, 2006; Suchcicki, 2012). In this regard, it is essential that the project purpose clearly defines the project, to ensure understanding and clarity to decision-makers and key stakeholders (Andrews, 2012). Furthermore, the project owner and client's needs for the project, are described and motivated in the project purpose section. Relatively, the objectives section identifies the project intentions (Ward et al., 1991; Suchcicki, 2012; Donovan et al., 2018). Suchcicki (2012) states that project objectives briefly highlight what the project intends to achieve in technical terms and based on the client's requirements. Technical objectives are described based on methodology efficiencies (McKeever, 2006; Suchcicki, 2012). On the other hand, the client's objectives are described in terms of benefits, specified client's requirements and anticipated benefits (McKeever, 2006; Suchcicki, 2012). Ward et al. (1991) stipulate that project objectives are informed by what the project owner requested in terms of the type of the construction project. Similarly, Richards et al. (2005) inform that the client's requirements are commonly the project's major objectives and would be one of the determinants of a project's success or failure. Generally, the project's purpose and objectives highlight the project's intentions, motives, requirements, and anticipated expectations (Ward et al., 1991; Suchcicki, 2012; Donovan et al., 2018).

2.7.4 Project budget and resources estimates

Project budget and resource estimate section/s outline high-level funding requirements for the project inputs (McKeever, 2006; Suchcicki, 2012). A project charter budget is based on the project funding requirements such as the workforce, materials, equipment, documentation, machinery, training, security requirements, facilities, quality assurance, and any other necessities required for project realisation (Knack & Clark, 2004; McKeever, 2006; Suchcicki, 2012; Burke, 2013; Kumari 2016; Kloppenborg et al., 2018). The project budget estimate is typically based on all project resource inputs converted in monetary terms, taking into account both direct and indirect cost estimates (Kloppenborg et al., 2018). However, Kloppenborg et al. (2018) assert that there is inadequate information about the project during the project charter stage; hence, cost estimates may be inaccurate. The tentative project budget estimate is mainly informed by the project feasibility studies, particularly the economic feasibility study (Suchcicki, 2012; Mukherjee & Roy, 2017; Okereke, 2020). To avoid risks emanating from feasibility study inaccuracies, contingencies are integrated into the allocated project budget (Touran, 2003; Charette, 2004; McKeever, 2006; Enshassi & Ayyash, 2014; Abednego et al., 2014; Love et al., 2015).

2.7.5 Project scope overview

The project scope section in the project charter presents an overview of the project scope (Kloppenborg et al., 2018). The scope overview entails high-level requirements, deliverables, boundaries, and project acceptance criteria (Ruuska & Teigland, 2009; PMI, 2013; Kumari, 2016; Kloppenborg et al., 2018). The high-level requirements focus on summarising the project's technical description and specifications (PMI 2013; Kloppenborg et al. 2018). Likewise, Suchcicki (2012) describes the project scope overview as the summarised work required to deliver the project, considering the specified project functions and features. In the same trend, Varajão et al. (2017) refer to project scope as the collection of project requirements and activities. In general, the project scope overview summarises the project in its entirety on what work needs to be performed in order to deliver the project (Suchcicki, 2012; PMI, 2013; Kloppenborg et al., 2018).

Project deliverables are typically integrated with the project scope overview and schedule milestones (Pyzdek, 2003; Knack & Clark, 2004; Kloppenborg et al., 2018). A deliverable, with reference to the project scope overview, is a unique, verifiable completion of an activity or phase within the broad project scope (PMI, 2013; Hellas, 2015; Suchcicki, 2012). Prior to starting the next phase or activity, a project scope deliverable is commonly subject to approval by the project client or sponsor (Suchcicki, 2012). Here, expected project outputs in the form of project scope deliverables to support objectives, are also included in the project scope overview (Hellas, 2015; Kloppenborg et al., 2018). Project scope deliverables entail attributes of the project required to satisfy the client, contract, and stakeholders (Knack & Clark, 2004; Alias et al., 2014; Kloppenborg et al., 2018). In the construction industry, the project scope deliverables can be described and denoted by different major phases or activities of the construction project (Alias et al., 2014).

2.7.6 Project milestone schedule

A high-level plan stipulating the few significant, anticipated accomplishments along the project life cycle are indicated in the project milestone schedule section of the project charter (Suchcicki, 2012; PMI, 2013; Kloppenborg et al., 2018). The project milestone schedule highlights the project duration from start to end and major events along the project life cycle (Suchcicki, 2012). Burke (2013) defines a milestone as a key project event that acts as a progress accomplishment marker. Hosseini et al. (2016) and Kloppenborg et al. (2018) interpret milestones as null-duration progress

measurement events across or between project timelines. In other words, anticipated milestones should be measurable in terms of the expected date of completion and project milestone deliverables (McKeever, 2006; Antony et al., 2007; Suchcicki, 2012; PMI, 2013). The milestone date of completion and the attached deliverable should satisfy key stakeholders involved in approval decision-making (Kloppenborg et al., 2018). Furthermore, the milestone schedule serves as a valuable abstract source of information for key stakeholders who are not actively involved in the project (Kloppenborg et al., 2018).

In practise, milestone schedules are integrated with the project deliverables regarding financial expenditures (Suchcicki, 2012; Kloppenborg et al., 2018). Project milestones schedules highlight time and cost-related acceptance criteria requirements and conditions to be met for the deliverable's approval (Antony et al., 2007; PMI, 2013; Kloppenborg et al., 2018). Typically, reviews of the predecessor project phase are conducted during the scheduled milestone, and the results of the reviews inform the financial expenditure approval and the start of the succeeding phase (Suchcicki, 2012). Specifically, project schedule milestones help to identify vital signs as the project progresses and inform necessary action or changes to promote project success (McKeever, 2006; Antony et al., 2007; PMI, 2013). According to Kloppenborg et al. (2018), project schedule milestones occur after the completion of a major scope accomplishment, key deliverable, or critical design that the project team and sponsor need to monitor closely. Identification of milestones promotes a better management of financial costs and project schedules (Chang, 2001; De Marco et al., 2009; Katz et al., 2015). Therefore, it is deduced that aspects of duration, expenditure, and scope are considered and integrated into formulating project milestone schedules.

2.7.7 Projects risks

The project risk section outlines the high-level project risks and the underlying risk assessment brief (Kloppenborg et al., 2018; Janhunen, 2022). The risk assessment briefly highlights the probability and significance of each risk identified together with a possible solution (KarimiAzari et al., 2011; Renault & Agumba, 2016). Risk refers to any uncertain factor/s which, on occurrence, may either have a positive or negative impact on the project (Smith et al., 2014; Renault & Agumba, 2016). Risks are categorised into internal and external factors that may limit the construction project realisation (Smith et al., 2014; Renault & Agumba, 2016). Among internal factors considerations are project requirements such as expertise, resources, facilities, legalities,

or contracts, which may affect the project timelines, budget, quality, and scope (KarimiAzari et al., 2011; Smith et al., 2014; Rastogi & Trivedi, 2016; Rostami & Oduoza, 2017; Do & Lam, 2019). Conversely, external factors emanate from economic, social, political, technological, and environmental conditions associated with the project (KarimiAzari et al., 2011; Rastogi & Trivedi, 2016; Rostami & Oduoza, 2017). To note, the initial risk assessment in the project charter serves as an input to a detailed project risk management plan developed during the project planning phase (KarimiAzari et al., 2011; Smith et al., 2014; Kloppenborg et al., 2018). Therefore, the project charter risk assessment brief is not a replacement for a full risk assessment undertaken during project planning. A detailed project risk management plan is conducted during the project plan and documented in the project plan (Smith et al., 2014; Renault & Agumba, 2016).

2.7.8 Constraints and assumptions

Constraints and assumptions are typically presented together with project risks in the charter (Kloppenborg et al., 2018). A constraint refers to any factor which may hinder project implementation, while project assumptions are suppositions that are true without validation and proof. (Smith et al., 2014; Renault & Agumba, 2016; Kloppenborg et al., 2018). Renault and Agumba (2016) stipulate that the project is proactively analysed, and specific project restrictions are outlined as constraints. On the other hand, all high-level factors that are probably correct, real, or factual that may affect the project, are outlined as assumptions (Kloppenborg et al., 2018). Project assumptions are embedded with some risk level, therefore validated and proven by the project team during the project planning phase (Young, 2016; Kloppenborg et al., 2018). Validated and proven assumptions are documented within the project plan, while invalidated incorrect, inconsistent, and incomplete assumptions that cannot be proven, but may adversely affect the project, become project risks (Young, 2016; Kloppenborg et al., 2018). In a nutshell, project risks, constraints, and assumptions present project knowns, known unknowns, and unknowns, which may positively or negatively impact the construction project realisation.

2.7.9 Project approval and commitment signatures

The project charter's approval section is at the end of the document, where key stakeholders sign and date to signify their commitment to the project (McKeever, 2006; Suchcicki, 2012; Donovan et al., 2018). Project approval is the formal act of sanctioning, agreeing, or confirming the project's commencement (Laureani & Antony, 2010; Suchcicki, 2012; Kloppenborg et al., 2018). The Project Charter should be signed and dated by all key stakeholders to document the agreement

and provide a written project commencement authorisation (McKeever, 2006; Suchcicki, 2012). Key stakeholders such as the project sponsor, project manager, project owner's internal executive management, client/customer, and consultants, are generally involved in the project charter approval (McKeever, 2006; Suchcicki, 2012). Herewith, the project charter's approval authorises the project manager to utilise the allocated resources to deliver the project (Laureani & Antony, 2010; Donovan et al., 2018; Kloppenborg et al., 2018).

Briefly stated, the project charter elements are not static; there are noticeable presentation and terminology differences. Entities present project charter elements varyingly, depending on the construction project's uniqueness and key stakeholders' philosophies. Based on extant literature, there are overlaps, linkages, and interconnectedness of project charter elements governed by the proposed project requirements and key stakeholders' preferences. Commonly, related project charter elements are integrated and presented collectively. Alternatively, project charter elements are separately presented. Regardless of the presentation format and terminology, the global, African, and South African trends show that each project charter element's inclusion is determined by its relevance to the construction requirements and attributes to meet key stakeholders' expectations. The ultimate aim of the project charter is to detail high-level project attributes and benefits. In general, the project charter document should be short in length and succinctly developed for the project sponsor/s and key stakeholders, to prudently review and approve or reject the proposed project. Project rejection translates to project termination. Conversely, project approval means that the proposed construction project has been accepted.

2.8 Conclusion

In conclusion, the chapter provided a historical project management overview of the project management profession's origins and progression. The chapter also described project management concepts associated with project inception and the project management profession. Herewith, various construction project feasibility studies concerning project initiation were explained and discussed. Specifically, the economic financial feasibility, operational and market feasibility, technical and technological feasibility, scheduling feasibility, regulatory feasibility, and social feasibility studies required to determine the construction project viability, were detailed. The chapter also elaborated on the business case that provides information on the proposed construction project's benefits and strategic goals. In addition to the business case, the project

charter and underlying project charter elements were discussed. The project charter is a document signed by key stakeholders to signify the proposed construction project's approval and acceptance. Project acceptance denotes the end of the project initiation phase and marks the beginning of the project planning phase. The next chapter is the continuation of the conceptual framework, and focuses on project realisation in relation to the construction industry.

CHAPTER THREE - PROJECT REALISATION PROCESS

3.1 Introduction

This chapter is the continuation of this study's conceptual framework. The previous chapter focused on the conceptual framework underpinning construction project inception, while this chapter focuses on the construction project realisation conceptual framework. The chapter begins by explaining the project design planning phase comprising construction schematic design, design development, construction documents, and construction bidding, followed by an elaboration of the construction project execution and closure. The last section of the chapter discusses construction project manager's roles, competencies, and the integration of project management knowledge areas into the construction project life-cycle.

As an overview, the design phase comprises the architect, client, and consultants who compile and finalise all the project information emanating from both schematic design and design development phases to produce construction documents. Construction documents are used for the bidding process and as guidelines for project execution. The execution phase entails the implementation of the project plan based on the construction documents. Subsequently, the closure phase follows after the physical construction of the building project has been completed and comprises handing over the finalised construction building to the client and documenting lessons learned. Construction project managers play a crucial role in executing multifaceted responsibilities towards construction project realisation. Construction project managers work with various stakeholders to apply project management skills, technical skills, and integration of project management knowledge areas on different project life cycle stages to accomplish construction project realisation.

3.2 Construction project design planning

In the project life cycle, the planning phase is a successive project phase after project initiation. A construction planning phase is triggered by the approval of a project charter. Henceforth, the planning phase establishes the project scope, refines objectives, and stipulates the required course of action to achieve project objectives (Sears et al., 2015; PMI, 2017). Sears et al. (2015) further elaborate that construction project design planning phase should determine the project's general approach, break down the project into manageable work activities, identify and sequence

project work activities, and gain project endorsement from the project team. According to Roseke (2020), the project planning phase comprises the project scope statement, success factors, deliverables, work breakdown structure, schedule, budget, quality, human resource plan, stakeholder list, communication, risk register, and procurement plan.

PMI (2017) identifies the following planning phase elements for construction projects, namely, project scope management, project schedule management, project cost management, project stakeholder management, project risk management, project quality management, project resource management, project procurement management, and project communications management. The construction planning phase elements are also called 'project management knowledge areas' (PMI, 2017; Kloppenborg et al., 2018). In the same notion, extant literature from numerous scholars and project management practitioners' exert great emphasis on the inclusion of the following construction project plan components: project goals, project scope, key milestones and major deliverables, work breakdown structure, budget, quality, human resources plan, risk management plan, health and safety, communication plan, stakeholder management plan, and change management plan (Rotimi & Ramanayaka, 2015; Roberts, 2019; Akomah et al., 2020; Keng et al., 2020).

In the construction industry, the project planning phase elements are an output combination of schematic design and design development in the form of construction documents (Ali et al., 2008; Lim et al., 2015, Lee & Kim, 2017; Lim et al., 2018; Kwok & Grondzik, 2018; Khosakitchalart et al., 2018; Aldeek, 2020). The construction project planning phase elements are integrated as inputs, resulting in an output of construction schematic design and design development (Tessema, 2008). Construction project schematic design and design development phases integrate various elements of project planning, such as scope management, schedule management, cost management, stakeholder management, risk management, quality management, resource management, procurement management, and communications management during the planning phase as a guide in order to accomplish project objectives (PMI, 2017; Rotimi & Ramanayaka, 2015; Roberts, 2019; Akomah et al., 2020).

3.2.1 Construction schematic design

Following the approval of the project charter, the client and the project manager appoint an architect to start the process of developing schematic designs. The purpose of schematic design is to translate the project idea into physical building drawings of space and determine the building requirements (Leicht & Messner, 2007; Amasuomo et al., 2017; Kwok, 2018). During the schematic design phase, the construction project manager and sponsor inform the architect of the proposed project idea to create the foundational design (Tessema, 2008; Leicht & Messner, 2007; Viscuso et al., 2020). Furthermore, the architect is guided by the project site and input from various consultants in the development of schematic designs, depending on the nature of the project (Garcia et al., 2020).

Geotechnical engineers, structural engineers, mechanical engineers, electrical engineers, and quantity surveyors are typical consultants involved in both schematic design drawing options and the design development phase (Oyedele et al., 2003; Staub-French & Khanzode, 2007; Tessema, 2008; Fidler, 2013; Sibiya et al., 2015; Chidiebere et al., 2017). Geotechnical engineers provide information regarding soil suitability for the construction project site to inform the architect's schematic drawings (Ricketts et al., 2004; Day, 2010; Kotiukov & Lange, 2019). Buch (2010) states that the design team relies on geotechnical engineers for soil testing and soil appropriateness for the construction building design. Likewise, Okeke et al. (2020) emphasise soil characterisation prior to the construction of the building.

Structural engineers provide input regarding the building design skeleton in relation to footings, sheathing, framing, roofing, and serviceability of the construction project (Chen et al., 2005; Tessema, 2008; Chaudhary & Piracha, 2013; Mangalathu & Jeon, 2018). Mechanical engineers provide information about the project machinery usage and installation requirements (Tessema, 2008; Chaudhary & Piracha, 2013). Quantity surveyors prepare project costs plans and bill of quantities (BOQ), which would inform the practicability of the schematic designs (Chandramohan et al., 2020). In the same notion, Akinrata and Ogungbile (2018) posit that electrical systems' information, such as wiring and lighting systems associated with the proposed construction project are provided by electrical engineers. An appointed construction project manager can emanate from any aforementioned profession and provide design information on the design, based on the specific background (Akinrata & Ogungbile, 2018). Several schematic designs are produced, and

the schematic design which best suits the client's and diverse stakeholders' requirements, is selected (Tessema, 2008). The involvement of each stakeholder depends on the nature of the construction project and is at the client's prerogative. In some projects, contractors are involved in schematic drawings and design development (Staub-French & Khanzode, 2007; Tessema, 2008; Kozlovska et al., 2016; Laryea & Watermeyer, 2016).

In summary, the primary objective of schematic design is to develop a feasible construction project concept by creating various generic building ideas, taking into consideration the budget and client's requirements. The architect continually consults with the client to ascertain the construction project requirements. Furthermore, the architect, with the assistance of consultants, prepares design studies comprising drawings and related documents, demonstrating the relationships and scales of the project construction elements. The construction schematic design phase is concluded when the client selects and approves the drawing which matches his/her project requirements.

3.2.2 Construction design development

The design development phase focuses on the refinement of the selected schematic design drawing (Suryani & Riantini, 2019). During the design development phase, results from schematic design are collected and refined in accordance with the construction building site plan and the client's requirements. Construction project elements such as floor plans, elevations, section drawings with full dimensions, materials, colours, and general structural details are refined and finalised during the design phase (Tessema, 2008; Mrema et al., 2012). Based on the same notion, Eastman et al. (2011) and Ching and Binggeli (2018) state that the design development phase comprises the construction arrangement plan, space arrangements, furnishings, equipment, building design, material types, and quality, material colours, complete definitions of all project features and systems. Prominent features of the project are integrated during the design development phase. Furthermore, changes suggested by the client and key stakeholders on the selected schematic drawings, are considered and/or implemented during the design development phase (Tessema, 2008). Cost assessments are incorporated during the refinement of the construction design in the BOQ, stipulating the construction inventory and labour requirements (Tas & Yaman, 2005; Tessema, 2008; Brook 2016; Ghaffarianhoseini et al., 2017).

During the design development phase, consultants and key stakeholders provide crucial inputs of requirements relating to engineering, equipment, machinery, electrical, air-conditioning systems, plumbing, interior and exterior material, and human resources of the construction building project (Tessema, 2008; Sears et al., 2015; Ghaffarianhoseini et al., 2017). The client engages with the consultants' design team throughout the design development phase towards the determination of the completed construction building. Decisions made during the design development phase inform the project scope details, BOQ cost requirements, schedule requirements, quality requirements, human resources requirements, stakeholders' involvement, communication requirements, potential risks, and procurement requirements. The design development phase is collaborative, where project ideas are assessed, weighed, and integrated into the construction project (Ghaffarianhoseini et al., 2017). During the design development phase, effective flow and interpretability of information among stakeholders is essential to ensure the desired outcome is achieved (PMI, 2014; Miettinen & Paavola, 2014; Ghaffarianhoseini et al., 2017). It is therefore crucial for stakeholders involved in the design development phase to exercise high levels of accuracy to avoid project cost overruns at the completion of the construction project.

Producing a design which encompasses all the project information, is the ultimate objective of the design development phase (Tessema, 2008; PMI, 2014; Trani et al., 2015; Cassano & Trani, 2017). The design development phase provides an understanding of the final scope of the project, building function, building spaces, interaction and coordination of spaces within the building, building equipment, building materials, and the holistic function of the building (Tessema, 2008; Lobos & Donath, 2010; Sears et al., 2015). Rodrigues et al. (2019) state that room sizes, interior layout, exterior layout, and material requirements are clearly specified during the design development phase. With the advent of technology in the construction industry, the construction project design development may be produced through a project management software such as the Building Information Modeling (BIM) and Computer-Aided Design, SketchUp Pro and LayOut and Drafting (CADD) (Liberatore et al., 2001; Tranl et al., 2015; Brightman, 2018; Jefferies & Dastider, 2018). Typically, project management software produces three-dimensional imagery of the construction building design (Lin, 2014; Akponeware & Adamu, 2017; Ahn et al., 2020). The design team utilises construction project management software/s to produce a digital design to clearly show the final construction building

simulation (Tranl et al., 2015; Akponeware & Adamu, 2017; Jefferies & Dastider, 2018). The digital design also provides a detailed BOQ cost analysis of the project (Kaewunruen et al., 2020).

In summary, based on the afore-discussed literature, the ultimate deliverable of the development design phase comprises written instruction drawings with specific material selection, installation instructions, technical information, and quality control requirements. Thus, the primary objective of the construction design development phase is to provide a holistic definition and description of all the essential aspects of the project, which is used as a construction project execution guide. The construction design development phase pertains to the refinement of the selected construction schematic design. In this case detailed structural plans, floor plans, elevations, sections, specifications of construction systems, materials, finishes, and construction cost estimates are produced. Furthermore, the construction building colour/s, lighting fixtures, special equipment, and patterns are selected, reviewed, and approved. Coordination of the construction project elements is also established and finalised during the construction design development phase. The refinements made during the design development phase minimise errors, and allow for coordination of addressing problems that could be costly, and likely lead to construction project failure. Design-related decision making should be completed during the design development phase, to prepare project construction documents such as the work breakdown structure (WBS), BOQ, and contracts. Therefore, after and/or during the construction design development phase, the construction project documentation process is initiated, to produce construction documents.

3.2.3 Construction project documents

The project construction document phase finalises the design details and phases of the project (Campbell, 2000; Veloso et al., 2018). The design team consultants compile and finalise all the project information emanating from both the schematic design and design development phases (Oluwaseun & Olumide, 2013; Veloso et al., 2018). Brightman (2018) postulates that the project technical information, set of drawings, and specifications emanating from design phases, are finalised in the form of construction documents. Material quantities, quality, and equipment required to execute the project, together with the underlying costs, are clearly defined in the BOQ (Rumane, 2016; Brook, 2016). The project contractual obligations and diverse stakeholders' relationships are outlined and established (Brightman,

2018). Furthermore, the construction team's duties and roles are defined in the construction documents (Tessema, 2008; Brook, 2016). Documentation that will guide diverse contractors to execute the project, is produced during the project construction document phase (Brook, 2016; Laryea & Watermeyer, 2016).

Construction documents are used to obtain bids from contractors and subcontractors. In turn, contractors and/or subcontractors use construction documents to obtain price quotations from suppliers and labour costs (Tessema, 2008; Brook, 2016). Furthermore, contractors and subcontractors use construction documents to construct the building project (Kozlovska et al., 2016). In addition, construction documents are used to obtain building permits from the local authority within the jurisdiction for the project (Živković et al., 2019; Nurrahmah & Tuti, 2021). The client/financier, developers, and architect, in consultation with the relevant consultants (Živković et al., 2019; Nurrahmah & Tuti, 2021), typically handle the permitting process. The architect, in discussion with the relevant consultants, deals with changes, corrections, and required additional information for permit approval from the local authority (Živković et al., 2019; Nurrahmah & Tuti, 2021). After changes and corrections or amendments, the final deliverable is the completed construction project scope in the form of a set of specifications and drawings, which would be used for construction bidding and the construction process (Kozlovska et al., 2016). Costs associated with the changes and corrections are integrated into the final construction documents (Brook, 2016).

The complete construction project scope in the form of a set of specifications and drawings are ultimately used in the development of the construction execution project plan by conducting a work breakdown structure (Cheraghi et al., 2017). Siami-Irdemoosa et al. (2015) define a work breakdown structure as a project management planning process that involves partitioning of the project into phases, work packages, and deliverables. The architect, construction project manager, and consultants conduct the work breakdown structure; the construction project scope is divided into smaller manageable tasks (Mehmet, 2011; Cheraghi et al., 2017). During the work breakdown structure, the timeframes and resources such as materials, labour and finances are allocated to the appropriate individual construction tasks (Abdullah, 2006; Sutrisna et al., 2018; Kloppenborg et al., 2018; Al-Kasasbeh et al., 2021). Furthermore, communication lines for all relevant stakeholders and a sequence of

construction tasks are established during the work breakdown structure (Mehmet, 2011; Siami-Irdemoosa et al., 2015; Cheraghi et al., 2017). Construction project tasks that can be executed simultaneously are also established during the work breakdown structure (Shevtsov et al., 2007; Zhao et al., 2021). Siami-Irdemoosa et al. (2015), Elsyie et al. (2018) and Kloppenborg et al. (2018) state that issues associated with procurement, risk, schedule, costs, change management, and stakeholder engagement are taken into consideration during work breakdown structure, in developing a construction project plan.

The work breakdown structure can be in the form of, or an integration of, a spreadsheet, flowchart, list, Gantt chart, or critical path analysis (CPA), depending on the construction project manager and key stakeholders' philosophy, guided by the nature of the construction project and client or project parent organisation preferences (Kumar, 2005; Ogot et al., 2005; Devi & Reddy, 2012; Browning, 2014; Karabulut, 2017; Sutrisna et al., 2018; Kloppenborg et al., 2018). The spreadsheet construction project work breakdown structure entails partitioning of the different project stages, deliverables, or tasks in rows and columns, while the flowchart construction project work breakdown structure details the different project phases, deliverables, or tasks in a diagrammatic workflow (Ogot et al., 2005; Sequeira & Lopes, 2015; Sutrisna et al., 2018). When utilising the list for the construction project work breakdown structure format, different project stages, deliverables, or tasks are simply listed in sequential order (Devi & Reddy, 2012; Burghate, 2018). The most utilised work breakdown structure technique is the Gantt chart and the CPA (Abdullah, 2006; Browning, 2014; Karabulut, 2017).

On the one hand, the Gantt chart construction project work breakdown structure integrates project timelines and costs, simultaneously linking the project tasks and showing the project milestones (Gantt, 1919; Abdullah, 2006; Burke, 2013; Sutrisna et al., 2018; Susilowati et al., 2021). On the other hand, the network diagram is a graphical depiction of the construction project tasks, tasks' start dates and completion dates, task durations, and tasks' sequential relationships (Abdullah, 2006; Browning, 2014; Karabulut, 2017). The Program Evaluation Review Technique (PERT) technique is used to calculate the expected duration of each activity considering the most likely time for completion, optimistic time, and pessimistic time based on the Beta distribution (Karabulut, 2017; Kloppenborg et al., 2018). The established tasks'

interdependencies are used to construct a network diagram, and the forward and backward pass are used to determine the critical path and floats (Ogot et al., 2005; Karabulut, 2017; Kloppenborg et al., 2018). In the network diagram, floats are project tasks that can be delayed without delaying the overall project, while the critical path tasks are project tasks with zero float, and therefore, cannot be delayed without impacting the overall completion of the project (Kloppenborg et al., 2018). Regardless of the work breakdown structure's technique, various project management knowledge areas are typically considered when formulating a work breakdown structure to promote efficient and effective project execution (Burke, 2013; Kloppenborg et al., 2018).

The unequivocal essentiality of construction documents stems from the fact that construction documents, such as the construction project scope and work breakdown structure, are inevitable in the construction execution roadmap (Tessema, 2008; Kozlovska et al., 2016). In the same notion, Cheraghi et al. (2017) affirm that the construction project documents, particularly the construction project scope and work breakdown structure, are the backbone of the construction project plan. The construction project manager, key stakeholders and the selected contractors utilise the construction project scope and work breakdown structure documents to execute the project tasks. Typically, contractors and subcontractors are not involved in the development of the work breakdown structure and the overall construction plan (Campbell, 2000; Arain et al., 2006). However, in the bidding process, the selected contractors and subcontractors are mandated to execute the construction project tasks (Campbell, 2000; Arain et al., 2006). Therefore, the construction project scope (Project scope statement) and work breakdown structure should be clear and detailed when handed over to the selected contractors and subcontractors to promote project success (Allen et al., 2014).

3.2.4 Construction bidding

When the construction project documents are complete, the bidding process commences and this involves the preparation of tender documents, sending tender bid invitations to contractors, receiving contractors' bids, evaluation of contractors' bids, and awarding of the contract to the most suitable contractor/s who meets the construction project tendering requirements (Arslan et al., 2008; Oyeyipo et al., 2016; Smith, 2017). Main contractors can further the bidding process by delegating construction sub-works to sub-contractors (Arslan et al., 2008). Similar to the selection of main contractors selection process, the main contractor liaises with the client or client's

representative in selecting the sub-contractors (Arslan et al., 2008; Smith, 2017). The process of selecting sub-contractors involves the preparation of tender documents, sending tender bid invitations to sub-contractors, receiving sub-contractors' bids, evaluation of sub-contractors' bids and awarding the contract to the most suitable sub-contractor/s who meet/s the construction project tendering requirements (Arslan et al., 2008; Smith, 2017). Brook (2016) defines bidding as a process of selecting contractor/s to execute the construction project. Oyeyipo et al. (2016) affirm that bidding is the most common way in which contractors obtain construction project work.

In the tendering process, the client, project manager, architect, and key senior management stakeholders are involved in the preparation of bid proposals and decision-making in awarding the tender (Halaris et al., 2001; Arslan et al., 2008; Oyeyipo et al. 2016). Similarly, Abdullah (2006) and Oyeyipo et al. (2016) identify the client and experts such as the architects, quantity surveyors, and engineers as the major stakeholders involved in the bidding process, acting as the client's representatives. The client oversees the bidding process with the architect and senior management team. The architect develops the construction project design and therefore, has a superior understanding of the project in comparison to other stakeholders (Abdullah, 2006; Tessema, 2008; Kozlovska et al., 2016; Viscuso et al., 2020). As a result, the architect plays a crucial role in clarifying drawings and specifications for contractors (Abdullah, 2006; Tessema, 2008; Kozlovska et al., 2016; Van den Hurk & Siemiatycki, 2018). The architect's insights are helpful in selecting an ideal contractor to execute the project based on technical capabilities (Kozlovska et al., 2016).

On the one hand, in order to select the most suitable contractor/s, the project owner/client, project manager, architect, and key stakeholders relevant to the tendering process should be knowledgeable of the technical, competencies, financial, and generic information about the potential contractors (Arslan et al., 2008; Smith, 2017). Therefore, aspects such as the contractor/s' efficiency, quality of workmanship, recruitment of qualified project team members, reputation, accessibility, timeous completion of contracted work, and budgetary target compliances are considered in the tendering process (Arslan et al., 2008; Rumane, 2016; Smith, 2017). Information regarding construction project and potential contractors ultimately inform tender prices (Aje et al., 2016). Also, Aje et al.'s (2016) findings show that factors such as the

availability of materials, level of profitability, and labour productivity significantly influence tender construction prices.

On the other hand, before bidding to embark on the construction project execution, the invited contractors consider the client's capabilities to fulfill the tender conditions (Oyeyipo et al., 2016; Alsaedi et al., 2019). Herewith, contractors consider factors such as the client's reputation, financial standing, project size, project type, construction project risks, project location, expertise, the current amount of work under the contractor's belt, capital required, project profitability, availability of time and bidding methodology in order to make a decision (Wanous et al., 2003; Banki et al., 2008; El-Mashaleh et al., 2014; Oyeyipo et al., 2016; Alsaedi et al., 2019; Mohamed et al., 2021). Arslan et al. (2008) emphasise that during the tendering/bidding process, selecting suitable contractor/s and sub-contractor/s for the construction work is critical for holistic project performance and success. Therefore, adequate effort and time are required to prepare realistic bid proposals (Arslan et al., 2008; Oyeyipo et al., 2016).

The methodology of construction project bid proposal preparation varies according to the features and structure of the project (Arslan et al., 2008). Typically, in the public sector, there are rules and regulations that govern the selection of contractors and sub-contractors (Sharma & Bindal, 2014; Aje et al., 2016). Contrarily, the private sector is characterised by flexibility in selecting contractors and sub-contractors to execute the construction project (Sharma & Bindal, 2014). Contractors in the private sector are selected, mainly based on their qualifications, past project/s success rates, and personal industry relationships (Marques & Berg, 2011; Sharma & Bindal, 2014). However, both in the private sector and public sector, bidding negotiations are conducted based on competitive tender prices (Aje et al., 2016). A construction project's competitive tender prices are supposed to be low enough to win the contract and high enough to attain profitability (Abdullah, 2006; Kimms, 2007; Arslan et al., 2008; Oyeyipo et al., 2016). Typically, the client will favour low enough tender prices that are favourable to the project budget in cases of errors during execution. In contrast, the contractors favour high enough tender prices which are favourable to their profitability margins. In conclusion, the tender prices should be mutually favourable to all the affected parties, especially the client, client representative, contractor/s, and sub-contractor/s, to promote project success and meet

budgetary goals. After the completion of the tendering process, it is the actual execution of the construction project, discussed in the next section.

3.3 Construction project execution and administration

Subsequent to the construction designs and specifications developed by the architect/s and consultant specialists under the advisement of the client, the construction execution phase commences (Larcón & Mardones, 1998; Shahmeh, 2020). A “kick-off” or “kick-start” meeting marks the commencement of the construction project execution phase, at which time the project teams are informed of their tasks and responsibilities (Van den Ende & Van Marrewijk, 2014; PMI, 2017). Typically, the construction execution phase is the responsibility of the contractors and sub-contractors selected during the bidding process (Alarcón & Mardones, 1998; Shahmeh, 2020). The project execution phase entails the implementation of the project plan based on the construction documents (Pérez et al., 2010; Hadzaman et al., 2016; Al-Agele & Ali, 2017; Joshua, 2019). In the same notion, (Shahmeh, 2020) affirms that the project team’s responsibility is to implement various tasks during the project execution phase. Olsson (2006) interprets the construction execution as a predetermined project plan put into action. Thus, the project plan is put into motion, whereby project teams practically perform work on-site (Cassano & Trani, 2017; Zhao et al., 2021).

During construction project execution, the project team is developed, and resources are assigned to tasks by the project manager in accordance with the project management plan (Shahmeh, 2020). Shahmeh (2020) states that the construction execution phase encompasses the procurement of equipment, materials, and services to the site and the integration of project team members and other resources to carry out the construction project. Assigned tasks are implemented according to the project plan, and the work breakdown structure is developed from the complete construction documents and/or project scope (Dallasega et al., 2015, PMI, 2017). Diverse responsibilities and tasks are defined for project team members (PMI, 2017; Shahmeh, 2020). Project activities are carried out, aimed to meet planned project goals and ultimately deliver the construction project (Dallasega et al., 2015; Al-Agele & Ali, 2017; Joshua, 2019). Project execution allows contractors to ensure that the construction project activities are achieved in accordance with the project plan and that the outcomes of the construction plan are generated (Al-Agele & Ali, 2017; PMI, 2017; Zhao et al., 2021).

The construction project manager is the main driver of the project execution phase (Shahmehri 2020). It is the responsibility of the construction project manager to coordinate and continuously monitor the construction project's progress (Iqbal et al., 2015). Depending on the project structure and the client's requirement, project administrators support construction project managers in monitoring and controlling the project budget (Peters et al., 2016; Mok et al., 2017). The project execution phase is governed and guided by the construction project manager by maintaining control and communicating with diverse project stakeholders. Al-Agele and Ali (2017) recommend the importance of communication between executives and designers towards project success. To facilitate communication, the project manager uses the construction documents information to monitor and control the direction of the project (Alarcón & Mardones, 1998; Shahmehri, 2020). In particular, the construction project manager compares the construction project plan document with the project progress reports to measure performance (Bryde et al., 2013). Also, the architect visits the construction site varyingly, depending on the monitoring project needs.

Systems and status meeting procedures are set up to track and monitor project execution progress and quality. (Etzion et al., 2001; Lei et al., 2012; Rumane, 2016; Bobde & Panganti, 2020) Corrective measures should be taken on any deviations to bring the project back to the original defined plan and to avoid scope creep (Hao et al., 2008; Shahmehri, 2020; Bobde & Panganti, 2020). Variations and modifications should be recorded and published in the original project plan (Hao et al., 2008; Kloppenborg et al., 2018). The client and key stakeholders should be constantly kept informed of the project status (Jallow et al., 2020). Continuous monitoring of the project progress is crucial to ensure project costs are maintained, and tasks execution are aligned to the project plan (Hao et al., 2008; Iqbal et al., 2015; Kloppenborg et al., 2018; Bobde & Panganti, 2020). Furthermore, continuous monitoring enables the detection of risks associated with project plan changes and ultimately informs the decisions to make appropriate adjustments taking into account cost implications (Hao et al., 2008; Iqbal et al., 2015; Kloppenborg et al., 2018). Variances and the associated costs should be recorded and integrated into the original project plan (Hao et al., 2008). Project plan variances and changes are commonly reported during task execution and project team meetings (Hao et al., 2008). The construction project original plan should be regularly and timeously updated in accordance with the project progress status and should be available to key stakeholders. Photos and field reports are written to document

project progress (Kim et al., 2018). Verification of the contractor's billing accuracy is essential for the completed work, to avoid cost overruns through overbilling (Smith, 2017).

To sum up, construction project execution is initiated by the kick-start meeting, which entails project team development, construction project scope endorsement, purchasing and procurement of equipment, materials, and services to the site, the integration of project team members and other resources to carry out the construction project, provision of project guidance, quality assurance, creating project progress status reports and taking corrective action in respect of errors. Effective allocation and management of resources, risks, contractual agreements, communication channels, stakeholder engagement, and project change are crucial to successfully accomplish project execution objectives. During project execution, construction project tasks should be continuously monitored and controlled against the intended acceptance requirements. Furthermore, the construction project progress status should be measured and communicated to relevant stakeholders. Corrective action should be timeously taken in terms of any project execution discrepancies. Thereafter, completed project tasks should be reviewed for quality and measured against project charter costs, schedule, and quality acceptance criteria. The costs, schedule and quality of the construction project progress status should be incorporated in the original project plan. The project execution phase is completed when all project tasks highlighted in the construction work breakdown structure and project plan are completed. At this stage, the construction building would be complete and ready for commissioning and closure.

3.4 Construction project commissioning and closure

The project construction closure phase is the final stage of a construction project (Burke, 2013; PMI, 2017; Akinshipe et al., 2019; Addo, 2021). The project construction closure phase occurs after the physical construction of the building project has been completed, and comprises handing over the finalised construction building to the client and documenting lessons learned (Golenkin, 2010; Doloj, 2016; PMI, 2017; Kloppenborg et al., 2018; Nyawira et al., 2020; Rithe & Pachekar, 2021). All contractual, financial, and legal obligations associated with the project are terminated during the construction project closure phase (Zohrehvandi et al., 2017; Nyawira et al., 2020). Thus, contractors, subcontractors, and suppliers are released from the construction project duties (Zohrehvandi et al., 2017; Kozlovska et al., 2016; Segbedzi & Hackman, 2021). Furthermore, construction closure entails usage, termination of facilities, and temporary construction utilities such as wastewater, potable drinking water, dewatering equipment, lighting, drainage, hoisting

facilities, electrical power, ventilation, stairs, and ladders (Gilliland, 2019; Abdelaty & Nesselhauf, 2020). Also, excess materials are transferred to other projects or released back to the project's parent organisation (Gilliland, 2019). In the same vein, project closure involves job site clean-up, return of equipment, waste disposal, and removal of temporary infrastructure and buildings to make the construction building project ready for the client handover (Abdelaty & Nesselhauf, 2020). Gilliland (2019) affirms that project closure entails remnant leftover cleanup and organising project handover documentation.

Project changes related to unfinished items, tasks, and expectation or specification nonconformities discovered during the project walkthrough, are detailed in a punch list document (Golenkin, 2010; Cunningham, 2018; Abdelaty & Nesselhauf, 2020). Prior to handing over to the client, punch list items are either rectified, completed, or accepted by key stakeholders (Abdelaty & Nesselhauf, 2020). Project changes emanating from the punch list require the coordination of relevant key stakeholders such as the client, project manager, architect, consultants, contractors, and subcontractors to ensure that project alterations are completed in accordance with contractual requirements, project timeline, and project budget (Cunningham, 2018; Abdelaty & Nesselhauf, 2020). Executing construction projects involves diverse stakeholders responsible for different specific tasks and areas (Gilliland, 2019; Segbedzi & Hackman, 2021). Therefore, the demobilisation of diverse stakeholders involved in completing the construction-building project requires comprehensive high-level coordination, to ensure that all tasks were completed appropriately (Gilliland, 2019; Segbedzi & Hackman, 2021). Different, relevant authorities must conduct conformance inspections and ensure identified nonconformities be reported to the relevant stakeholder and thereafter, addressed. (PMI, 2017; Gilliland, 2019). In South Africa, the National Building Regulations and Building Standards Act no. 103 of 1977 and local building by-laws are used as a guide for conformance and compliance inspections (Crafford et al., 2021; De Villiers et al., 2021). A certificate of occupancy will only be issued for a construction building, after all the inspections satisfy the requirements of the National Building Regulations and Building Standards Act no. 103 of 1977, and the relevant by-laws (Crafford et al., 2021; De Villiers et al., 2021).

Project commissioning forms part of project closure and is a process of ensuring that all building components and systems are installed, contractual, and quality obligations are satisfied, that the project is completed according to the approved design, and all project miscellaneous requirements are met (Wu & Issa, 2012; Kloppenborg et al., 2018; Lee et al., 2021). A project walkthrough with the client explaining the construction building operation and maintenance requirements, is also conducted during project closeout (Gilliland, 2019). The architect and construction project manager conduct a walkthrough of the project once the physical building construction project has been completed, and detail the changes required (Gilliland, 2019; Abdelaty & Nesselhauf, 2020). In addition, all relevant project documents detailing all project phases, tasks, client acceptance, and entities involved in completing specific tasks and all project financial documents are handed over to the client (Zohrehvandi et al., 2017; Gilliland, 2019; Rithe & Pachekar, 2021). Construction project closure documents from stakeholders such as the design team, engineering team, contractors, and subcontractors are crucial for recordkeeping purposes and dispute resolution (Gilliland, 2019). A certificate of occupancy is issued to the client after all the project closure obligations have been satisfied (Segbedzi & Hackman, 2021). In a nutshell, the construction project closure is conducted by the construction project manager, and it typically comprises of a punch list, commissioning, inspections, site cleanup, document collection, certificate of occupancy, and building handover to the client (Golenkin, 2010; PMI, 2017; Gilliland, 2019; Abdelaty & Nesselhauf, 2020; Rithe & Pachekar, 2021; Segbedzi & Hackman, 2021).

3.5 Construction project manager's role, competencies, and knowledge areas' integration

Construction project managers emanate from different professional backgrounds, including, but not limited to, construction management, architecture, quantity surveying, civil engineering, mechanical engineering, electrical engineering, structural engineering, business management, finance, law, and entrepreneurial construction with limited or no formal qualifications (Brettell et al., 1996; Sibiya et al., 2015). Sunindijo (2015) defines a construction project manager as a professional individual with multifaceted responsibilities, encompassing the application of project management knowledge, tools, techniques, and skills to meet the clients' and stakeholders' building expectations and needs (Kloppenborg et al., 2018). Similarly, Kendrick (2015), Heagney (2016), and Harrison and Lock (2017) consider construction project managers as organised, passionate, and goal-oriented individuals who are educated and well-informed in managing projects. Equally, Walker (2015) defines construction project managers as agents of change who facilitate the project from ideation to realisation, by applying their skills and motivating project

stakeholders. Numerous scholars observe construction project managers as effective communicators responsible for project stakeholders' engagement, facilitation, and promotion of teamwork towards the achievement of project objectives, concurrently keeping the client updated about the project progress status (Cheng et al., 2005; Crawford & Nahmias, 2010; Meredith & Mantel Jr, 2011; Binder, 2016; Sunindijo, 2015; Meng & Boyd, 2017; Irfan et al., 2021). Zulch (2012) and Kloppenborg et al. (2018) affirm that construction project managers play a focal point of communication with all project stakeholders, and facilitate project initiation, planning, implementation, and closure project life cycle.

Construction project managers are responsible for planning and overseeing the construction project life cycle at each stage from conception to completion, to ensure that the project is completed safely and timeously, in accordance with the expected quality, within scope and budget.(Rumane, 2016; Chidiebere et al., 2017; Irfan et al., 2021). Throughout the construction project life cycle, thus, construction project initiation, design planning, development, execution, and closure, construction project managers execute their roles by applying diverse knowledge areas (PMI, 2017; Janhunen, 2022). Thus, integration management, communication management, stakeholders management, risk management, cost management, schedule management, quality management, scope management, resources management, and procurement management knowledge areas are applied by the construction project managers at different phases of the construction project life cycle to facilitate and manage the project (Zavadskas, Turskis, & Tamošaitiene, 2010; PMI, 2017; Addo, 2021). Addo (2021) asserts that construction project managers should inculcate all project management knowledge areas and principles to complete the project successfully. In addition, construction project managers should be capable of risk identification and mitigation to prevent cost overruns (Binder, 2016; Kerzner & Kerzner, 2017; Cheraghi et al., 2017).

Construction project managers are characterised by leadership qualities such as integrity, honesty, decision-making, protecting project team members, instilling and defending project core values, expression of respect, facilitating project scope changes, embracing emotional intelligence, ownership of trust, establishing ethical behavior, and culture of honest, and displaying ultimate commitment to stakeholders and the project (Zulch, 2012; Sunindijo 2015; Meng & Boyd, 2017; Kloppenborg et al., 2018; Irfan et al., 2021). Furthermore, the construction

project manager should be involved in workforce issues such as recruitment and retention of competent employees, to ultimately develop a competent project team to achieve project objectives (Zulch, 2012; Kloppenborg et al., 2018; Addo, 2021; Irfan et al., 2021). In turn, the construction project manager should be able to effectively listen and speak, focus on key project matters, advocate for the project objectives, establish order, maintain enthusiasm, resolve team and stakeholder conflicts, seek support and openly share ideas (Sunindijo, 2015; Meng & Boyd, 2017). Through research and probing questions, the project managers identify project stakeholders' interests, motivate the team, understand stakeholders' desires, and maintain effective stakeholder relationships, all aimed at achieving project objectives (Meng & Boyd, 2017; Kloppenborg et al., 2018; Irfan et al., 2021).

The construction project manager, in partnership with the client and key stakeholders, drive and lead the project charter development, make logical trade-off decisions, assemble and unify a detailed project plan, balance all stakeholders' needs, all focused on the achievement of the project's objectives (Suchcicki, 2012; Sunindijo, 2015; Kloppenborg et al., 2018). It is the responsibility of the construction project manager to drive scope development and obtain a deep understanding of stakeholders' needs and wants, determine holistic project requirements, monitor and control scope boundaries to avoid scope creep, demonstrate necessary flexibility, and scope change decision-making based on alteration essentiality (Sunindijo, 2015; Meng & Boyd, 2017; Zhao et al., 2021). Kloppenborg et al. (2018) and Addo (2021) state that construction project manager and key relevant stakeholders should lead schedule development, understand resource requirements and availability, understand schedule logic restrictions, maintain a deep understanding of the construction project life-cycle, set key milestones, all in order to accomplish project success parameters. Adequate understanding of the building project scope helps the construction project manager and the quantity surveyor with reliable cost estimations and the development of cost control measures, aimed at meeting construction project budgetary goals (Zulch, 2012; Sunindijo, 2015; Kloppenborg et al., 2018).

Construction project managers engage in vast project activities such as the assignment of tasks to project team members, coordination of construction resources, in-depth review of the project cost estimate, tracking of expenditure, forecasting of potential project cost and schedule changes, overseeing of onsite and offsite activities, selection of tools, equipment and materials, procuring

and tracking of inventory, risk analysis, and mitigation, reviewing of day-to-day construction project tasks' progress, preparing of internal and external construction project status reports (Crawford & Nahmias, 2010; Sunindijo, 2015; Meng & Boyd, 2017; Kloppenborg et al., 2018; Phan et al., 2020; Irfan et al., 2021; Zhao et al., 2021). Moreover, construction project managers are responsible for applying for permits, overseeing contractors' contractual obligations, monitoring occupational health and safety regulation compliance, negotiating the terms of agreements with diverse stakeholders, and ensuring that construction quality standards are accomplished (Crawford & Nahmias, 2010; Sunindijo, 2015; Rumane, 2016; Meng & Boyd, 2017; Irfan et al., 2021; Zhao et al., 2021). Also, construction project managers identify suitable suppliers to effectively procure required materials and services, manage suppliers' contracts, maintain supplier relationships, and ensure timely deliveries (Ruparathna & Hewage, 2015; PMI, 2017). Construction project managers, in executing multifaceted responsibilities, play a crucial role in the project's success (Phan et al., 2020; Irfan et al., 2021).

Notably, construction project managers' responsibilities vary from project to project, depending on the nature of the project, varyingly from commercial, residential, or industrial construction projects (Cheng et al., 2005; Phan et al., 2020; PMI, 2017). However, numerous construction project managers' responsibilities are standard and are guided by the generic project life cycle stages (Cheng et al., 2005; Kloppenborg et al., 2018). PMI (2017) and Li et al. (2020) affirm that construction project managers' duties are similar and overlap across the globe, as outlined in ISO 21500:2021. As a result, construction project managers can manage projects across the globe, dependent on their level of skills and experience (PMI, 2017; Li et al., 2020). However, the construction project nature, location of the project, and the client's philosophy influence the construction project managers' responsibilities and behavior in managing the project (Abou-Zeid et al., 2007; Jo et al., 2015; Mukherjee & Roy, 2017; Anees et al., 2018).

Typically, construction project managers simultaneously integrate and apply various PMBok knowledge areas to project management process groups throughout the construction project life cycle (Zavadskas et al., 2010; Addo, 2021). During project initiation, construction project managers require competencies such as effective questioning, listening skills, persuasion, feedback generation, vision, client problem articulation, and building consensus (Zavadskas et al., 2010; Kloppenborg et al., 2018; Addo, 2021). Similarly, during the project planning phase,

construction project managers require competencies such as project management knowledge, technical construction skills, construction theoretical knowledge, and the ability to build stakeholder consensus (PMI, 2017; Kloppenborg et al., 2018). During construction project execution, construction project managers should be capable of guiding the execution process, instilling ethical behaviour, and motivating team members towards the achievement of the project objective (Zavadskas et al., 2010; PMI, 2017; Kloppenborg et al., 2018; Addo, 2021). During the construction project closure phase, construction project managers require good writing skills, the ability to capture lessons learned, be able to share information, and take pride in workmanship.

Construction project monitoring and controlling occur throughout the project life cycle (Burke, 2013; Kloppenborg, 2018). Addo, (2021) affirms that the project manager monitors and controls each phase of the construction project, concurrently applying relevant project management knowledge areas. During construction project initiation, the project business case and project charter development, are monitored and controlled through conducting various feasibility studies (Burke, 2013; Mukherjee & Roy, 2017; Kloppenborg et al., 2018; Okereke, 2020). During construction project planning and design, control and monitoring are exercised through research and schematic designs to determine the project viability (Tessema, 2008; Burke, 2013; Suryani & Riantini, 2019). During the project execution phase, the project work, costs, schedule, quality, schedule, scope, scope changes, resources, communications, risks, procurement, and stakeholders are all simultaneously controlled or monitored towards the achievement of construction project objectives (PMI, 2017; Kloppenborg et al., 2018). Finally, the development of the punch list, commissioning and termination of construction project contracts, and legal and financial obligations are monitored and controlled during construction project closure (PMI, 2017; Cunningham, 2018; Gilliland, 2019; Nyawira et al., 2020; Abdelaty & Nesselhauf, 2020). The afore-discussed construction project manager's duties and application of the project management knowledge areas throughout the construction project life cycle, are holistically summarised in Table 3.1.

Table 3.1: Construction project manager's duties and application of knowledge areas in the construction life cycle

CONSTRUCTION PROJECT KNOWLEDGE AREAS	CONSTRUCTION PROJECT LIFE CYCLE PHASES			
	Initiation plus monitoring and controlling	Planning and design plus monitoring and controlling	Execution plus monitoring and controlling	Closure plus monitoring and controlling
Integration Management	Project charter development.	Project management plan development.	Direct and manage project work.	Close project.
Scope Management		Scope definition and collection of requirements. Work breakdown structure creation. Scope management planning.	Scope management. Scope change facilitation (Approvals and rejections)	Scope review and verification. Lessons learned.
Schedule Management		Schedule management planning. Definition of tasks. Task sequencing. Estimation of task durations. Schedule development.	Schedule management (Controlling and monitoring). Schedule change facilitation (Fast-tracking options where necessary).	Schedule review. Lessons learned.
Cost management		Cost management planning. Cost estimations. Budget determination.	Cost management (Controlling and monitoring). Cost change facilitation (Crashing options where necessary).	Cost review. Cost re-assignment where necessary. Lessons learned.
Quality Management		Quality management planning.	Quality Management.	Quality review and verification. Lessons learned.
Resource management		Resource management planning. Estimation of resources per task.	Acquiring resources. Team development. Team management.	Resource re-assignment where necessary.
Communications Management		Communications management planning.	Managing communications.	Review the communications plan
Risk Management		Risk management planning. Risk identification and analysis. Risk response strategies.	Implementing risk response strategies.	Lessons learned.
Procurement Management		Procurement management planning.	Conduct procurements.	Contract terminations
Stakeholder Management		Stakeholder engagement planning.	Managing stakeholder engagement.	

Source: Adopted from PMI (2017, p. 25)

In general, construction project managers apply different project management knowledge areas to construction project life cycle phases to ensure the project is completed on time, within scope, and within budget. Furthermore, construction project managers ensure that project tasks are completed in accordance with the current relevant local and international building codes, concurrently abiding to legal, regulatory requirements. To track project progress with ease, the construction managers and the team should prudently plan each construction phase and tasks involved, to develop a detailed holistic construction project plan. A detailed comprehensive construction project plan enables the construction project manager to communicate the plan to diverse stakeholders, and effectively track project progress. Failure to develop a detailed construction project plan of action might subject the construction project to delays and overspending issues. Detailed planning promotes the construction project manager's ability to deliver the construction project within budget, and successfully.

3.6 Conclusion

This chapter focused on the construction project realisation conceptual framework. The chapter commenced by explaining the construction project design planning phase comprising construction schematic design, design development, construction documents, and construction bidding, followed by an elaboration of the construction project execution and administration process. Next, the construction project closure is discussed. The last section of the chapter discusses construction project manager's roles, competencies, and an integration of project management knowledge areas to the construction project life-cycle. The design team, comprising of the architect, client, and consultants, compile and finalise all the project information emanating from both schematic design and design development phases, to produce construction documents. Construction documents are used for the bidding, and also as a guide for project execution. The construction project execution phase entails the implementation of the project plan based on the construction documents. Subsequently, the construction closure phase follows the physical construction building project that has been completed, and comprises handing over the finalised construction building to the client and documenting lessons learned. Construction project managers play a crucial role in executing multifaceted responsibilities towards construction project realisation. Construction project managers work with diverse stakeholders to apply project management skills, technical skills, and various project management knowledge areas on different construction project life cycle stages, to accomplish construction project realisation. The next chapter discusses theoretical framework that underpins this study.

CHAPTER FOUR - THEORETICAL FRAMEWORK

4.1 Introduction

This chapter focuses on the theoretical framework which underpins this research. The stakeholder, goal-setting, systems, and complexity theories will be discussed in relation to the study's objectives and the nature of the construction projects. Firstly, the stakeholder theory will be discussed, focusing on construction project stakeholders and their impact on the project budgetary goals. Secondly, the goal-setting theory will be discussed in relation to the set construction project budgetary goals. Thirdly, systems theory will be discussed, aimed at elaborating on the systematic nature of the construction projects. Lastly, the complexity theory will be discussed to elaborate on the complex nature and agility of construction projects, considering the diverse stakeholders and their impact on the project's budgetary goals and ultimate project success.

4.2 Stakeholder theory

The stakeholder theory was founded in the late twentieth century by Freeman, and was proposed for application in strategic management in 1984 (Fontaine et al., 2006; Mainardes et al., 2011; Freeman et al., 2020). Prior to 1984, scholars such as Ackoff and Eric Trist contributed to the development of the stakeholder theory, with the aim to understand government importance in an organisation and as part of creating worker-centric management theories (Freeman et al., 2020). In 1984, Freeman advanced the development of the stakeholder theory in a quest to understand and explain the business's behavior and relationship with its internal environment and external environment stakeholders (Mainardes et al., 2011). Gibson (2000), Phillips (2003), Orts and Strudler (2009), Lange and Bundy (2018), and Freeman et al. (2020) posit that the stakeholder theory was developed with the aim to organise information for effective strategic planning concerning matters associated with strategy, ethics, interests, and morals among stakeholders in business operation. In the same notion, Bhasin (2020) points out that the stakeholder theory focuses on the interconnections between the business and stakeholders, with the business having a greater responsibility towards stakeholders, to maximise value creation towards accomplishing business objectives.

Over the years, the stakeholder theory has evolved and has been adopted as a fundamental tool in the management of various business aspects (Mainardes et al., 2011). Donaldson and Preston (1995) and Freeman (2016) affirm that the stakeholder theory has mainly been adopted in the management of businesses. The stakeholder theory application helps management to deal with business operational complexities (Key, 1999; Mainardes et al., 2011; Freeman, 2016; Valentinov et al., 2019). In collaboration with the works of, but not limited to, Atkin and Skitmore (2008); Littau et al. (2010); Eskerod et al. (2015); Uribe et al. (2018); Bahadorestani et al. (2020); Khan et al. (2021), this research applies the stakeholder theory in the management of projects with a particular focus on construction projects. This study employs the stakeholder theory with the aim of alleviating construction project realisation complexities. Application of the stakeholder theory may increase the chances of successfully completing construction projects within the budget. The construction project is associated with numerous stakeholders, and it is the responsibility of the construction project manager to maximise value from the stakeholders to achieve the construction project's budgetary goals and ultimate project success.

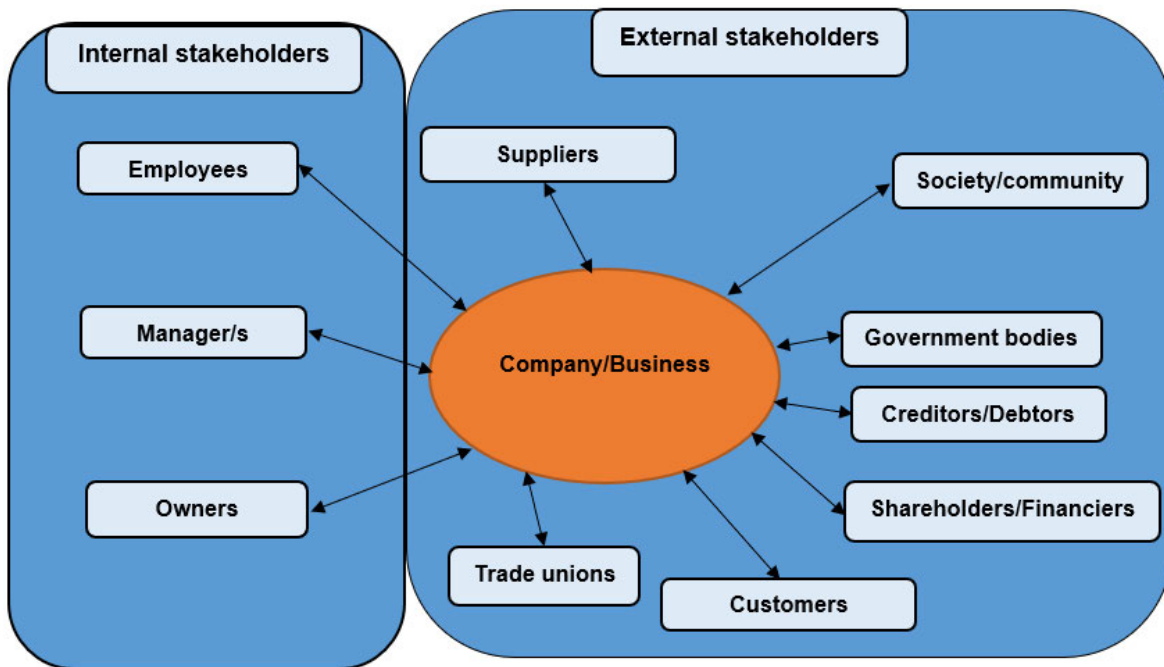
Great coverage of stakeholder conceptualisation has been experienced in governmental, non-governmental, political, businesses, and other entities (Mainardes et al., 2011). Mainardes et al. (2011) and Freeman et al. (2020) point out that the stakeholder theory emanates from the '*Stakeholder*' conceptualisation. Frederick et al. (1992) define the concept of a stakeholder as any individual, group, or entity that impacts an organisation's activities, or is impacted by the organisation's activities. Similarly, Fontaine et al. (2006) define a stakeholder as a person, group, or entity that is affected, or can affect business operations. Bhasin (2020), on the other hand, defines stakeholders as all those who have a stake in the business operation. The organisation, other organisation's actors, and the nature of the organisation-actor relationships who have a stake or interest in the organisation are the fundamental factors that define a stakeholder in relation to stakeholder theory (Clarkson 1995; Mainardes et al., 2011; Bhasin, 2020; Freeman et al., 2020). Although researchers define the stakeholder concept differently, the stakeholder theory premise is that the business should consider its stakeholders' interests, needs, influences and expectations, which affect its operations, sustainability, and policies (Frederick et al., 1992; Freeman, 2015, 2016).

Taking stakeholder theory into perspective, the construction project stakeholders are individuals/persons, group/organisations, or any entity impacted by the project's activities, or that impact the project activities (Turner, 1999; Olander, 2007; Mashwama et al., 2018; Osunsanmi et al., 2020). Winch (2002) defines a project stakeholder as any actor who incurs a direct loss or direct benefit resulting from the activities of the construction project. Similarly, Takim (2009, p.168) defines project stakeholders "as those who can influence the activities/final results of the project, whose lives or environment are positively or negatively affected by the project, and who receive direct and indirect benefit from it." In the same notion, Tanko, Abdullah, and Ramly (2017) refer to stakeholders as individuals or organisations who are either actively or passively engaged with a construction project, and their interests are affected by the construction project outcome. Therefore, the construction project manager should consider stakeholders' interests, needs, influences, and expectations that affect the construction project. Failure to consider and meet construction project stakeholders' interests, needs, influences, and expectations may result in project cost overruns and, ultimately, project failure.

From the stakeholder theory perspective, the business stakeholders are categorised into internal stakeholders and external stakeholders (Key, 1999; Seborá & Theerapatvong, 2010; Bhasin 2020; Barney & Harrison, 2020; Fiandrino & Tonelli, 2021; Murphy & Wilson, 2021). Internal business stakeholders comprise employees, managers, and owners, while external business stakeholders comprise suppliers, society/community, government bodies, creditors, debtors, trade unions, shareholders/ financiers, political groups, and customers (Key, 1999; Freeman, 2015; Bhasin, 2020; Murphy & Wilson, 2021). Stakeholders are dually creators and recipients of value in the business value creation process (Freudenreich et al., 2020; Fiandrino & Tonelli, 2021). Therefore, central to both internal and external stakeholders is the business or company, which is responsible for stakeholders involved in creating value or receiving value in the business value creation process, as depicted in Figure 4.1 (Bhasin 2020). Managers are typically the locus of business control and governance (Donaldson & Preston, 1995; Key, 1999; Fiandrino & Tonelli, 2021).

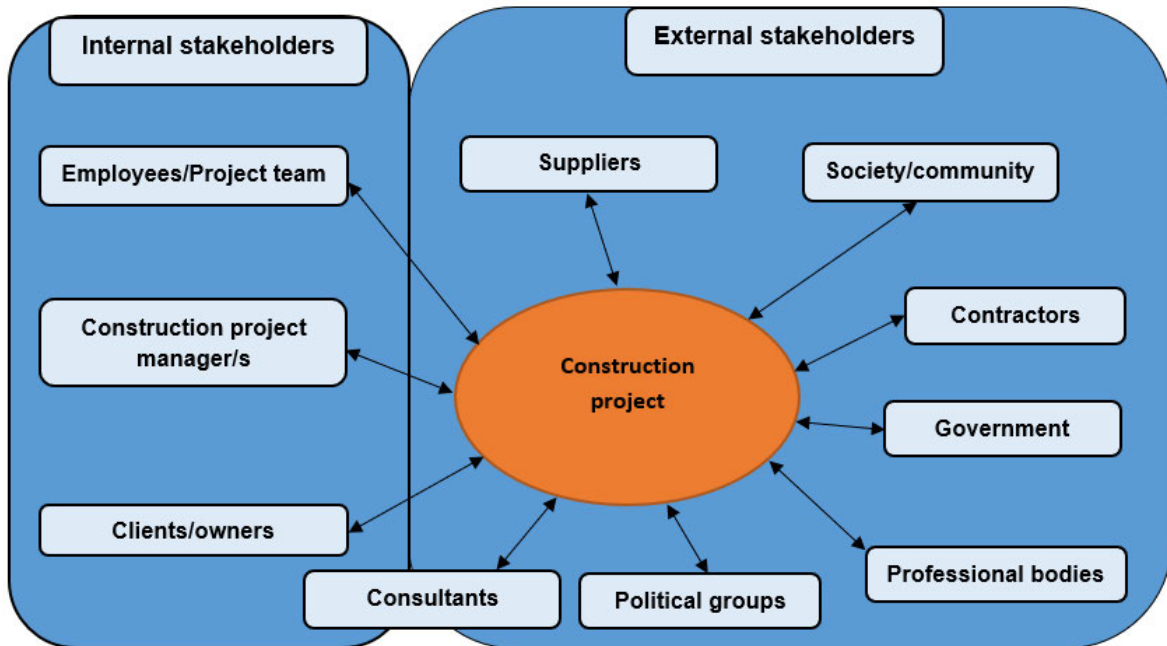
Corresponding to business stakeholders, the construction project stakeholders are categorised into internal and external stakeholders (Leung & Olomolaiye, 2010; Mashwama et al., 2018; Osunsanmi et al., 2020). Similar to the aforementioned business stakeholders, internal construction project stakeholders comprise the employees/project team, construction project manager/s, and clients/owners, while construction project external stakeholders comprise of suppliers, society/community, contractors, government bodies, trade unions, professional bodies, customer/end-user and political groups (Takim, 2009; Alinezhad et al., 2020). Figure 4.2 shows a graphical representation of how stakeholder theory ties to the construction project realisation. Thus, central to internal and external stakeholders, the construction project is guided by the construction project manager, who is responsible for the project and inevitably responsible for diverse stakeholders' interests, needs, influences, and expectations in value creation, to achieve project objectives.

Figure 4.1: Business/Company stakeholder theory



Source: Adopted from: (Freeman, 2015; Bhasin, 2020)

Figure 4.2: Construction project stakeholder theory



Source: Researcher's deduction based on stakeholder theory

Based on Figure 4.1 and Figure 4.2 stakeholder theory illustration, stakeholders' activities similarly affect both the business and the construction project. Freeman (2015) argues that an organisation cannot operate in isolation of stakeholders. Therefore, the business should satisfy its stakeholders' needs and interests to achieve its goals (Jensen, 2010; Freeman, 2015). The business should constantly be aware of its customers', employees', suppliers', competitors', creditors', society's, and shareholders' needs and expectations (Jensen, 2010; Freeman, 2015). Employees expect a fair remuneration for their services in value creation, while the business expects employees to add value to achieving business goals (Jensen, 2010; Van Buren & Greenwood, 2011; Freeman, 2015; Bhasin, 2020; Freudenreich et al., 2020). In addition, the business is expected to provide employees with fair working conditions in order to satisfy employees' work environment needs and expectations (Jensen, 2010; Bhasin, 2020). Taking stakeholder theory into perspective, employees tie in to the project team's needs and expectations alongside the contractors and consultants, providing their employment services to the construction project. Similar to the business scenario, the construction project team members expect to be provided with fair working conditions and remuneration to execute their tasks towards achieving project goals. Conversely, the project team should be competent and committed to satisfying the construction project's requirements. Failure to meet the construction project

requirements and/or the project team's needs and expectations may result in failure to achieve the construction project objectives.

The business expects its suppliers to provide materials and services timeously and at acceptable prices and quality (Jensen, 2010; Freeman, 2015; Bhasin, 2020). On the other hand, suppliers expect equitable payment in exchange for their goods and services (Jensen, 2010; Freeman, 2015; Bhasin, 2020). In transacting and in generic business operations, ethical and moral guidelines should be maintained by both suppliers and the business (Burton & Dunn, 1996; Key, 1999; Bhasin, 2020). Key (1999) and Fiandrino and Tonelli (2021) emphasise the importance of suppliers in adding value to the business, and the importance of abiding by legal obligations when dealing with suppliers. Likewise, construction projects require materials from different suppliers in order to add value to the completion of different construction project tasks (Hunt & Thomas, 2003; Enshassi et al., 2009; Takim, 2009, Wang et al., 2017; Lee et al., 2019; Pilger et al., 2020). Therefore, the construction project manager and key stakeholders involved in procurement, must ensure the correct project supplies are acquired on time, are of acceptable quality, and at fair prices aligned to the set construction project budget. Furthermore, the construction project manager and key stakeholders should uphold ethical, legal, and moral guidelines in procuring project materials. Findings by Doloi (2013), Tedla and Patel (2018), and Gamil and Abdul Rahman (2020) lament that procurement-related issues associated with cost, delays, and quality of materials are causes of construction project cost overruns. Here, construction project managers are to provide their suppliers with the specifications of the kind of material and the quality that is needed to complete the project. Hence, mutual satisfaction of the construction project suppliers' needs and continuous quality controls in relation to construction project requirements, are of paramount importance in completing the construction project within budget and successfully.

According to Freeman (2015), the government forms part of the stakeholders theory, because it influences the business activities and impacts the business's bottom line. The findings by Meixell and Luoma (2015) affirm that the government is a stakeholder that significantly influences business operations. In a business, the government assumes the role of imposing and upholding ethical, legal, and moral boundaries (Pfarrer, 2010; Ferrero et al., 2014; Jamali & Carroll, 2017). Failure to satisfy government regulatory requirements has legal implications which may result in lawsuits against the business and other stakeholders' resistance, which may threaten the

business' survival and profitability (Sternberg,1997; Clement, 2005; Pfarrer, 2010; Meixell & Luoma, 2015; Schaltegger et al., 2019). Therefore, the business is obliged to abide by government regulatory requirements such as, but not limited to, labour laws, taxation laws, labour laws, occupational health and safety laws, advertising laws, trade laws, environmental laws, and antitrust in order to achieve its objectives (Burton & Dunn, 1996; Gibson, 2000; Pfarrer, 2010; Ferrero et al., 2014; Jamali & Carroll, 2017; Fiandrino & Tonelli, 2021). Government influence on business activities is dependent on the type of business and industry (Clement, 2005; Pfarrer, 2010; Meixell & Luoma, 2015). Businesses are obliged to abide by government regulatory requirements relevant to their specific industry (Sternberg,1997; Ferrero et al., 2014; Meixell & Luoma, 2015; Jamali & Carroll, 2017). Regardless of the type and the industry in which the business operates, all businesses are, one way or another, affected by government regulatory requirements (Schaltegger et al., 2019).

Similar to the business' obligations to abide by government regulatory requirements, construction projects should abide by requirements such as labour laws, taxation laws, employment laws, occupational health and safety laws, bidding and advertising laws, trade laws, licensing laws, and environmental laws, in order to achieve the project goals (Kanchana et al., 2015; Oyeyipo et al., 2016; Alsaedi et al., 2019; Eyiah et al., 2019; Zhang et al., 2021). The applicability of government laws depends on the size of the construction project, geographical location, and the nature of the construction project, which ties to local regulatory requirements (Eyiah et al., 2019; Zhang et al., 2021). Regardless of the size of the project, all construction projects are, one way or another, affected by government regulatory requirements throughout the project life cycle (Eyiah et al., 2019). In addition, construction projects are influenced by political parties and governed by professional boards, which provide the regulatory compliance framework for construction projects (Wang et al., 2004; Ofori, 2004; Wilkie, 2015). Therefore, construction project managers and key stakeholders should ensure that government laws and relevant professional boards' regulatory compliance frameworks are observed, to achieve project objectives and avoid legal implications that may result in lawsuits against the construction and other stakeholders' resistance, that threaten the success of the project. Legal implications such as lawsuits, result in expenses that would not have been budgeted for, negatively impacting the construction project's budgetary goals.

Businesses operate within communities (Lépineux, 2005; Chiu & Wang, 2015; Jensen, 2017). The community has diverse needs and expectations from the business. It is the business's responsibility to understand the community's expectations and ensure that they are considered (Lépineux, 2005; Dunham et al., 2006; Chiu & Wang, 2015; Jensen, 2017). Fernando and Lawrence (2014) assert that community expectations and needs should be prioritised, based on their impact on the business goals, taking into consideration the business's capabilities in these expectations and needs. Typically, the community expects the business to provide employment, engage in charitable programs, make social contributions, and make local investments (Chiu & Wang, 2015; Yekini et al., 2017; Jensen, 2017). Correspondingly, construction projects are executed within communities of various geographical locations, affecting the community's physical and health comfort (Almahmoud & Doloi, 2015; Almahmoud & Doloi, 2020). Characteristically, the community benefits from the construction project through employment, while the construction project benefits from the community's provision of their employment services towards project completion (Almahmoud & Doloi, 2015). Therefore, the community's expectations and needs should be considered to promote the construction project's success (Almahmoud & Doloi, 2015; Williams, 2016; Van Thuyet et al., 2019; Awung & Marchant, 2020). Ma and Fu (2020) affirm that the community's negative response to the construction project often results in delays and cost overruns. To promote construction project success, the project manager and key stakeholders should take into account the community's expectations and needs, which directly or indirectly impact the project's success (Williams, 2016; Awung & Marchant, 2020).

The stakeholder theory may be contrasted to shareholder theory, which states that a business' sole purpose is to pursue shareholders' wealth and business profitability, with minimal attention to other business' stakeholders' expectations (Carson, 1993; Smith, 2003; Pfarrer, 2010; Wallin, 2022). The stakeholder theory, in comparison, recognises both the business' financial obligations to generate wealth for shareholders/owners and the importance of other multiple stakeholders involved in business value creation. The stakeholder theory emphasises that in addition to the business's primary economic purpose to create wealth, the business has legal, ethical, and discretionary obligations (Carroll, 1979; Pfarrer 2010; Freeman, 2016). Freeman, therefore, argues that, to create sustainable value for shareholders, the interests of multiple other stakeholders should be considered. Failure to take into consideration stakeholders who may disrupt business value creation, may negatively impact shareholders' wealth (Pfarrer, 2010; Freeman, 2016). Concerning the stakeholder theory, in the construction project realisation, the

shareholders are equated to the project owners, clients and/or financiers of the project, expecting a positive return on investment, either financial or non-financial. Therefore, the construction project managers and key stakeholders should effectively trade-off between the needs and expectations of the project client, versus the needs and expectations of other stakeholders in order to add value and meet project financial goals (Doloi, 2013; Eskerod et al., 2015).

In a nutshell, the concept of stakeholder theory focuses on the stakeholder relationships that a business should understand to achieve its goals. Typically, business stakeholders comprise of, but are not limited to, employees, managers, owners, suppliers, society/community, government bodies, creditors, debtors, trade unions, shareholders/ financiers, political groups, and customers. Freeman, the founder of stakeholder theory, argues that other stakeholders' needs should be considered to accomplish shareholders' financial goals. Similar to business, and taking stakeholder theory into perspective, to meet the construction project budgetary goals and complete the project successfully, the construction project managers should understand and meet the diverse project stakeholders' needs and expectations. Typically, the construction project stakeholders comprise of, but are not limited to employees/project team, construction project manager/s, clients/owners, suppliers, society/community, contractors, government bodies, trade unions, professional bodies, customer/end-user, and political groups. Construction projects are better understood as a set of stakeholder relationships that are not reducible to transactions. The role of a construction project manager is focused on how the construction project stakeholders co-operate and add value towards accomplishing project goals. In the process of understanding and meeting the stakeholders' needs and expectations, moral, ethical and legal obligations should be maintained. Therefore, a construction project manager and key stakeholders, should effectively and legally deal with trade-offs on competing stakeholders' needs and expectations' in order to achieve project goals. Next, the goal-setting theory is discussed and applied in the construction industry, in relation to the project's budgetary goals and ultimate success.

4.3 Goal-setting theory

Goal-setting theory's acceptance as a theory, dates as far back as more than 25 years ago, emanating from over 50 years of research on basic goal- related concepts (Locke & Latham, 2006, 2019). The psychologists Edwin A. Locke and Gary P. Latham are the pioneers of the goal-setting theory, and aimed to explore the importance of setting goals in order to improve individuals' and team performance (Hollenbeck & Klein, 1987; Locke & Latham, 2002, 2006, 2019;

Al-Hoorue & Al Shlowiy, 2020). In particular, goal-setting theory was developed in 1968 by Edwin A. Locke (Locke & Latham, 2019). From 1974 to date, Edwin A. Locke and Gary P. Latham formed a partnership to develop and improve the goal-setting theory (Locke & Latham, 1974, 2002; 2006, 2019). Although Locke & Latham are recognised as the founding fathers of goal-setting theory, scholars such as, among others, Mace (1935), Murray (1938), Ryan (1935, 1970), Ryan and Smith (1954), Herzberg et al. (1959) contributed to the development of goal-setting theory with the focus on behaviorism, performance, and motivation towards the achievement of goals. Goals underpin the goal-setting theory, and a goal is defined as a future valued outcome or an objective of action, to achieve a specified standard of proficiency within a specified timeframe (Locke & Latham, 2002, 2006).

Goal-setting theory reflects a robust relationship between commitment and performance towards the achievement of goals (Lunenburg, 2011; Pepper & Gore, 2015). In the context of project management, an integral element in project budgeting is the nexus between project objectives and project team commitment (Pepper & Gore, 2015). Goal-setting theory emphasises setting clear, acceptable, specific, measurable, and achievable goals, concurrently challenging to motivate team members to accomplish high-level performance (Latham, 2004; Locke & Latham, 2006; Marsden & Richardson, 1994; Locke & Latham, 2013). Therefore, developing strategies with appropriate feedback criteria to motivate team members, is essential towards achieving goals (Latham, 2004; Locke & Latham, 2013). In addition, the goal-setting theory extends the scope of the relationship between commitment and performance towards goal achievement by implying that the assignment of acceptable specific and challenging goals increases motivation (Ambrose & Kulik, 1999; Atkinson & Shaw, 2006; Smith, 2006). Taking goal-setting theory into perspective, a construction project manager's responsibility to set reasonable challenging goals aligned to project success requirements and the team members' willingness to accept the goals will ultimately result in high-levels of a project team's motivation and performance towards the accomplishment of construction project goals.

Based on its utility, various studies have adopted goal-setting theory towards performance improvement. Brandstätter et al. (2003) applied goal-setting theory to examine students' retraining requirements in education continuation. Consolvo et al. (2009) employed goal-setting theory in determining how persuasive technologies inspire physical activity. Furthermore, Consolvo et al.

(2009) strived to understand how subordinates react to set-goal timelines and their attitude towards goal setters. Latham and Pinder (2005) applied goal-setting theory to explore how setting goals affect employees' motivation and performance in executing their duties at the workplace. In the same vein, Chienwittayakun and Mankin (2015) used goal-setting theory to link objectives and goals with employee performance. Berson et al. (2015) utilised goal-setting theory to determine how leaders should communicate with employees to promote motivation and performance. Clear and appropriate communication regarding goals is paramount to achieving high-levels of performance (Halevy et al., 2015). Arguably, Simpson (2013) contends that appropriate communication of goals without employee commitment, hampers the accomplishment of goals. This finding is consistent with Smith (2006), in that employee commitment plays a significant role in accomplishing goals. Therefore, communication and employee commitment are essential to achieve intended goals. In this study, goal-setting theory informs construction project managers as leaders in setting acceptable challenging goals, communicating and motivating project team members to commit to set goals and ultimately improve project task execution performance.

Goal-setting theory has been applied in various studies; thus, the relationship between set goals and ethical behaviour (Welsh & Ordóñez, 2014), the relationship between different gender and ethnic groups on academic achievements (Schippers et al., 2015), and the influence of educational video games on optimising the instructional elements is significant (Nebel et al., 2017). Linked to this study, Liu et al. (2020) conducted a study on how goal-setting theory affects project management practices. Findings by Liu et al. (2020) show that culture, strategy, and stakeholders' reflections influence project management practices towards set project goals. While Zwikael et al. (2018) emphasise the benefits of setting effective project goals towards achieving project success. Matsoso et al. (2021) employed goal-setting theory on the value of setting budgetary goals for small and medium-sized enterprises. Communication and literacy levels of personnel involved in setting budgetary targets and monitoring, are of great importance towards achieving budgetary goals (Matsoso et al., 2021). On this note, it can be inferred that construction project set goals would be influenced by factors such as culture, project team ethical behaviour, project team ethnicity, and communication. In addition, construction project managers should be literate and thoroughly understand project budgets.

Consolvo et al. (2009) state that the benefits of setting goals are realised when there is a feedback criterion to measure progress towards goal achievement. Maritim (2013) applied goal-setting theory to manufacturing parastatals, and inferred that budgetary planning and controlling promote high levels of financial performance. Onduso (2013) embarked on a similar study in applying the goal-setting theory to explore budgetary effects on the performance of businesses in the manufacturing industry. Results from the study showed budgetary goals, adopted management's control and monitoring systems influence financial performance (Onduso, 2013). In relation to the current study, the feedback control mechanism attribute of goal-setting theory ties in with project budgetary control systems assessed at different construction project milestones and/or phases. For instance, project budgetary control assessments at each project milestone offer cost feedback and project progress status towards the predetermined budgetary project goals. Consequently, setting a project goal promotes high levels of performance for project success factors such as cost, schedule, and scope (project management triangle), all of which determine the quality, and may result in cost-saving and ultimately alleviating project budget overruns.

Chong and Chong (2002) hypothesise that communicating and sharing budgetary goals with employees positively impact employees' commitment and performance in executing their tasks. Khin et al. (2014) conducted a study on the link between goal-setting perceptions and employees' commitment in relation to performance. The findings showed that goals deemed fair are executed with high-level commitment and outperformance, while goals deemed unfair result in poor employee commitment and underperformance (Khin et al., 2014). The evidence suggests that setting challenging but fair goals lead to high-level employee commitment and performance. In the context of construction project management, this underscores that the fairness will inform the project team's commitment to both generic and financial set goals, ultimately determining the project's generic and financial performance. Therefore, high levels of construction project performance can be achieved by setting fair financial goals, which are likely to trigger high-levels of commitment, accompanied by an efficient and effective cost-saving mechanism in executing project tasks.

The preceding studies uncover the significance of the goal-setting theory in this research. This research embraces goal-setting theory to examine how construction project stakeholders influence a project's financial and generic performance and in particular, focusing on construction

project managers in setting challenging acceptable cost goals and making trade-off decisions in relation to the project schedule, scope, quality, and stakeholder's needs. From the project management triangle (cost, schedule, scope/quality), the cost element goal of the project management triangle is singled-out as the major determinant of the construction project success. To substantiate, Akinshipe et al. (2019) posit that the failure to meet construction project budgetary goals leads to exhaustion of financial resources (cost) prior to the scheduled completion (schedule) of the project and tasks therein (scope), resulting in the premature termination of the project (failure).

To note, construction project triangle elements (cost, schedule, scope/quality) are systematically connected, and are all influenced by diverse construction project stakeholders. Therefore, cost goals set by the construction project manager and key stakeholders will impact schedule, scope, and quality simultaneously impacted by various stakeholders involved in different stages of the construction project life cycle. In addition, factors such as fairness of goals, the origin of goals, culture, ethics, government, attitudes, and literacy, impact stakeholders' performance towards the achievement of the construction project objectives. In a nutshell, project budgetary goals cannot be accomplished in isolation of a project management triangle trade-offs and stakeholders' needs, expectations, and attributes, because these are all systematically connected and contribute towards construction project success. Drawing insights from goal-setting theory and numerous factors that affect goals, this research proceeds to explore systems theory, which focuses on the interdependence of components of construction projects.

4.4 Systems theory

The development of the system theory commenced in the 1920s and 1930s with an interest in explaining issues associated with relationships, interdependence, and the structure of humans and organisations (Baridon & Loomis, 1931; Von Bertalanffy, 1938; Hall & Fagen, 1956; Katz & Kahn, 1966; Drack et al., 2007). In the 1940s, Ludwig Von Bertalanffy narrowed the systems theory from a biological standpoint, to explain how organisms functioned (Montuori, 2011; Walker, 2012). Thereafter, he extensively conducted research in diverse phenomena spectrums of science in developing systems theory (Von Bertalanffy, 1950, 1951, 1952, 1956, 1957, 1967, 1969, 1972). Consequently, extant literature proclaims Ludwig Von Bertalanffy as the founding father of systems theory (Von Bertalanffy, 1973, 1993, 2010, 2019; Chong, & Ray, 2002; Drack

et al., 2007; Pouvreau & Drack, 2007; Montuori, 2011; Walker, 2012; Drack, 2015; Hammond, 2019; Hofkirchner 2019; Ramage & Shipp, 2020). Systems theory focuses on the study of phenomena in different fields. According to Chen and Stroup (1993), a system refers to the collaborative interaction of elements, the sum of which displays a behaviour not localised in its constituent elements. Likewise, Muusha (2012) affirms that a system refers to a confined set of interconnected components displaying coherent behaviour as an attribute. Similarly, a construction project is a temporary system characterised by numerous components in the form of stakeholders' and other project requirements and constraints, that influence project success.

The systems theory is a multidimensional theory that explains the systematic nature of complex relationships between parts found in society, nature, science, and organisations (Ansari, 2004; Richardson & Midgley, 2007; Charlton & Andras, 2009; Brandell, 2010). Similarly, Sheridan (2010) describes the systems theory as an interdisciplinary study of science associated with natural or physical state of complex systems. The systems theory is aimed at studying and understanding the phenomenal interdependence of an organisation's interrelated components (Katz & Kahn, 1966; Sasson & Austin, 2003). Thus, the systems theory is a powerful method to expound on homeostatic systems (Schneider 2001). Ansai (2004) concurs that common principles and models present in all complex permanent or temporal scales of organisational systems existence, are investigated and described through systems theory. Similarly, the temporal existence of a construction project is a system characterised by complex interdependence of the project's interrelated components. Construction projects are variedly impacted by stakeholders' activities associated with diverse stakeholders with diverse needs and expectations as a whole.

Extant literature shows the application of System Theory in numerous studies. Scholars such as Pincus (2001), Mikulincer et al. (2002), Muusha (2012), Brinberg et al. (2017) and Skelton et al. (2020) employed the systems theory on family dynamics, and established that families can be understood as systems of interrelated and interdependent persons. In contrast, Patton and McMahon (1999, 2006, 2014) intensively focused on systems theory application as the main framework for career development and counselling. Patton and McMahon (1999, 2006, 2014) maintain that systems theory is integral to the plethora of career development theories and concepts. Howley and Chuang (2017) proposed the use of systems theory to assess quality

measurement, accreditation, and reporting systems on the healthcare entities in determining the influence of quality of care and patient safety. Richardson and Midgley (2007) applied systems theory to develop a system thinking theory in a community. In addition, Cumming and Allen (2017) describe systems theory as an ecosystem with interdependent elements and interrelated parts working together to accomplish a mutual goal. In the same vein, Stichweh (2008); Mele et al. (2010), and Unsworth et al. (2014) opine that systems theory can be utilised to describe a collection of elements that function together to produce outcomes from a single part of an entity. Likewise, a construction project manager is an integral part of a construction project, in liaison with diverse stakeholders working on interrelated activities towards the achievement of project objectives.

Notably, since its inception, the systems theory has been utilised diversely in various sectors, industries or studies over the years. It has been extensively applied in various studies, including nursing, education, social work, organisations, psychology, and public relations studies (Kast & Rosenzweig, 1972; Broom, 1986; Hazleton, 1992; Chen & Stroup, 1993; Vallacher & Nowak, 1994; Härkönen, 2001; Schneider, 2001; Jordan et al., 2012; Chikere & Nwoka, 2015; Greene, 2017). The application of systems theory in project management is not a novelty, Davies and Saunders (1988), Shenhar and Dvir (1996), McBride et al. (2004), Blomquist et al. (2010) and Javed and Liu (2019), applied it in relation to the triple triangle (Budget, schedule, and scope). Similarly, systems theory is adopted for this study, in relation to stakeholders' effects on the cost element of the triple triangle, ultimately affecting scope, schedule, and quality elements of a construction project success factors.

Teece (2018) applied systems theory in management, to extrapolate how managers' responsibilities are affected by the interrelation between the organisation's internal and external environmental factors. Ludwig (2015) embarked on a similar study, using systems theory in an organisational set-up, focusing on environmental components such as competition, consumers, economy, and government, influencing the organisation's management to inform organisational behaviour towards goal achievements. In a similar manner, this study applies systems theory from a project management standpoint, focusing on stakeholders such as, but not limited to, government, community, clients, project manager/s, architect/s, project administrator/s, quantity surveyor/s, civil engineer/s, local authorities, contractor/s, supplier/s, health and safety personnel,

electrical engineer/s, plumber/s, mechanical engineer/s, and lawyers, influencing the behaviour and success of a construction project. Based on the aforementioned stakeholders, construction project managers are affected by both internal and external construction project stakeholders' activities and expectations, in managing a construction project.

The researcher's opinion is that construction projects cannot be undertaken in isolation of multiple stakeholders with interrelated activities towards achieving project objectives. The systems theory focuses on relationships among parts, and how diverse components work together as a whole, or to achieve mutual goals (Ansari, 2004; Blomquist et al., 2010; Teece, 2018; Javed & Liu, 2019). Similarly, construction projects are a complex system comprising diverse stakeholders working together with a common goal to complete a building construction project successfully. Construction project stakeholders such as; client/s, project manager/s, architect/s, project administrator/s, quantity Surveyor/s, civil engineer/s, local authorities, contractor/s, supplier/s, health and safety personnel, electrical engineer/s, plumber/s, mechanical engineer/s, lawyers and community systematically work together at different phases of the project, effecting different tasks, concurrently or at different timeframes, to ultimately complete the project successfully. As the systems theory has a functional orientation (Stichweh, 2008), all construction project stakeholders have an influence on the outcome of the construction project. Typically, construction project stakeholders are varyingly impacted by project activities and do not always agree on the common project objectives. Subsequently, introducing complexity in the construction project system arises from the conflict of interests and diverse stakeholders' needs and expectations. Next, the complexity theory is discussed in relation to construction stakeholders' complexities and the construction project budget.

4.5 Complexity theory

Complexity theory is a developing theory that emerged in the mid to late 20th century, and to date, several scholars have contributed to its existence with overlapping studies focusing on systems, non-linearity, networks, adaption, evolution, and self-organisation (Byrne, 1998; Manson, 2001; Norberg & Cumming, 2008; Larsen-Freeman et al., 2017). Complexity theory emanates from systems theory and chaos theory (Eve et al., 1997; Marion, 1999; Sterman, 2000; Schneider & Somers, 2006). Systems theory focuses on the interconnectedness of parts in an orderly manner within a system as a foundation of complexity theory (Locke & Latham, 1974,

2002; 2006, 2019). In contrast, chaos theory offers a view that chaotic systems are governed by both a mixture of chaos and order with some level of interdependence, characterised by patterns and self-organisation to underpin complexity theory (Kauffman, 1995; Lee, 1997; Eve et al., 1997; Dooley & Van de Ven, 1999; Marion, 1999; Schneider & Somers, 2006). In general, a system is a set of parts that performs some collective function, and in particular, complexity theory focuses on complex systems (Kauffman, 1995; Sanger & Giddings, 2012; Larsen-Freeman et al., 2017).

Scholars such as Baker (1993), Kauffman (1991, 1993, 1995), Prigogine (1996), Eve et al. (1997), Mathews et al. (1999), Marion (1999), Morel and Ramanujam (1999) contributed to the conceptual and theoretical framework of non-linearity, adaption, evolution and self-organisation aspects of complexity theory, while Anderson (1999), Schneider and Somers (2006), Norberg, and Cumming (2008), and Larsen-Freeman et al. (2017) focused on the development of complexity theory from a holistic viewpoint, taking into account diverse network relationships formed within a system. Complexity theory is an amalgamation of systems, non-linearity, networks, adaption, and self-organisation, all aimed to explain an intricate phenomenon (Byrne, 1998; Manson, 2001; Tamjid, 2007; Norberg & Cumming, 2008; Curlee & Gordon, 2011). Larsen-Freeman et al. (2017) affirm that non-linearity, systematic networks, adaption, evolution, and self-organisation variables govern a system to coin complexity theory.

From a broader perspective, complexity theory has been employed in nursing education and health care services (Ray, 1998; Sterns et al., 2010; Walsh, 2000; De Oliveira Cruzl et al., 2017). Schneider and Somers (2006), Uhl-Bien et al. (2007) and Baltaci and Balcı (2017) applied complexity theory to the paradigm of leadership dynamics. Larsen-Freeman et al. (2017) utilised complexity theory in language development. In terms of the project management spectrum and similar to this research, complexity theory has been applied to project management practices, in particular focusing on project managers' capabilities in managing the complexities of projects (Thomas & Mengel, 2008; Vidal & Marle, 2008; Remington & Zolin, 2011; Cicmil et al., 2017). In the same vein, Curlee and Gordon (2011) extensively explained the application of complexity theory in project management, taking into account the emergence of virtual project teams and cultural diversity. In the footsteps of scholars such as Thomas and Mengel (2008), Vidal and Marle (2008), Curlee and Gordon (2011), Remington and Zolin (2011), Cicmil et al. (2017), this research applies complexity theory in project management with a particular focus on construction

stakeholders' diversities and their chaotic and anti-chaotic activities, which impacts on the construction project budget and ultimately, on construction project success.

Complexity theory aims to expound on systems which are complex. To recap, complex systems are types of a systems composed of numerous, diverse parts that are highly interconnected and capable of adaptation to achieve a collective result or outcome (Kauffman, 1995; Dooley & Van de Ven, 1999; Sanger & Giddings, 2012; Larsen-Freeman et al., 2017). Bertelsen (2003) interprets a construction project as a complex system formed by humans. Taking complexity theory into perspective, a construction project is a complex system composed of diverse stakeholders with diverse skillsets and duties, interests, needs, and expectations, that indirectly or directly impact the project budget and, ultimately, the project's success. On the one hand, diverse stakeholders must work together to apply their different skillsets and coordinate in different phases of the construction project throughout its life cycle to collectively produce a complete construction building project. However, on the other hand, stakeholders with interest in the project, but not actively or directly involved in the realisation of the project, also impact the construction project budget and, ultimately, the project's success.

Construction projects are characterised by both linearity, thus order, and non-linearity, thus chaos (Bertelsen, 2003). In the same vein, Curlee and Gordon (2011) support the notion that linear project management plans are subject to environmental and human adjustments, thus introducing nonlinearity. On the one hand, linearity is a product of a direct linear relationship between one cause and one effect, in particular, construction planning and project life cycle phases (Burke, 2013; Petroutsatou et al., 2021). On the other hand, non-linearity is an effect that is caused by multiple, different interacting parts (Marion, 1999; Schneider & Somers, 2006; Curlee & Gordon, 2011). Nonlinear systems show disproportionality of input to output, due to the complex set of interconnections within a system. With reference to complexity theory, the disproportionality of inputs versus outputs is mainly explained based on the 'Butterfly effect', an ideology that small changes may significantly impact the system (Lorenz, 2000; Kauffman, 1993).

Similarly, non-linearity is experienced in the construction project whereby diverse stakeholders' inputs are disproportionate to the project milestone outputs, due to interconnectivity complexity within the construction project life cycle system. Henceforth, all the varying magnitudes of inputs significantly impact the construction project budget and ultimate project success. Furthermore, internal and external environmental factors, including varying skillset and competencies, cultural tensions, diverse stakeholders' expectations and needs, policies, weather conditions, local regulatory requirements, international regulatory requirements, equipment and tools, technology dilemmas, ethical issues, economic situation, language barriers, and political influence introduce non-linearity on linear construction project plans (Curlee & Gordon, 2011; Chileshe & Yirenkyi-Fianko, 2012; Ghisellini et al., 2018; Nguyen et al., 2020).

Complex systems are highly interconnected, and thus they are modelled as networks of relations between nodes (Ravasz & Barabási, 2003). A construction project is a network of project phases connected by milestone nodes, that are achieved by diverse stakeholders and utilisation of diverse resources and are highly interconnected, functioning together to achieve a common project objective (Bertelsen, 2003). Construction projects are characterised by uniqueness and impacted by both internal and external environments. Therefore, project stakeholders involved in executing construction projects, inevitably evolve and adapt to the environmental changes that promote project success. Construction project managers, in particular, should be able to evolve, adapt and respond appropriately in dealing with diverse stakeholders throughout the life cycle, to meet project budgetary obligations and the ultimate success of the project. For instance, with the emergency of COVID-19, construction project managers had to adapt and respond to various government policies in guiding construction projects towards meeting project budgetary objectives, and ultimate project success (Jallow et al., 2020; Nyathi et al., 2020; Al Aansoori et al., 2021).

Although the construction project manager guides the project from ideation to completion, some degree of self-organisation is experienced among the project management and the project team members at the corporate level and execution operational level, respectively (Owen & Koskela, 2006; Owen et al., 2006; Saynisch, 2010; Moriel, 2017; Albuquerque et al., 2020). Typically, the construction management team self-organises during the inception (Pre-design and design) phases in generating construction ideas (Owen et al., 2006). Albuquerque et al. (2020) affirm the

application of agile project management in the construction industry, where the design team self-organises. In the same way, Moriel (2017) confirms that during the execution phase, the construction project team members typically self-organise to improve communication in performing certain tasks which do not require supervision. Clearly, complexity theory variables of non-linearity, networks, adaption, evolution, and self-organisation are all present in a construction project system. On this note, Curlee and Gordon (2011) allude that project managers should embrace transformational leadership in order to evolve and adapt in dealing with the complexities of projects. In addition, both the application of the traditional linear and agile nonlinear project management methodologies are essential for construction project managers in dealing with construction project complexities, towards meeting the budget and ultimate project success (Saynisch, 2010; Curlee & Gordon, 2011; Pitsis et al., 2014; Jin 2017; Albuquerque et al., 2020). Overall, the complexity theory ties in with the known-unknowns and unknown-unknowns which characterise construction projects.

4.6 Conclusion

In conclusion, this chapter focused on the theoretical framework which underpins this research. Stakeholder, goal-setting, systems, and complexity theories were discussed in relation to the study objectives and nature of the construction projects. Firstly, the stakeholder theory was discussed, focusing on construction project stakeholders and their impact on the project budgetary goals. Secondly, the goal-setting theory was discussed in relation to the set construction budgetary project goals. Thirdly, systems theory was outlined with the aim to elaborate on the systematic nature of the construction projects. Lastly, the complexity theory was evaluated to elaborate on the complex nature and agility of construction projects considering the diverse stakeholders, and their impact on the project's budgetary goals and ultimate project success. The next chapter provides literature review on construction project cost overruns and stakeholders complexities.

CHAPTER FIVE - CONSTRUCTION COST OVERRUNS AND STAKEHOLDERS' COMPLEXITIES

5.1 Introduction

The previous chapter focused on the theoretical framework which underpins this research, encompassing goal-setting theory, stakeholder theory, systems theory, and complexity theory. Goal-setting theory ties in with the construction project budgetary goals. To this effect, causes of cost overruns present hindrances towards the effective achievement of construction project budgetary goals. Then, the stakeholder theory, systems theory, and complexity theory underpin and reinforce the involvement of numerous stakeholders who are systematically connected with diverse project goals, ultimately presenting complexity in achieving construction project budgetary goals. Herein, this chapter focuses on cost overruns and stakeholder complexities. On the one hand, the literature on cost overruns is reviewed, based on the global, African, and South African contexts, focusing on the causes, impact, and possible solutions to curb construction budget overruns. On the other hand, construction stakeholders' complexities literature is reviewed by focusing on the identification of stakeholders within a construction project and their diverse expectations, which influence the project budget and ultimate project success.

5.2 Global construction project cost overruns phenomenon perspective

Construction project budget overruns are a global phenomenon (Flyvbjerg et al., 2004; Doloi, 2012; Tadewos & Patel, 2018). Construction project cost overruns occur when the project is delivered over the budget (Ullah et al., 2017; Tadewos & Patel, 2018; Albtoush et al., 2021). Flyvbjerg et al. (2018, p. 2) define cost overruns as “the amount by which actual cost exceeds estimated cost, with cost measured in the local currency, constant prices, and against a consistent baseline”. Evidence of construction project cost overruns caused in Canada emanate from budget underestimation, the need for extra materials, labour, equipment, and overtime work (Hao et al., 2008; Zhang et al., 2020). Poor monitoring processes, ineffective project planning, cost underestimations, insufficient contractor experience, improper execution methods, and scheduling deficiencies contribute to budget overruns in Australia, Ghana, and Malaysia (Shah, 2016). Findings by Sambasivan and Soon (2007) cite ineffective planning, poor site conditions, and incompetent construction project managers as the major causes of project overruns in Malaysia. In the same manner, Ullah et al. (2017) broadened the causes of cost overruns in

Malaysia based on the following contributors: contractor causes, consultant causes, client causes, and external causes. Project cost overruns resulting from improper planning, inappropriate management, inadequate experience, stakeholder conflicts, scheduling discrepancies, reworks, and poor financial controls were attributed to contractor causes. While cost overruns are associated with poor contract management, design errors, schedule underestimation, inadequate cost planning, and lack of experience are attributed to consultants. Financial issues, inadequate communication with consultants, project alterations, and payment delays are typically cost overruns caused by the client. Natural and external stakeholder-related cost overruns are a result of unforeseen site conditions, expensive machinery, price fluctuations, material delays, weather conditions unpredictability, unskilled labour, and equipment failure.

The majority of construction projects in the Middle East, (in) Saudi Arabia, are characterised by scope creep, resulting in budget overruns (Seddeeq et al., 2019). Seddeeq et al. (2019) identified cost underestimation as the major cause of construction project cost overruns. Most construction projects have been characterised by increased client involvement in changing the project scope (Seddeeq et al., 2019). The combination of design changes, poor planning, inadequate scope detail, and underestimation of the project expenses, are the main causes of cost overruns (Seddeeq et al., 2019). Design errors and incomplete scope at the bidding phase, negatively impact the project budget. Imbalances between the project budget and project benefits have been prevalent and is commonly an overestimated project budget with an inadequate budget (Seddeeq et al., 2019). In Indonesia, dominant factors such as cost estimation, mobilisation of resources, performance management, material price increments, incomplete information, poor time performance, and government financial policies have been blamed as the cause of completing the construction project over budget (Ronald & Lumbantoruan, 2019). In other evidence from India, material price increments, slow decision-making, ineffective schedule management, poor contract management, ambiguous design, incomplete design, reworks due to poor quality or incorrect work, ineffective stakeholder co-ordination, land acquisition issues, incorrect cost estimations, and ineffective tendering processes were found to be the main causes of budget overspending (Subramani et al., 2014; Wanjari & Dobariya, 2016; Devi & Ananthanarayanan, 2017; Annamalaisami & Kuppuswamy, 2021).

In Jordan, factors such as insufficient planning, design changes, materials issues, site conditions, poor project team productivity, bad weather conditions, terrain conditions, variation orders, and unfavourable economic conditions are the major contributors to construction project overspending (Odeh & Battaineh, 2002; Al-Hazim et al., 2017; Albtoush et al., 2021). Saeed (2009) found that lack of risk management, inadequate project initiation planning, and scoping discrepancies contribute to cost overruns in the United Arab Emirates (UAE). Similarly, Johnson and Babu (2020) identified and summarised the causes of cost overruns as scant budget estimation, improper procurement methodology, financial constraints, and design variation in the UAE construction projects. In contrast, the findings by Rosenfeld (2014) show premature tender documents, excessive change requests from the client, and unrealistic awarded low-priced tender contracts as the root cause of construction project cost overruns in Israel. McDonald (2004) identified the Big Dig construction project, which had a US\$2.4 initial estimation in 1984, and the cost ballooned to US\$13.6 in 2000 due to poor project governance. Love et al. (2011) identified the following projects with severe overruns; Denver's airport with 200% cost overrun in USA resulting from design changes and material quality, DKK Oresund Bridge with 68% cost overrun in Sweden, resulting from cost inaccurate estimations and inflation, Scottish Parliament Building greater than 900% cost overrun from political interferences impacting project manager's authority, and Western Australian Perth arena with 300% cost overrun resulting from poor planning.

In related research studies, project cost overruns resulting from the following: lack of software, equipment breakdown, shortage of materials, and inaccurate cost estimations resonating with construction project budget overruns in the United Kingdom (Olawale, 2010), design alterations resulting in variation orders, improper planning, schedule delays, inexperienced workforce, and mistakes during execution in Bahrain (Emam et al., 2014; Abusafiya & Suliman, 2017; Mohammad et al., 2021). In addition, causes include the following: change orders, ineffective planning, political interference, client bankruptcy and government policy changes in Kuwait (Koushki et al., 2005; Shalaby et al., 2018; Alrashidi & Adesta, 2021), exorbitant machinery costs, increases in material prices, cash flow, and impractical designs resulting in changes during execution, low labour productivity, cost underestimation, poor communication and poor cost management in China (An & Ma, 2019; Mansur et al., 2019; Chen et al., 2019), material prices fluctuations, inadequate planning, and inadequate cost control in Ethiopia (Sinesilassie et al., 2018; Taye, 2019), poor project planning, ineffective stakeholders' communication, design errors, and consultants incompetence in Saudi Arabia (Seddeeq et al., 2019). In a broader study focusing

on developing countries, Ahady et al. (2017) found that factors such as poor financial management, inaccurate cost estimations, and fluctuations in material prices are the critical causes of construction project cost overruns in Asia (India, Pakistan, Palestine Malaysia, and Indonesia), Middle East (Saudi Arabia), and in Africa (Ethiopia, Nigeria, and South Africa).

To summarise the global construction project cost overruns phenomenon perspective literature review construct, the whole section was uploaded in NVivo to create Figure 5.1-word cloud. The latter indicates the summarised word cloud visual of cost overrun causes from a global perspective. The greater the cost overrun causes, the larger the word visual indication in the diagram (will be). Therefore, cost underestimation, material price increments, design error, inaccurate cost estimation, and poor planning were the most prominent causes of construction project cost overrun, drawn from the global phenomenon perspective.

Figure 5.1: Global construction project cost overruns causes



Source: Extracted from NVivo word cloud

5.3 African construction project cost overruns phenomenon perspective

In Africa, the main causes of construction project cost overruns are associated with financial constraints, political interference, and economic volatility in Sudan (Mohamed 2015); in addition, cost overruns are related to contract modifications, penalties, design specification alterations, materials price increases, poor supervision, unforeseen site conditions in Zambia (Kaliba et al., 2009; Tembo-Silungwe & Khatleli, 2017; Sichone, 2017; Tembo et al., 2022); design changes, inadequate monitoring, mismanagement and payment delay penalties in Tanzania (Chileshe & Kikwasi, 2013; Tekka, 2021); poor cost estimations, personnel incompetency, corruption, inadequate cost control, unavailability of materials, claims and poor reporting in Zimbabwe (Chigara et al., 2013; Nyoni, 2019) as well as poor procurement management, inadequate risk management, shortage of qualified workforce, insufficient understanding of design specifications resulting to variation orders, bad weather conditions, inadequate cost control and late payment penalties in Lesotho (Nketekete et al., 2014, 2016). The following also applies: increased material costs, frequent design alterations, unqualified project managers, lack of training, inadequate stakeholder co-ordination, and poor management of contracts in Botswana (Chimwaso, 2001; Himayumbula & Prinsloo, 2010, Sefhemo, 2016. Adeyemi & Nduna, 2019). Furthermore, Himayumbula and Prinsloo (2010) concluded that the absence of project management governing body to regulate ethical conduct results in unqualified personnel managing construction projects, significantly contribute to cost overruns in Botswana.

Buertey et al. (2012) conducted a study on cost contingencies. The findings revealed that cost contingencies are mainly allocated for incomplete scope and specification changes, which are blamed for cost overruns in Ghana. In Ghana, factors such as project complexity, flawed feasibility studies, inaccurate cost estimations, client financial difficulties, delays, poor technical workmanship, inadequate communication plans, material price increments, inefficient procurement of materials, design variations, interest rates changes, poor financial management, and excessive project manager's workload contribute to construction project cost escalations (Frimpong et al., 2003; Ayarkwa et al., 2013; Shah, 2016; Famiyeh et al., 2017; Coffie & Aigbavboa, 2020; Akinradewo et al., 2022). In a study conducted in Nigeria, project cost overruns were attributed to project stakeholder miscommunication, corruption, malpractices of contractors, contract ambiguity resulting in excessive claims, poor site management, wastage, political interferences, mismanagement, poor leadership, design changes, change orders, incompetence and budget underestimation (Owolabi et al., 2014; Obodoh & Chikasi, 2016; Saidu & Shakantu, 2017; Akinradewo & Oladinrin, 2018; Eja & Ramegowda, 2020). In the same nation, Aiyetan

(2013) concluded that project cost overruns emanate from the three main construction stakeholders, client, consultants, and contractor. Herewith, miscommunication, insufficient planning, and ill-management practices are negative factors contributing to cost escalations and, misinterpretation of the client's requirements and inexperience of the workforce are (respectively) cost overruns contributions emanating from the consultants and contractors.

Findings by Gituro and Mwawasi (2017) revealed that scope expansion, poor cost monitoring, fluctuations of foreign exchange rates, insufficient contract specifications and unpredictable weather conditions, negatively impact construction budgets in Kenya. In other evidence, design alterations, scope creep, ambiguous activity breakdown structure, contract issues, and contractors' incompetence were found to be the main reason for construction projects exceeding the budget (Githenya & Ngugi, 2014; Boru, 2016; Oyieyo et al., 2020). In the Democratic Republic of Congo, technical incompetence, community interference, torrential rain damages, and material-related issues contributed to construction project overruns (Bitamba & An, 2020; Bank & Mvukiyehi, 2021). In Malawi, issues associated with time delays such as contractual disputes, bad weather conditions, prolonged time to source qualified workforce, design changes, change approval delays, and contractor payment delays resulting in penalties, were found to be some of the causes of budgetary overruns (Mukasera, 2016). In addition, Tuyishime (2020) found frequent specification alterations, material cost variations, poor contract management, and expensive material transportation costs as the main causes of construction budget overruns in Rwanda. The causes of project cost overruns, as noted by Mashwama et al. (2017), included underestimations, reworks, and under-looking the role of a construction project manager in Swaziland. Overall, it can be observed from the above secondary data that there are some common causes of construction project cost overruns that overlap across African countries.

Similar to the global construction project cost overruns phenomenon perspective construct, the literature review content on African construction project cost overruns phenomenon perspective was uploaded in NVivo to create Figure 5.2-word cloud. Based on the literature review summary in Figure 5.2-word cloud, the most prominent causes of cost overruns are indicated by larger word visuals. Here, design changes, material price increases, inaccurate cost estimation, incompetence, and poor contract management were found to be prevalent causes of budgetary cost overruns in Africa.

Figure 5.2: African construction project cost overruns causes



Source: Extracted from NVivo word cloud

5.4 South African construction project cost overruns phenomenon perspective

In the South African context, project cost overruns have been experienced in construction projects across provinces. For example, construction projects such as the Nkandla presidential residence project, with an initial budget of R27 million, resulted in more than 900% cost overrun (R246 million spent) in Durban (Laryea, 2019), and the undermentioned projects experienced significant cost overruns. The Kusile project had an initial budget estimate of R69.1 billion in 2007, resulting in an estimation of R460 billion at completion after 2020 in Mpumalanga, while in Limpopo, the Medupi project which had an initial budget estimate of R79 billion in 2007, resulted in an estimation of R234 billion at completion after 2020 (Tshidavhu & Khatleli, 2020; Areff, 2021). In Johannesburg, the Vosloorus taxi rank, with an initial budget of R17.8 million, was completed with a cost overrun of R3.4 million, with the overall completion costs totaling R21.2 million (Saba, 2018). Similarly, R25.2 million additional funds were required to complete the project; in the Thohoyandou taxi rank project in Limpopo, which had a budget of R280 million, the project

ultimately totaled R305.2 million (Democratic Alliance, 2021). Correspondingly, the Kimberly Mental Hospital budget ballooned from R290 million to R1.86 billion in Kimberly (Medical Brief, 2018). Also, the N2 Gateway housing project in Cape Town and the RDPs' housing projects across the country have experienced cost overruns (Blake, 2007; Baloyi & Bekker, 2011; Amoah et al., 2020; Areff, 2021).

In preparation for the FIFA 2010 World Cup, Baloyi and Bekker's (2011) findings indicate that the following stadium construction projects were completed over the budget; the Soccer City project with an initial budget of R2.2 billion and final cost of R3.7 billion in Johannesburg, the Ellis Park project with an initial budget R 240 million and final cost of R 253 million in Johannesburg, the Moses Mabida project with an initial budget R 1.6 billion and final cost of R 3.1 billion in Durban, the Mombela project with an initial budget R 600 million and a final cost of R1 billion in the Nelspruit, Green Point project with an initial budget R 2.9 billion and final cost of R4 billion in Cape Town, In addition, the following over budget projects include the Royal Bafokeng project with an initial budget R 360 million and final cost of R483 million in Rustenburg, the Mangaung project with an initial budget R 245 million and final cost of R359 million, in Bloemfontein, and the Loftus Versfeld project with an initial budget R 122 million and final cost of R131 million in Pretoria, (Baloyi & Bekker, 2011; Medical Brief, 2018; Saba, 2018; Laryea, 2019; Tshidavhu & Khatleli, 2020). Also, the Nelson Mandela Bay project in Port Elizabeth and Peter Mokaba project in Polokwane incurred unknown figures of cost overruns (Laryea, 2019).

Singling out the FIFA 2010 World Cup stadia construction projects, Baloyi and Bekker's (2011) findings revealed that the causes of cost overruns were a result of delays in awarding contracts, material cost increments, inaccurate estimation of material costs, lack of skilled personnel, labour cost increases, shortage of labour, change orders, and complexity of the projects. Similarly, shortages of qualified personnel, the client's sluggish decision-making, inaccurate estimation of material costs, poor procurement of material, poor controlling and monitoring, unforeseen site conditions, scope changes in scope, scope creep, poor site management, variation orders, and contractual claims were found to be the cause of cost escalation at the Kusile and Medupi projects (Tshidavhu & Khatleli, 2020). At the same time, Saba (2018) highlights vandalism during execution resulting in reworks, as one of the causes of budget overruns in South African construction projects. Also, Saba (2018) indicates that upfront payment resulting in abandonment

of the site and re-contracting another contractor incurs an additional cost, contributed to cost overruns.

In terms of other evidence on the causes of construction project cost overruns in South Africa, these include: incomplete design at tender stage, inadequate cost planning, onsite scope of work changes, inadequate monitoring of funds, contractual claims, and penalties (Ramabodu & Verster, 2013), inadequate planning, contractors inexperience, contractors inefficiency, time extension, project abandonment, poor project management, under-utilisation of human resources, unsatisfactorily workmanship, and shortage of skilled site workers (Mukuka et al., 2014). There is also evidence of poor design planning resulting in an ambiguous scope of work and scope changes, escalations of material prices, project abandonment by the contractor, poor construction planning and co-ordination, variation orders, crashing and fast-tracking (Gaetsewe et al., 2015).

In addition, the list includes material quantity underestimation, client slow decision-making, price escalations, legislation changes, corruption, wastages, poor quality (Adugna, 2015), poor planning, materials price fluctuation of prices, labour costs, exorbitant bank interest rates, inflation, on site poor financial management, poor stakeholder co-ordination, and shortage of local materials (Mulalo et al., 2018), as well as lack of project team project specialty experience, scope changes pressure from stakeholders and community resistance (Simushi & Wium, 2020), poor planning and decision making, late provision of design information, scope of work changes, contractors inadequate experience, unskilled labour, lack of co-ordination, material prices increments, and bad weather condition provisions (Morena & Amoah, 2021).

Lack of key skills, regulation noncompliance issues, environmental sustainability issues, tender risks, health, and safety non-compliance negatively impact construction project budgetary goals (Ahady et al., 2017). Khabisi et al.'s (2017) findings were consistent with the findings by Mukuka et al. (2014), Gaetsewe et al. (2015), Mulalo et al. (2018), that the lowest tender bid acceptance, numerous design changes, decision-making delays, inaccurate cost estimations, design errors and omissions, variation orders, contractors' inexperience, and inaccurate quantity take-off were found to be the dominant causes completing construction project over budget. In general, most

5.5 Prominent global, Africa and South African construction cost overruns causes

This section briefly synthesises the causes of cost overruns based on the three constructs discussed, namely, the global construction project cost overruns phenomenon perspective, the African construction project cost overruns phenomenon perspective, and the South African construction project cost overruns phenomenon perspective. From the global phenomenon perspective, cost underestimation, material price increments, design error, inaccurate cost estimation, and poor planning were the most prominent causes of construction project cost overrun. While, design changes, material price increases, inaccurate cost estimation, incompetence, and poor contract management were found to be prevalent causes of budgetary cost overruns in Africa. Similarly, scope changes, design changes, material price escalations, inaccurate cost estimation, and contractors' inexperience as the most critical and common causes of cost overruns in South Africa. From a holistic perspective, material price changes, design changes, and inaccurate cost estimation were the most common causes of cost overruns across all geographical areas.

5.6 Impacts of construction project cost overruns

Project cost overruns present major problems for financiers, governments, clients, companies, and the supply chain (Smith, 2014). Project time overruns, contractual disputes, contractor loss of profit, client loss of return on investment, adversarial stakeholder relationships, loss of employment for the project team, mistrust, legal litigation battles, discontinuation or total abandonment, and end-user expected usage loss are some of the effects of cost overruns (Emam et al., 2014; Owolabi et al., 2014; Gaetsewe et al., 2015; Prajapati et al., 2016; Mansur et al., 2019; Pimplikar, 2021). The implications of construction project cost overruns resulting in project discontinuation or total abandonment, can be incapacitating to stakeholders such as the client, construction project managers, and other stakeholders invested in the project (Fugar & Agyakwah-Baah, 2010; Gbahabo & Ajuwon, 2017; Rekord, 2020; Dlamini & Cumberlege, 2021). For example, the R3.5 billion Showmax Villa mall in Pretoria, South Africa, was discontinued when finances were depleted in 2011 (Property24, 2011; Rekord, 2020).

To date, an injection of R2 billion is required to complete Showmax Villa mall (Property24, 2011; Rekord, 2020). Failure to complete the mall would translate to financial losses both for the initial investment and the potential return on investment for the client and investors. On the other hand, it has also resulted in stakeholders' lost opportunities to operate businesses and shops in the mall (Property24, 2011; Rekord, 2020). Equally, the Medupi and Kusile cost overruns have resulted in costs being transferred to end-users paying high electricity tariffs and load-shedding, negatively impacting the South African economy (Areff, 2021). Preceding the Showmax Villa mall, Medupi, and Kusile examples, cost overruns present major problems for diverse stakeholders invested in the project, negatively impacting social and economic activities. Gaetsewe et al. (2015) state that cost overruns result in socio-economic upheaval. Figure 5.4 shows the diverse negative impact of construction project cost overruns, which significantly affect varied stakeholders and the economy at large. Therefore, it is paramount to find solutions to curb construction project cost overruns to promote project success and, ultimately, economic development.

Figure 5.4: Impacts of construction project cost overruns



Source: Constructed by the researcher

5.7 Proposed solutions to construction project cost overruns

Scholars and construction project management practitioners have proposed diverse solutions and recommendations to alleviate cost overruns across the globe. In order to curb cost overruns, appropriate procurement of the right materials at the right and minimisation of material wastage was commended by Saidu and Shakantu (2017) in Nigeria. Proper project scoping and application of modern project management tools were encouraged as a measure to alleviate completing the project over budget in Kenya (Gituro & Mwawasi, 2017; Waithera & Susan, 2019). In this regard, Seddeeq et al. (2019) advocated for adequate planning, time, complete scoping prior to pricing, replacing the lowest bidder system with a comprehensive bidder system, verifying design completeness, selection of qualified contractors, and managerial personnel in Saudi Arabia, while Zhang et al. (2020) indicated that advanced value-for-money methodology assessments were helpful in preventing budget overruns in China. In another study focusing on India, Pakistan, Palestine, Malaysia, Indonesia, Saudi Arabia, Ethiopia, Nigeria, and South Africa, Ahady et al. (2017) suggested that developing countries should formulate regulations, rules, and policies to lessen cost overruns. Recent studies by Alasfour and Mirzal (2021) emphasised effective communication, which results in team cohesion for projects undertaken in Kuwait, while Annamalaisami and Kuppuswamy (2021) emphasised that stakeholders who are directly involved in the management of project finances are the best individuals to effectively mitigate cost overruns, based on their understanding of project financial behavior and past experiences.

In a study conducted in Ethiopia, Gebre (2021) recommended that finalised design without errors should be used, sufficient cost contingencies should be allocated for fast-tracking and crashing, the inclusion of all relevant stakeholders is necessary in decision making concerning costs, selection of qualified and skillful personnel, appropriate control and co-ordination of tasks, and training where necessary to avoid cost deviations. As a result of construction project managers and infrastructure developer's incapacity in Sub-Saharan Africa, Gbahabo and Ajuwon (2017) recommend computer-aided budget estimations, private-public partnership, building information modeling, and 'reference class forecasting' to lessen the menace of completing a project over the budget.

Seddeeq et al. (2019) conducted a literature review study in Saudi Arabia and found thirty-eight causes of project cost overruns. These were further summarised into seven categories: client-related, contractor-related, stakeholders-related, consultant-related, contract-related, resources-related, and external-related causes. In this regard, Seddeeq et al. (2019) recommend close cost monitoring, proper integration, and coordination of different stakeholders, to ensure that there are no deviations of actual costs from planned costs and scope. Based on the infrastructure projects undertaken in the Dutch regions, Leereveld (2021) upholds that appropriate and increased stakeholder collaboration and problem-solving are valuable aspects to be considered in order to complete construction projects within the budget. Undeniably, stakeholders are central to cost overrun causes. Therefore, answers to curb the cost overruns phenomenon lie in stakeholders who can plan, budget, manage, monitor, control, and forecast construction project finances.

From the South African context, the Joint Building Contractors Committee (JBCC) was formed in 1984 and registered in 1997 with a mandate to guide and represent developers, building owners, professional consultants, developers, general contractors, specialist contractors, and sub-contractors, in an effort to alleviate construction project failures and stakeholder complexities, (JBCC, 2007; Othman & Harinarain, 2011; Maritz, 2020). Othman and Harinarain (2011) opine that JBCC has been helpful in curbing risks associated with diverse stakeholders working on a project. However, in focusing on the JBCC, quality, cost, health, and safety factors were excluded in Othman, and Harinarain (2011), even though they could significantly contribute to cost overruns. In this regard, Ramabodu and Verster (2013) and Khabisi et al. (2017) advise that factors that influence construction cost should be identified at the beginning of the project to decrease cost overruns, while Gaetsewe et al. (2015) propound on the proper financial allocation of finances and improvement of the client's internal processes to prevent overspending. Recently Dlamini and Cumberlege (2021) offered a solution of equipping construction project managers and the relevant stakeholders with financial planning, budgeting, and cash flow skillsets to alleviate project overspending. Despite the identified causes and recommendations of cost overruns by few researchers in South Africa, project cost overruns remain a challenge in the South African construction industry. In summarising this section, Table 5.4 shows the proposed solutions to curb construction project cost overruns per scholar/s.

Table 5.1: Proposed solutions to construction project cost overruns

Proposed Solutions to Construction Project cost overruns	Author/s
<ul style="list-style-type: none"> • Appropriate procurement of the right materials, at the right and minimisation of material wastage 	(Saidu & Shakantu, 2017)
<ul style="list-style-type: none"> • Proper project scoping 	(Gituro & Mwawasi, 2017; Waithera & Susan, 2019)
<ul style="list-style-type: none"> • Adequate planning, complete scoping prior pricing, replacing the lowest bidder system with a comprehensive bidder system, • Verification of the design completeness, • Selection of qualified contractors • Close cost monitoring, • proper integration and coordination of different stakeholders 	(Seddeeq et al., 2019)
<ul style="list-style-type: none"> • Formulate regulations, rules, and policies 	(Ahady et al., 2017)
<ul style="list-style-type: none"> • Effective communication 	(Alasfour & Mirzal, 2021)
<ul style="list-style-type: none"> • Usage of the finalised design • Sufficient cost contingencies • Inclusion of all relevant stakeholders in the decision • Utilisation of qualified and skillful personnel • Appropriate control and coordination of tasks 	(Gebre, 2021)
<ul style="list-style-type: none"> • Computer-aided budget estimations 	(Gbahabo & Ajuwon, 2017)
<ul style="list-style-type: none"> • Increased stakeholder collaboration 	(Leereveld, 2021)
<ul style="list-style-type: none"> • JBCC usage to promote stakeholder collaboration 	(JBCC, 2007; Othman & Harinarain, 2011; Maritz, 2020)
<ul style="list-style-type: none"> • Proper financial allocation 	(Gaetsewe et al., 2015)
<ul style="list-style-type: none"> • Financial planning, budgeting, and cash flow skillsets 	(Dlamini & Cumberlege, 2021)

Source: Constructed by the researcher

In a nutshell, construction project cost overruns present major problems for financiers, governments, clients, companies, and the supply chain at large (Smith, 2014). Numerous scholars in different parts of the world have acknowledged project cost overruns and the underlying negative implications of completing construction projects with budget excess. However, the explanations and causes of cost overruns are debatable, depending on the geographical location, cultural factors, economic and political conditions of the region in question (Cantarelli, 2011; Ramabhadran, 2018; Anigbogu et al., 2019). The causes of project cost overruns are not the same for all countries and regions within the country (Ramabhadran, 2018; Albtoush et al., 2021). Furthermore, there is a difference in the causes of cost overruns among developed, developing, and underdeveloped countries. Variations in construction project cost escalations are also dependent on the unit of study analytics. Different scholars utilised different units of analysis, ranging from focusing on individual construction projects, consultants, to contractors and other stakeholders involved in the project. Therefore, solutions to rectify construction project cost overruns differ from country to country and are dependent on the nature of the project.

5.8 Construction stakeholder complexities

According to Takim (2009, p.168) project, stakeholders are “those who can influence the activities/final results of the project, whose lives or environment are positively or negatively affected by the project, and who receive a direct and indirect benefit from it.” Similarly, and based on extant literature, project stakeholders refer to groups, individuals, organisations, or any entities that may affect or are affected by the project decisions, activities, and outcomes (Freeman, 2010, Yang, 2014; Tanko et al., 2017; Mashali et al., 2020; Mabelo, 2020). Stakeholders are categorised into internal stakeholders, referring to those who are directly involved in the activities of the construction project, and external stakeholders, which includes those indirectly involved in the activities of the construction project, but can influence the activities of the construction project in several ways (Winch, 2002, 2010; Leung & Olomolaiye, 2010; Ullah et al., 2017; Mashwama et al., 2018; Srinivasan & Dhivya, 2020). Internal and external stakeholders’ influences, interests, needs, and expectations affect the project’s budgetary goals and ultimate project success (Takim, 2009; Chileshe & Yirenkyi-Fianko, 2012; Mashwama et al., 2018; Osunsanmi et al., 2020; Srinivasan & Dhivya, 2020). In Malaysia, Ullah et al. (2017) confirmed and concluded that most construction project cost overruns causes are stakeholders related. Foregoing stakeholder conceptualisation and in line with Ullah et al. (2017) conclusions, the researcher’s opinion is that

accurate identification, engagement, and management of construction project stakeholders should be prioritised in order to complete projects within the budget in South Africa.

Scholars and construction project practitioners worldwide and in Africa, have identified the following: stakeholders, shareholders, owners, designers, construction project managers, facilities managers, users of facilities, legal authorities, team/employees, contractors, subcontractors, suppliers, banks, service providers, process providers, insurance companies, competitors, the press, media, government establishments, neighbours, community representatives, general public, visitors, customers, regional development agencies, civic institutions, the natural environment, pressure groups, etc. (Newcombe, 2003; Smith & Love, 2004). The list continues: consultant, client/owners/sponsor, contractor, supplier, and community leaders (Leung & Olomolaiye, 2010); landowners, financiers, clients, designers, consultants, builders, trade contractors, end-users, suppliers, lawyers, environmentalists, local residents, and archaeologists, regulatory agencies, local government and national government (Winch, 2002, 2010); client, owners, designers, financiers, construction managers, project leaders, contractors, subcontractors and suppliers (Manowong & Ogunlana, 2010) as well as parent organisations, consultants, architect, client, environmentalists, contractors, subcontractors, suppliers, public, and the media (Senaratne & Ruwanpura, 2016) business partners, building designers, project teams, construction supervision, construction managers, contractors and investor/s (Bizon-Górecka & Górecki, 2017); owners, designers, supervisors, contractors and consultants (Gunduz & Almuajebh, 2020); engineers, client/owners, contractors, employees, customers, general public, suppliers, local community, and local authorities (Srinivasan & Dhivya, 2020).

Based on secondary data across the globe, Chan and Oppong (2017) identified the following construction project stakeholders, namely: financiers, clients/owners, designers, management teams, contractors, sub-contractors, suppliers, creditors, project team/employees, advisors, and government aid categorised as internal stakeholders; chieftaincy/traditional authorities, community groups, deities/religious groups and social institutions such as hospitals and schools were categorised as local community, regulators, local government authorities and national government authorities were categorised as government authorities; archaeologists, trade and industry, politicians, conservationists, social groups, intervenors, environmentalist, end use, mass median, and others were categorised as the general public.

Narrowing down and linking to this research location, Buys and Le Roux (2013) identified the following construction project stakeholders as architects, clients, consulting engineers, general building contractors, and the government. Meanwhile, Mashwama et al. (2018) categorised stakeholders into primary and secondary stakeholders. On the one hand, primary stakeholders comprise senior organisational managers, corporate directors, general managers, functional managers, project managers, work package managers, customers/end-users, suppliers, contractors, sub-contractors, creditors, employees, local agencies, state agencies, federal agencies, commissions, judicial, legislative, unions, and shareholders. On the other hand, secondary stakeholders comprise social organisations, political organisations, environmentalists, competitors, local communities, the general public, consumer groups, intervenor groups, private citizens, tourists, professional organisations, hospitals, schools, media, families, and anyone else with interest on the project. Undoubtedly, construction projects comprise multiple stakeholders who can affect the budget varyingly.

In completing construction projects within the budget, an observable complexity and problem is the presence of multiple stakeholders with diverse needs, expectations, interests, and influences during the project life cycle. Abidin (2010) maintains that the presence of numerous construction project stakeholders presents a problem. Lin, Ho, and Shen (2018) claim that multiple stakeholders' interests and influences emerge from the project's extensive values, needs, expectations, and perceived benefits. In the same vein, Gunduz and Almuajebh (2020) acknowledge stakeholders' disagreements in relation to their views and goals, regarding the project's financial and managerial issues. It must be noted that presenting a joint project stakeholders' interdependency complexity, may lead to difficulties in meeting the project budget and ultimate project success (Clough et al., 2005; De Brucker et al., 2013; Nasr et al., 2020).

In another study, Seddeeq et al. (2019) grouped stakeholder-related causes of project failure, which impact costs into: client/owner causes, contractor causes, supplier resources cause, external causes, consultant causes, and all other parties involved in the project. To this effect, Heravi et al. (2015) and Seddeeq et al. (2019) advocate for developing a coordination system to integrate departments, units, and phases to promote mutual understanding and ultimately curb

project stakeholders' complexities that may be detrimental to the budget. In contrast, Ronald and Lumbantoruan (2019) suggest that clients should calculate the project's cost budget and time schedules properly. Evaluation of contractors is encouraged to ensure the availability of materials, manpower, and equipment to avoid time-cost-related issues (Ronald & Lumbantoruan, 2019).

Lack of effective communication among project stakeholders is one of the leading causes of cost overruns and project failures (Hwang & Tan, 2012; Aslam et al., 2019; Kania et al., 2020; Sediq et al., 2021). Lack of project stakeholder involvement and stakeholder-maladministration has been implicated as one of the major contributors to the complexities faced by project managers in completing the project successfully (Heravi et al., 2015). In another piece of evidence, minimal involvement of contractors, and designers in the early stages of project execution, were found to be a significant contributory factor to cost overruns and project failures (Martinsuo & Killen, 2014; Ajayi & Oyedele, 2018; Alsaedi et al., 2019; Annor, 2021). In this regard, Martinsuo and Killen (2014) propose that project stakeholders control the flow of resources during project execution.

Therefore, project stakeholder involvement is essential during project planning and other phases of the project, as it has a strong impact on the project budget and success (Martinsuo & Killen, 2014; Yang, 2014; Rathenam et al., 2016; Alsaedi et al., 2019; Demirkesen & Reinhardt, 2021; Kordi et al., 2021; Annor, 2021). In particular, during the project's planning phase, accurate project cost estimations are key to preventing project overruns (Baloi & Price, 2003; Martinsuo & Killen, 2014; Yang, 2014). Similarly, Eskerod and Vaagaasar (2014) and Sediq et al. (2021), emphasise the importance of knowing, communicating, and managing all project stakeholders' involvement and connection in the construction project life cycle, to enhance the achievement of project budgetary goals.

Doloi (2012) finds that scheduling and planning deficiencies of clients, consultants, and contractors' performance contribute heavily to project cost overruns. In another finding, Buys and Le Roux (2013) declare that stakeholder-cost-overrun-related is a result of stakeholders' design deficiencies, resulting in building defects that inevitably would require reworks at extra costs. Similarly, Seddeeq et al. (2019) find inadequate scoping and stakeholder misunderstanding, resulting in project scope creep and cost overruns. Therefore, clients, consultants, and

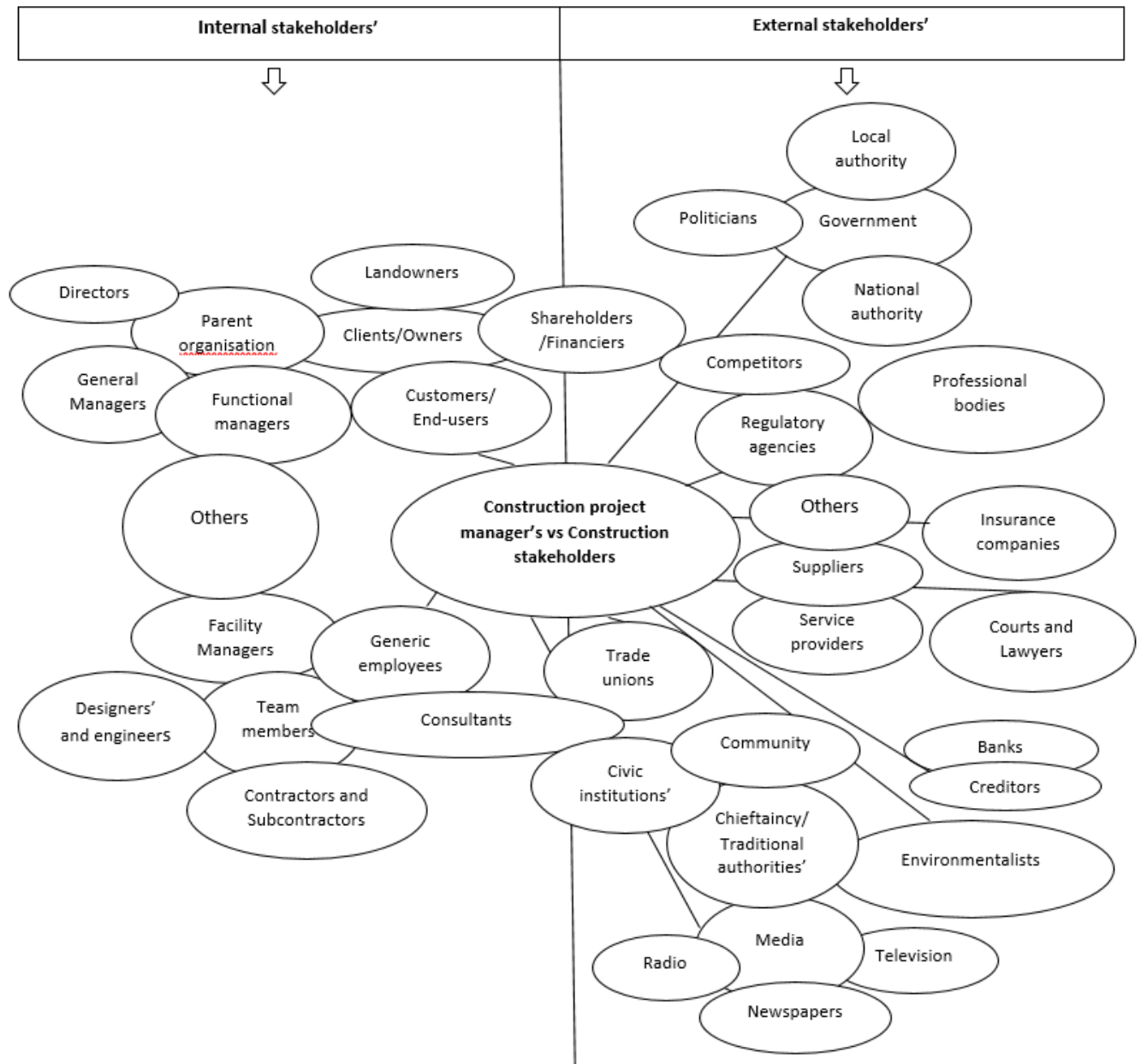
contractors should invest adequate time in the projects to avoid design errors, scheduling, and planning deficiencies, resulting in scope creep and cost overruns (Doloi, 2012; Seddeeq et al., 2019). Eskerod and Huemann (2013) and Demirkesen and Reinhardt (2021) state that project stakeholders must comply with the project needs and work as a team to avoid project mutual interest deficiency.

Senaratne and Ruwanpura (2016) argue that even though stakeholders such as the project manager, contractor, consultant, and client work as a team, their parent organisations' disciplines and culture affect the communication process of the project. Mazur et al. (2014) infer that construction project managers' emotional intelligence, cognitive flexibility, and systemic thinking promote effective stakeholder relationships for all parties involved, to enhance project success. Sunder (2016) proposes an inform-involve-influence model for dealing with multiple stakeholders at different stages of the project, in banking and financial services. Furthermore, Sunder (2016) recommends further studies on the model's applicability and customisation in other industries. To date, there have been limited efforts to establish and implement solutions to resolve project cost overruns associated with project stakeholder complexity in South Africa.

Drawing on literature, it can be observed that construction project stakeholders are similar and/or overlap from project to project and region to region, informed by the project environment. Furthermore, their expectations and needs differ and may conflict, impacting the construction project budget negatively or positively. Davis (2016) puts forward that stakeholders define the success of a project differently, thus based on their specific success criteria in association with the project. On the other hand, Nasr et al. (2020) point out that multiple presences of stakeholders at different project phases present either positive or negative interests. In the same vein, Chan and Oppong (2017) state that in pursuit of meeting the project budget and completing the project successfully, construction project managers should know stakeholder threats and opportunities, establish mutual goals, satisfy social responsibilities, and apply suitable strategies to enhance equitable value optimisation and stakeholders' satisfaction. On this note, stakeholders' negative interests may pose a threat to the budgetary goals of the project. For example, failure to consult and involve the indigenous people in Cape Town, South Africa, resulted to the Amazon's Africa headquarters construction stoppages with financial implications (Matsakis, 2022).

Therefore, construction project managers should have accurate information and a clear understanding concerning stakeholders' goals in an effort to meet their needs, without negatively impacting the project's budgetary goals (Hwang & Tan, 2012; Doloi, 2012; Pietrosemoli & Monroy, 2013; Seddeeq et al., 2019). Supporting the foregoing narrative, Nasr et al. (2020) uphold that each stakeholder's position towards the project dictates the direction of that stakeholder's impact on the project outcome and influence on decision-making. On the same basis, this research study is focused on stakeholders' goals which influence the project budget. In particular, construction project managers are central to the study as they are involved in the project from start to end, dealing with diverse stakeholders with diverse goals in different phases. Therefore, internal and external stakeholders' insights are critically important in curbing cost overruns emerging from diverse stakeholders' expectations and interests; hence the researcher deduced the diagram in Figure 5.5, as an illustration of construction project stakeholders' complex network.

Figure 5.5: Construction project stakeholders' network



Source: Constructed by the researcher

Drawing from Figure 5.5, construction project managers are obliged to consider a vast number of project stakeholders based on their influence and connection to the project. For example, the client's expectation has to be considered, taking into account the project team or employees' ability to achieve the required expectation, concurrently considering the materials available from the suppliers. The expectations of the client should be aligned with the customers'/end-users requirements. To achieve the client's expectations, the regulatory framework that governs the

construction industry and labour market should be considered. Failure to consider regulatory frameworks such as the labour laws may result in trade unions initiating strikes. On the other hand, local authority and/or government may halt the project if the client's expectations are pursued in non-compliance with the regulatory authorities. While stakeholders such as financiers contribute financially towards the client's project expectations, consultants provide technical assistance; environmentalists ensure that the client's project expectations are achieved in an environmentally friendly manner, etc. In a nutshell, all the project stakeholders' interests, influence, impact, and contribution should be considered, monitored, and managed by project managers in pursuit of meeting the client's project expectations. Therefore, all are connected in one-way or another in influencing the direction of a construction project.

5.9 Conclusion

In conclusion, this chapter was two-fold, focusing on construction project cost overruns and stakeholder complexities. On construction project cost overruns, literature on project cost overruns causes from developed, developing, and underdeveloped countries, both globally and within the African continent, was reviewed. Subsequently, causes of construction project cost overruns were considered, focusing on the South African context. After that, the impact and possible solutions to curb construction budget overruns were discussed. On construction stakeholder complexities, literature on project stakeholders' identification was discussed by integrating secondary data from global, African, and South African research studies. Furthermore, diverse stakeholders' expectations that influence the project budget and ultimate project success, were discussed. Based on the literature review, construction project cost overruns remain a major problem globally, within the African continent, and in South Africa. Sparse studies have been conducted on the causes of cost overruns and stakeholder complexities in South Africa. In particular, a research gap is identified in addressing stakeholder complexity causes of construction cost overruns in South Africa. Furthermore, not many studies in South Africa focus on construction project managers involved throughout the project life cycle as a unit of analysis. Therefore, this study utilised construction project managers as a unit of analysis in addressing the research gap from a pragmatic standpoint, discussed in the next chapter.

CHAPTER SIX - RESEARCH METHODOLOGY

6.1 Introduction

This chapter explains the study's philosophical worldview and the research methodology paradigm undertaken in data collection and analysis, to answer the research objectives and gain a better understanding on how construction project cost overruns can be resolved in South Africa. Firstly, the research philosophy paradigm is defined and explained in relation to the study and the researcher's worldview. Secondly, the research methodology paradigm and the mixed method research paradigm selected for this study are discussed, followed by the underlying research design, population, sampling technique, data collection and data analysis descriptions. Furthermore, an explanation and discussion on reliability, validity and trustworthiness of data collection and data analysis follows. The chapter is concluded by explaining the ethical clearance issues which were taken into consideration for this study.

6.2 Philosophical paradigm

Research philosophy refers to the researcher's worldview in which research data should be collected, interpreted, analysed and utilised to gain knowledge (Creswell, 2014; Chan, 2017; Tomaselli, 2018). According to Creswell (2014, p.6), research philosophy is categorised into four worldviews, namely "*postpositivist, constructivism, transformative and pragmatism*". For the purpose of this study, pragmatism philosophical standpoint was followed. Peirce, Dewey, Rorty and James introduced pragmatism in the 19th and early 20th centuries (Hall, 2012; Du Plooy-Cilliers et al., 2015). Pragmatism is characterised by the integration of inductive and deductive approaches (Creswell, 2014; Chan, 2017; Wong & Cooper, 2017). The inductive approach determines behavioral meanings, patterns and trends of data collected, taking into account subjective opinions (Chan, 2017; Wong & Cooper, 2017; Baškarada & Koronios, 2018). Conversely, theory is built through objective means of measuring data in deductive approach, however it is inappropriate to explain and understand behavioral meanings (Chan, 2017; Wong & Cooper, 2017; Baškarada & Koronios, 2018). Therefore, pragmatism compares and validates inductive and deductive data by focusing on what will make a change, and link generic issues from an ontological and epistemology standpoint to a methodology standpoint (Creswell & Plano Clark, 2011; Shannon-Baker, 2016; Chan, 2017; Wong & Cooper, 2017; Panhwar et al., 2017; Henry & Foley, 2018).

Ontology refers to the structure and nature of reality 'what is' about the research study undertaken (Rawnsley, 1998; Biddle & Schafft, 2015). Ontology seeks the research facts. On the other hand, epistemology refers to the structure and nature of knowledge, specifically on how to know about the research reality and legitimate sources of knowledge (Childers & Hentzi, 1995; Giacobbi et al., 2005; Biddle & Schafft, 2015). Epistemology focuses on ways and means to know what is real, and the research facts (Rawnsley, 1998; Biddle & Schafft, 2015). From a qualitative research perspective, ontology is subjective and socially constructed resulting in multiple realities (Lincoln & Guba, 2000; Maree, 2016; Baškarada & Koronios, 2018). Epistemologically, there is close interaction between the knower and the known (Maree, 2016). The researcher is used as the data collection instrument therefore there is no separation of the phenomena and the researcher (Giacobbi et al., 2005). The researcher has an influence on the phenomena hence a dependent relationship. On the other hand, from a quantitative research perspective, ontology is objective, and numerically constructed through the application of scientific methods to reach generalised research conclusions (Lincoln & Guba, 2000; Maree, 2016; Baškarada & Koronios, 2018). Epistemologically, there is separation between the researcher and phenomena (Creswell, 1994; Giacobbi et al., 2005; Maree, 2016). The researcher and phenomena were independent.

This research study is aligned with the view that the phenomena should embed an ontological and epistemological status. However, independently studying the phenomena from the outside, based on an inquirer's view of questions to ask or studying the phenomena from the inside without the separation of the researcher and phenomena with a small sample was not going to yield accurate reality about the research study (Maree, 2016; Chan, 2017; Biddle & Schafft, 2015; Baškarada & Koronios, 2018). The researcher advocates for both studying the phenomena objectively (quantitative) from outside, and subjectively (qualitative) from within, to yield in-depth ontological phenomenon status. Embracing diverse epistemologies and methods have been encouraged by several scholars to accurately understand the true reality of the phenomena or construct, and derive knowledge about the research problem and the ultimate action to be taken with respect to the phenomena. (Whaley, 2001; Creswell, 2003; Johnson & Onwuegbuzie, 2004; Giacobbi et al., 2005; Biddle & Schafft, 2015; Wong & Cooper, 2017; Chan, 2017; Solstad et al., 2018). Herewith, ontology translates to facts which are practically useful, and can work to resolve the research problem. Ontology can be achieved by multiple forms of knowledge construction forms. Epistemologically, facts which are practically useful and can work are known through

multiple approaches. Therefore, this research study is grounded on a pragmatic worldview which takes into account of both quantitative and qualitative ontological and epistemological perspectives to answer the research questions.

Pragmatic research aims to find answers and practical solutions to problems by specifically selecting appropriate complementary methods, and commonly adopts mixed methods research by dually utilising quantitative and qualitative research methods (Cameron, 2011; Creswell, 2014; Du Plooy-Cilliers et al., 2015; Shannon-Baker, 2016; Maree, 2016; Chan, 2017; Wong & Cooper, 2017). Mixed methods are advantageous in the sense that qualitative data is used to compliment quantitative data in the research study and vice versa, therefore one can gain a better understanding of the phenomenon (Onwuegbuzie et al., 2009; Du Plooy-Cilliers et al., 2015; Shannon-Baker, 2016; Chan, 2017; Wong & Cooper, 2017). Likewise, mixed methods research was utilised by merging quantitative and qualitative research methods, with the aim to specifically find solutions to eradicate project management stakeholder complexities in South Africa within the construction industry.

6.3 Mixed methods research paradigm

A research paradigm refers to a systematic technique of solving the research problem (Amaratunga et al., 2002; Kothari, 2006; Stanley, 2013; Mackey & Gass, 2015; Maree, 2016; Flick, 2018; Kumar, 2019). There are three research methodology paradigms, namely mixed method research paradigm, quantitative research paradigm and qualitative research paradigm (Mackey & Gass, 2015; Maree, 2016; Chan, 2017; Baškarada & Koronios, 2018). The mixed method research paradigm was employed for this study. Mixed method research integrates both qualitative and quantitative research paradigms in data collection and data analysis, to draw conclusions from a single study (Johnson et al., 2007; Zikmund et al., 2012, 2013; Chan, 2017; Sætra, 2017; Creswell & Creswell, 2017). In social sciences, a mixed methods research approach is still developing, while quantitative and qualitative research approaches are well-established (Giacobbi et al., 2005; Maree, 2016; Chan, 2017; Sætra, 2017). “Quantitative research is a process that is systematic and objective in its ways of using numerical data from only a selected subgroup of a population” (Maree, 2016, p. 145) and “qualitative research is an inquiry process of understanding, where a researcher develops a complex, holistic picture, analyses words, reports details views of the informants, and conducts the study in a natural setting” (Maree, 2016, p. 265). Next, the mixed methods paradigm where quantitative and qualitative research

methodology is succinctly explained in relation to the study, respectively. This is followed by the rationale to use both quantitative and qualitative research methodology paradigms for this study.

Quantitative research focuses on mathematically based procedures and methods, to statically explain the research phenomena emanating from numerical data (Aliaga & Gunderson, 2002; Muijs, 2010; Maree, 2016; Baškarada & Koronios, 2018). Numerical data, objectivity and generalisation are the three major elements of the quantitative research approach (Muijs, 2010; Maree, 2016). Descriptive statistics that emanate from the numerical data is used to explain variable relationships and to reach objective research conclusions (Charles & Mertler, 2002; Maree, 2016; Baškarada & Koronios, 2018). A quantitative research approach is characterised by a large sample size, which is predominantly chosen from larger populations (Maree, 2016). A large sample size enables the researcher to generalise the sample findings as being representative of the population (Maree, 2016). In quantitative research, knowledge is produced rationally in a fixed set-up, deductively explained to reach a logical research conclusion about the phenomena studied (Newman et al., 1998; Amaratunga et al., 2002; Maree, 2016; Walliman, 2017). Therefore, the instrument used to collect quantitative data for this research study was a questionnaire including structured closed-ended questions with predetermined responses (Amaratunga et al., 2002; Maree, 2016; Walliman, 2017).

Qualitative research methodology focuses on numerous behavioural trends, processes, reflections, cultural and social contexts to understand, constructing knowledge and resolving the research phenomenon studied (Percy et al., 2015; Taylor et al., 2015; Maree, 2016; Merriam & Grenier, 2019). The aim of qualitative research is to gather descriptive rich data, to understand a specific phenomenon being studied (Taylor et al., 2015; Merriam & Grenier, 2019). Shared meanings, language and consciousness are commonly embedded elements of qualitative research (Taylor et al., 2015; Maree, 2016; Merriam & Grenier, 2019). The study phenomenon meanings are constructed based on an understanding of the participants' worldview and experiences (Taylor et al., 2015; Maree 2016). Therefore, qualitative research is subjective in nature, with the understanding that each particular situation is unique. The study phenomena are understood from its naturalistic context and interpreted from the participant's worldview (Percy et al., 2015; Baškarada & Koronios, 2018; Merriam & Grenier, 2019). The behavioural trends of the subjects of study are unpredictable (Taylor et al., 2015).

Qualitative research is characterised by a small sample size, where participants with the most experience with respect to the studied phenomenon, are selected (Boddy, 2016; Maree, 2016; Merriam & Grenier, 2019). The researcher collects data in the form of words or texts from the participants by asking broad, open ended questions with respect to the study phenomenon. Participants ideally have broad and unique views and experiences about the study phenomenon (Percy et al., 2015; Taylor et al., 2015; Merriam & Grenier, 2019). Qualitative research is an interpretive paradigm rooted in hermeneutics of research theory, concerned with depth and quality of information provided (Taylor et al., 2015; Baškarada & Koronios, 2018; Merriam & Grenier, 2019). Therefore, knowledge is produced relationally with perceptual tentative answers, which are interpreted deductively and inductively, to understand the facts about the phenomena being studied (Maree, 2016; Baškarada & Koronios, 2018; Merriam & Grenier, 2019). The research at hand dealt with senior project managers who have had different experiences with regards to project cost overruns, in relation to project stakeholders, complexities, therefore individual 'reality' with this regard was essential in solving the project cost overruns phenomenon.

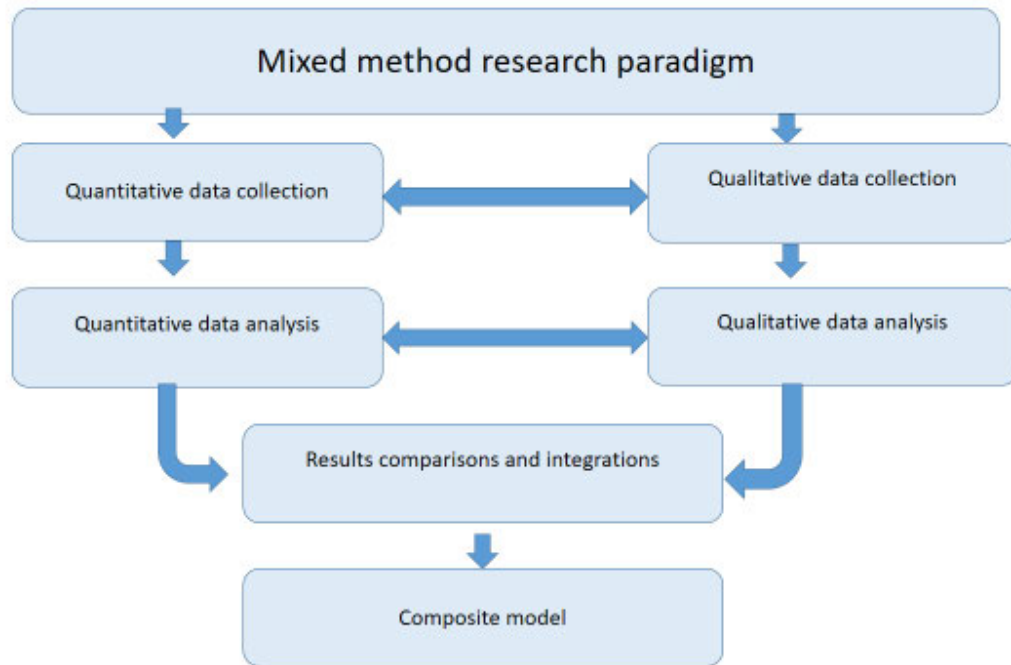
Numerous researchers have succeeded in overcoming the challenges associated with mixing qualitative and quantitative research approaches and have found mixed methods research paradigm more reflective of the true nature of the phenomena (Fischer, 1998; Brannen, 2017). Research approaches overlap and have evolved in hybrid designs to overcome weaknesses of quantitative and qualitative research methods when utilised individually (Maree, 2016; Panhwar, Ansari & Shah, 2017; Baškarada & Koronios, 2018). Therefore, utilisation of mixed methods research paradigm enabled the researcher to dually capitalise on the strengths of qualitative and quantitative research methods, hence producing a broader understanding of the research phenomenon (Maree, 2016; Shannon-Baker, 2016; Creswell & Creswell, 2017; Wong & Cooper, 2017; Panhwar et al., 2017; Baškarada & Koronios, 2018). Generalisation of the findings with respect to the larger population and in-depth understanding about the phenomenon, is gained from utilising both quantitative and qualitative research approaches, respectively (Maree, 2016; Wong & Cooper, 2017; Shannon-Baker, 2016; Baškarada & Koronios, 2018).

The assumption in quantitative research is that there is a common objective reality across participants (Newman et al., 1998; Muijs, 2010; Shannon-Baker, 2016). In the same manner, the researcher argues that the nature of reality should be common across the study participants. Thus, the ontological status derived from both quantitative and qualitative approaches, was complimentary. The objective of the study informs and determines the researcher's choice of a research approach (Muijs, 2010; Shannon-Baker, 2016; Chan, 2017). Similarly, the researcher's pragmatic approach to resolve project stakeholder complexities to curb project cost overruns, informs the utilisation of mixed methods research paradigm as the best fit to gather data. To develop a model and reach research conclusions, mixed methods research paradigm enabled the researcher to understand project management stakeholders' complexities and project cost overruns from multiple epistemological views and interpretations.

6.4 Mixed methods research design

Research data was collected and discussed at the same time by means of concurrent triangulation design to confirm and collaborate both quantitative and qualitative data (Maree, 2016; Warfa, 2016; Creswell & Creswell, 2017). Concurrent triangulation design refers to the use of quantitative and qualitative methods to gather both types of data simultaneously with the aim of understanding the study of interest better by comparing and contrasting study findings to produce well-validated conclusions (Bentahar & Cameron, 2015; Maree, 2016; Warfa, 2016; Dewasiri et al., 2018). Concurrent triangulation design enabled the researcher to use the same participants once-off in data collection, hence the timeframe was shorter, compared to other mixed method sequential designs (Bentahar & Cameron, 2015; Maree, 2016; Creswell & Creswell, 2017; Dewasiri et al., 2018). Quantitative research questionnaire distribution and qualitative research interviews in gathering data from the participants was done simultaneously. Upon completion of data collection, the researcher analysed quantitative and qualitative data simultaneously and compared the two sets of data to determine convergence. See Figure 6.1 as an illustration of the mixed research methodology paradigm undertaken to collect data analysis and reach research inferences for this study.

Figure 6.1: Mixed methods research paradigm



Source: Constructed by the researcher

6.5 Population and study sample

In research, the term ‘population’ refers to the total study objects and consists of individuals, organisations, groups, things of interest, human products and events from which information is required or the conditions to which they are exposed to, with the aim to make specific inferences (Welman et al., 2012; Wiid & Diggins, 2013; Maree, 2016; Creswell & Creswell, 2017). A sample is defined as a subsection of the total research population which is considered to be representative of the total study population (Du Plooy-Cilliers et al., 2015). A sample is drawn from the population of interest, and alternatively, a sample may be the total population of the research study (Welman et al., 2012, Creswell & Creswell, 2017). A representative sample reflects the features of the total research population (Du Plooy-Cilliers et al., 2015; Murgan, 2015).

The population of this study comprised professional construction project managers registered with the South African Council for Project and Construction Management Professions (SACPCMP) Board located in Midrand, South Africa. The SACPCMP board “is a statutory body established by section two of the Project and Construction Management Act, 2000 (Act No. 48 of 2000) founded to provide statutory professional certification, registration and regulation of project and

construction management professionals” (South Africa 2011, p. 9). SACPCMP comprise of three categories, namely, construction health and safety, project and construction project management, and building inspectors’ registration. The project and construction project management can be further categorised into four groups, namely professional construction managers, candidate construction managers, professional construction project managers, candidate construction project managers and professional construction mentors (SACPCMP, 2019). From the aforementioned categorisation, the target population of this study were professional construction project managers, and professional construction mentors.

Professional construction managers and candidate construction managers are responsible for the onsite physical construction process within the built environment and includes the co-ordination, administration, and management of resources (SACPCMP, 2019). The difference between professional construction managers and candidate construction managers is that the former is experienced, and the later are new graduates with accredited built environment qualification (SACPCMP, 2019). Professional construction project managers, candidate construction project managers, and professional construction mentors are all responsible for the physical construction process within the built environment from conception to completion, including management of related professional services. However, they differ as professional construction project managers are experienced in comparison to candidate construction project managers who are newly graduates (SACPCMP, 2019). In addition to professional construction project managers, responsibilities, professional construction mentors are seasoned practitioners responsible for the evaluation and assessment of a contractor’s skills, identification of the contractor’s shortcomings, and the provision of suitable relevant professional advice to the contractor, to address these shortcomings to achieve the contractor’s potential (SACPCMP, 2019).

6.5.1 Quantitative sample determination

Purposively, professional construction project managers, and professional construction mentors who interact with diverse stakeholders throughout the project life cycle, were the target population for this study (SACPCMP, 2019). Professional construction managers and candidate construction managers, who are mainly involved during the project execution phase and candidate construction project managers without experience, were excluded from this study (SACPCMP, 2019). The population for this study comprised a total of plus or minus 900, therefore, the total study population was $N = 900$ for both quantitative and qualitative data collection (SACPCMP, 2019). The gatekeeper advised that an online questionnaire could only be distributed by

SACPCMP personnel because of previous clientele harassment by external stakeholders. Due to the professional board gatekeeper questionnaire distribution requirements, the sample size that was calculated based on Krejcie and Morgan's (1970) was discarded. Therefore, both probability and non-probability sampling methods were inevitably used for quantitative data collection. In particular, the stratified probability sampling was integrated with simple random non-probability sampling to accommodate the researcher's constraints posed by the gatekeeper in regard to online questionnaire distribution. On the other hand, purposive non-probability sampling method was used for qualitative data collection.

6.5.2 Qualitative sample determination

The qualitative intended sample size $n = 15$ was drawn from the same pool of professional construction project managers. The sample size was deduced based on qualitative saturation numbers from previous studies, homogeneity of the study population, timeframe and the budget, to undertake the study (Fusch & Ness, 2015; Maree, 2016; Sim et al., 2018). Saturation refers to a stage reached where no new relevant data is obtained from data collection (Dworkin, 2012; Fusch & Ness, 2015). The findings by Mason (2010) show that the average saturation sample size is $n = 31$ for purely qualitative studies. Arguably Boddy (2016) contends that, practically, saturation occurrence sample size is $n = 12$ for a homogeneous population. The findings of Mason (2010) and Boddy (2016) were taken into consideration in determining the sample size. The researcher used a mixed methods approach therefore not entirely qualitative, and the study population were construction project managers, therefore homogenous in nature. The intended qualitative sample size for this study was 15 construction project manager interviewees. This sample size is greater than $n = 12$ saturation occurrence for homogenous population and average of the purely qualitative studies. Furthermore, the sample size of 15 is in accordance with Bertaux's guideline recommendations for qualitative data collection, regardless of the chosen research methodology (Bertaux, 1981).

6.6 Sampling method

Academic research is categorised into probability and non-probability sampling methods (Du Plooy-Cilliers et al., 2015; Maree, 2016). A probability sampling method is characterised by the principle of randomness in selecting the population sample (Du Plooy-Cilliers et al., 2015; Maree, 2016). All units of analysis in probability sampling method have a fair chance to be included in the sample, therefore the findings of the study can be generalised to the corresponding population

(Welman et al., 2012; Maree, 2016). Probability sampling is classified into four sampling methods, namely: stratified sampling method, simple random sampling method, systematic sampling method and cluster sampling method (Welman et al., 2012; Du Plooy-Cilliers et al., 2015; Maree, 2016). Conversely, non-probability is a non-random sampling method characterised by certain underlying settings and requirements of the research, in selecting the population sample (Du Plooy-Cilliers et al., 2015; Etikan et al., 2016; Maree, 2016). Units of analysis in a non-probability sampling method do not have an equal chance of inclusion in the sample and certain units of analysis may have a zero chance of inclusion in the sample. Non-probability sampling is also classified into four sampling methods, namely quota sampling method, convenience sampling method, snowball sampling method and purposive sampling method (Welman et al., 2012; Du Plooy-Cilliers et al., 2015; Maree, 2016).

6.6.1 Stratified sampling and simple random method

In a stratified sampling method, the population is split into a number of non-overlapping groups called strata, and each group of the strata is called a stratum (Welman et al., 2012, Du Plooy-Cilliers et al., 2015; Maree, 2016). A stratified sampling method aims to address issues of unequal distribution and non-homogeneity of the population (Du Plooy-Cilliers et al., 2015; Maree, 2016). Proportional allocation and equal allocation are the two main methods of allocating sample sizes to strata (Du Plooy-Cilliers et al., 2015; Maree, 2015; Maree, 2016). Proportional allocation is where a proportional number of units of analysis is drawn from each stratum, proportional to the population stratum size and equal allocation is whereby the same number of units of analysis are drawn from each stratum (Du Plooy-Cilliers et al., 2015; Maree, 2015; Maree, 2016).

The proportional allocation strategy was utilised whereby the size of the sample in each stratum was taken in proportion to its population size. The sampling frame for this study is based on South African provinces (Strata) and each province represents a stratum. According to SACPCMP (2019) the professional construction project managers registered with SACPCMP Board per province were as follows:

- Gauteng Province: 351
- KwaZulu-Natal Province: 144
- Western Cape Province: 108
- Eastern Cape Province: 99

- Mpumalanga Province: 72
- Limpopo Province: 54
- Free State Province: 36
- Northwest Province: 18
- Northern Cape Province: 18

Total: 900

In order to deduce the minimum stratum sample representation, the population numbers per province were converted into percentages. Herewith, the percentage of each province (stratum) was calculated as follows:

- Gauteng Province; $351 \div 900 = 39\%$
- KwaZulu-Natal Province; $144 \div 900 = 16\%$
- Western Cape Province; $108 \div 900 = 12\%$
- Eastern Cape Province; $99 \div 900 = 11\%$
- Mpumalanga Province; $72 \div 900 = 8\%$
- Limpopo Province; $54 \div 900 = 6\%$
- Free State Province; $36 \div 900 = 4\%$
- Northwest Province; $18 \div 900 = 2\%$
- Northern Cape Province; $18 \div 900 = 2\%$

To accommodate the online questionnaire distribution, the simple random sampling technique was the most suitable sampling method in each stratum (province). According to Bryman (2012), simple random sampling technique gives room for each member of the target population to have the same chance of being selected to participate in the study. According to Nichols (1995) and Masegare (2016), a simple random sample is free of bias if two conditions are met:

- The sampling frame is accurate, detailed and cover the full target population
- Fieldworkers must succeed in contacting all those selected

Similarly, simple random sampling method was utilised in each stratum, providing equal opportunity for each project manager to participate, informed by their voluntary will to be included in the study. Furthermore, the sampling frame was accurate, detailed, and covered the full target population, as it purposely excluded other construction project practitioners registered with

SACPCMP. The personnel at SACPCMP succeeded in contacting and distributing the online questionnaire to all the project managers selected from the SACPCMP database.

Proportional population percentages per province informed the qualitative sample size per province/ and the decision to select the five provinces with the highest proportional numbers. Therefore, the proportional stratum qualitative sample size of $n = 15$ per province was calculated as follows:

- Gauteng Province; $0.39 \times 15 = 5$
- KwaZulu-Natal Province; $0.16 \times 15 = 2$
- Western Cape Province; $0.12 \times 15 = 2$
- Eastern Cape Province; $0.11 \times 15 = 1$
- Mpumalanga Province; $0.08 \times 15 = 1$
- Limpopo Province; $0.06 \times 15 = 1$
- Free State Province; $0.04 \times 15 = 1$
- Northwest Province; $0.02 \times 15 = 1$
- Northern Cape Province; $0.01 \times 15 = 1$

Financial restrictions were considered, particularly travelling and accommodation expenses, and time limitation was concurrently informed by construction project execution concentration, based on SACPCMP membership. The qualitative sample size of $n=15$ was drawn from Western Cape province, KwaZulu-Natal province, Gauteng province, and Eastern Cape province.

6.6.2 Purposive sampling method

Purposive sampling method is applied in special circumstances with a specific purpose in mind and here the researcher deliberately selects the respondents based on the qualities of the participants (Tongco, 2007; Teddlie & Yu, 2007; Etikan et al., 2016; Maree, 2016). The specific underlying qualities of the participants would have to be verified by prior data collection (Maree, 2016; Etikan et al., 2016). Therefore, the units of analysis in each stratum for quantitative data collection were professional construction project managers, based on their involvement in the construction projects from inception to closure. For qualitative data collection, senior professional construction project managers with at least ten years work experience were used as units of analysis in each stratum. It was the researcher's opinion that senior professional construction project managers would contribute valuable information immensely to this research study based

on their experience, knowledge and involvement with diverse stakeholders from project initiation to completion, for at least a decade.

6.7 Data collection

Data collection refers to the procedure undertaken, to gather information from both primary and secondary sources (Blankenship, 2010; Maree, 2016; Creswell & Creswell, 2017). Primary data is first-hand information gathered by the researcher from the study participants by means of questionnaires, interviews and observations (Du Plooy-Cilliers et al., 2015; Murgan, 2015; Maree, 2016). In particular, questionnaires are the most common instrument for data collection for social science research (Murgan, 2015). Secondary data refers to existing information which may be obtained from published journal articles, textbooks, databases, government gazette public documents and other various sources from the internet (Du Plooy-Cilliers et al., 2015; Maree, 2016). For this research study, primary data was qualitatively collected by means of interviews, and quantitatively by means of online questionnaires as instruments of data collection. Secondary data was gathered from various sources such as published journal articles, textbooks, databases, government gazette public documents and other various sources from the internet.

6.7.1 Data collection instrument

For the purpose of this study, a questionnaire and interview schedule were used as data collection instruments. According to Bryman (2012) a questionnaire is a collection of questions distributed to respondents. Similarly, Kalusopa (2011) supports that a questionnaire is a data collection instrument consisting of questions and prompts, aimed at gathering information from respondents. A questionnaire, as a data collection instrument, should be applicable to the research study undertaken (Mouton, 2001). Questionnaires are the most popular data collection instrument utilised in research surveys and exist in diverse formats; postal or mail based, self-administered, interviewer-administered, online surveys, interview schedules or telephonic (Creswell, 2004). Self-administered questionnaires comprise postal, delivery and collection, as well as online questionnaires. Foregoing the above information, a questionnaire should consist of any set of questions relevant to the study and administered in accordance with the study requirements. Therefore, the researcher found online self-administered questionnaires to be more appropriate for quantitative data collection and interview questions for qualitative data collection.

6.7.1.1 Questionnaire development and pilot study

In developing a questionnaire, the structure, content, sequence, format and alignment to meet research study objectives, are major considerations when formulating questions (Bell, 2003). Furthermore, it is essential that the formulated questions are tested through a pilot study to ensure questions can be asked and answered as planned (Welman et al., 2005; Koita et al., 2018). According to Malmqvist et al. (2019), a pilot study helps to identify and address questionnaire weaknesses. Close-ended and open-ended questions are the two types of questions included (Babbie & Mouton, 2001; Leedy & Ormond, 2005). In close-ended questions, respondents select an answer from a list of options provided by the researcher, while in open ended questions, respondents provide their own answers to the question (Babbie & Mouton 2001). Close-ended questions are mostly preferred by researchers because they are easier to code, compared to open-ended questions (Leedy & Ormond, 2005). However, the main drawback of closed ended questions is that respondents are forced to only select answers from the provided options, without giving room for unexpected answers.

For this research study, the questionnaire was developed by the researcher, informed by the research questions, research objectives, and preliminary literature review, with a specific focus on the research problem. Furthermore, a statistician was consulted in developing the research questionnaire to review the structure, content, sequence, format and applicability of the questions to the research study. To test the validity of the questionnaire, a pilot study was conducted in the month of November 2018, prior to the ethical clearance approval application and distribution to the larger population. Input from the pilot study was integrated to finalise the questionnaire development. The questionnaire was converted into an online survey, after ethical clearance approval, and due to the construction professional board ethical boundaries. The questionnaire comprised close-ended questions. To alleviate closed-ended question's drawbacks, the questionnaire consisted of questions with 'other, specify' and an open-ended option at the end "Any other additional information," to allow respondents to provide unexpected answers which were not part of the closed -questions options.

There were four sections in the questionnaire, namely:

- **Section A:** Demographic information. This section consisted of questions that sought information and answers on socio-demographics of construction project managers.
- **Section B:** Project stakeholders' complexities (and) contribution to project cost overruns. This section consisted of questions that sought information and answers about the extent to which project stakeholders' complexities contribute to cost overruns within the construction industry in South Africa.
- **Section C:** Project stakeholders' involvement and communication regarding the project budget. This section consisted of questions that sought information and answers on stakeholder's involvement and communication with regards to the project budget within the construction industry in South Africa.
- **Section D:** Project stakeholders' influence on the project budget: Project managers' experiences. This section consisted of questions that sought information and answers on project managers' experiences with regard to project stakeholders and project budgets within the construction industry in South Africa.

In the questionnaire, the closed-ended questions consisted of nominal and ordinal questions. Nominal questions are questions without numerical ranking options, which can provide two or more options (Kumar, 2017). Nominal questions that only provide two options for respondents to select the answers but are not limited to 'yes or no,' 'true or false,' 'male or female' are called dichotomous questions (Batchelder & Narens, 1977; Kumar, 2017). Nominal questions with more than two options are called multiple choice questions (Kumar, 2017). The questionnaire for this study consisted of dichotomous, nominal questions with 'male or female' options, and 'yes or no' options. Also, multiple choice questions were included in the questionnaire with multiple options.

Ordinal questions are questions with two or more ordered options provided for selection as an answer (Kumar, 2017). Likert-scale questions are the most commonly used ordinal technique to measure respondents' attitudes, opinions, and beliefs. Five-point Likert-scale questions were mostly used in sections B to D of this study questionnaire. Table 6.3 shows examples of diverse Likert-scale ordinal question variables comprised in the questionnaire. The scales of 1-5 measures the intensity of the respondents' feelings concerning the question, with 1 being the lowest intensity and 5 being the highest intensity.

Table 6.1: Likert-scale question variables

Scales	Likert-scales question variables		
1	Very dissatisfied	Strongly disagree	Never
2	Dissatisfied	Disagree	Rarely
3	Neutral	Undecided	Sometimes
4	Satisfied	Agree	Very frequently
5	Very Satisfied	Strongly agree	Always

Constructed by the researcher

6.7.1.2 Interviews

Interviews were also used as a data collection instrument to supplement data gathered from the questionnaires. Interviews as a data collection instrument enable the researcher (Interviewer) to have personal contact and interaction with the participant (Interviewee). According to Creswell (2006), interviews are categorised into three types, namely: structured interviews, semi-structured interviews and open unstructured interviews. Structured interviews are characterised by questions which are standardised across all participants, aimed to promote data reliability. In a semi-structured interview, questions are aligned to specific objectives, but the interviewer allows the conversation to flow towards the achievement of the set objectives. According to Mouton (2013) the scope of the semi-structured interview is limited to specific subtopics, therefore, questions are developed in advance. In the far extreme, unstructured interviews are characterised by generic objectives, allowing the interviewer to ask spontaneous questions about the area explored. Spontaneity of the interview conduction allows the interviewer to exploit special experience, insights or knowledge from respondents (Welman et al., 2005). For the purpose of this study, semi-structured interviews were used as a data collection instrument. A set of questions aligned to the study objectives were developed by the researcher in advance.

6.7.2 Quantitative data collection

Quantitative data was collected from construction project managers registered with the SACPCMP. Due to the ethical code of conduct relating SACPCMP clientele harassment, the researcher was prohibited to have a direct contact with the participants. The gatekeeper advised that the research can only be conducted via the professional board personnel. Therefore, a link of an online questionnaire linked to the researcher's google drive was provided to the gatekeeper, for distribution to the participants on the 8th of May 2019. Subsequently, data collection commenced on the 9th of May 2019 and ended on the 30th of June 2019. During the data collection period, four reminders were sent to the respondents on the 14th of May 2019, 21st of May 2019, 3rd of June 2019 and 19th of June 2019. All the online questionnaire questions were mandatory. Completed online questionnaire were directly sent to the researcher's google drive.

After data collection completion, the collected data was extracted from the researcher's google drive for capturing in SPSS.

6.7.3 Qualitative data collection

Purposively, senior construction project managers were selected, based on their experience, which was important to the study. Therefore, a list of the most senior construction project managers, which included mentors within the professional board, were provided to the researcher by the gatekeeper from the professional board database. Thereafter, the researcher selected twenty potential interviewees from the list. Based on stratified sampling criteria (See section 6.6.1), the interviewees were selected from four provinces where construction projects tend to be concentrated, and it may be noted that construction project managers are prominently constructed in South Africa (SACPCMP, 2018). Therefore, five potential interviewees were emailed in each of the provinces selected, which were Gauteng, KwaZulu Natal, Western Cape, and Eastern Cape. The email comprised both the consent letter and the interview questions. In the email, the gatekeeper from the professional board was copied in the email. Fifteen interviewees consented, including five from Gauteng, four from KwaZulu Natal, four from Western Cape, and two from Eastern Cape. Of the twenty potential interviewees, fifteen consented to the interview.

Semi-structured interviews comprising open-ended questions were used to collect qualitative data. This method was chosen so that construction project managers could provide responses based on their own experiences, and articulate ideas that were not initially anticipated at the beginning of the study. Furthermore, semi-structured interviews allowed the participants to provide detailed information and insights. Geer (1988) and Popping (2015) affirm that open-ended questions allow for detailed information and accurately measure the salient concerns of the participants. Moreover, probing questions in semi-structured interviews allow for investigated participants to understand key terms and provide comprehensive answers on the subject matter (Singer & Couper, 2017; Neuert et al., 2021).

6.7.3.1 Interview appointments and place

Prior to making travel arrangements, the researcher contacted the interviewee/s to schedule an appointment. Interview appointments were agreed between the researcher and the interviewee, based on the interviewee's availability. The interviews were carried out at mutually convenient venues and times as per agreed interview dates presented in Table 6.2. Taking into consideration

that construction project managers are rarely in an office space set-up, a combination of venue settings, depending on participants' preference were utilised; these included offices, coffee shops, a participant's home, construction site, and one interview was conducted in a car. Mutual agreement was reached between the researcher and the interviewee, concerning the convenience of the venue in terms of surrounding noise and disruption. Therefore, venues with none to minimum noise and disruptions, were selected. In addition, to ensure a relaxed atmosphere and encourage participants' freedom, participants suggested and selected both the venue and time to conduct the interview.

Table 6.2: Construction project managers participants' list, location and interview date

Participants	South African province location	Date of the interview	Construction industry experience
Interviewee 1	Eastern Cape	30 June 2019	Private and Public sector
Interviewee 2	Western Cape	07 July 2019	Private and Public sector
Interviewee 3	Western Cape	13 July 2019	Private
Interviewee 4	Western Cape	20 September 2019	Private and Public sector
Interviewee 5	KwaZulu-Natal province	16 October 2019	Private and Public sector
Interviewee 6	KwaZulu-Natal province	18 October 2019	Private and Public sector
Interviewee 7	KwaZulu-Natal province	18 October 2019	Private sector
Interviewee 8	KwaZulu-Natal province	20 October 2019	Private and Public sector
Interviewee 9	Eastern Cape	29 October 2019	Private and Public sector
Interviewee 10	Gauteng province	08 November 2019	Private and Public sector
Interviewee 11	Gauteng province	08 November 2019	Private and Public sector
Interviewee 12	Gauteng province	09 November 2019	Public sector
Interviewee 13	Gauteng province	09 November 2019	Private sector

Constructed by the researcher

6.7.3.2 Voice recording equipment

To record the interviews, the researcher's personal cellphone (Samsung A30s) and a digital audio recording machine (Sony's ICD-UX512 voice recorder) were used. The Sony's ICD-UX512 voice recorder was selected because it had a built-in USB Plug/Connector which made it easier to transfer the recordings to the computer and/or laptop. Furthermore, the recorder had a built-in memory totaling 2GB, which allowed adequate space for all the audio interviews and earphone jack to directly listen to the audio recordings via earphones. The Samsung A30s cellphone was used as a back-up in case of recorder failure or malfunction. Spare batteries for the recorder were kept as a back-up, in case of running out of battery power, to prevent incomplete interview recordings. In addition, as a precautionary measure, both the cellphone and the recorder were tested prior to each interview to ensure functionality through a short conversation that was recorded and played back.

6.7.3.3 Interview conduction

Prior the commencement of the interview, the researcher explained the objectives and aims of the study with reference to the interview questions. Also, the interviewee's consent to record the interview was re-requested prior to each interview, in addition to the prerequisite consent letters which were initially emailed. The researcher conducted all the interviews. The Whyte's Directiveness Scale (Whyte, 1982) was used which encouraged voice tone, reflections on the participants' responses, probing questions and subsequent introduction of the new research aspect. Probing questions which prompt further explanation, clarification, or justification (Sahin & Kulm, 2008) were asked to ensure the adequacy of information provision from the interviewees. Moreover, probing questions were asked where the interviewees were unclear or provided inadequate information to the main interview question.

During the planning stage, fifteen construction project managers consented to conduct the interview and were the target of the study. However, during data collection, one interviewee withdrew from the study, leaving fourteen interviewees and saturation was reached at the 13th interviewee, whereby no new information was being provided by the interviewees (Guest et al., 2006; O'Reilly & Parker, 2012; Fusch & Ness, 2015). The interviews per province comprised four in Gauteng, four in KwaZulu Natal, three in Western Cape and two in Eastern Cape. In addition to the Gauteng interviewee's withdrawal from the research, one interview from Western Cape was canceled due to data collection saturation. In terms of gender distribution, the interviewees comprised of two females, and eleven males.

6.8 Data analysis

Data analysis encompasses the process of transcribing, coding, organising and breaking research data into manageable units to make sense of data therefore identifying data patterns and making research decisions based on the patterns (Sekaran & Bougie, 2016; Maree, 2016; Creswell & Creswell, 2017; Tomaselli, 2018). According to Du Plooy-Cilliers et al. (2015), data analysis forms the basis of the researcher's findings, conclusions, recommendations and possibly the development of the research model to solve the research problem. In a mixed method approach, numeric quantitative data is summarised into meaningful descriptive statistics, and interpretive qualitative data is summarised into meaningful themes, which both ultimately result in collective research study findings, conclusions and recommendations (Timmreck, 2002; Maree & Pietersen, 2007; Creswell & Creswell, 2017; Tomaselli, 2018). Likewise, quantitative data was captured on IBM (SPSS) version 25 software thereafter summarised into meaningful descriptive

and inferential statistics. Qualitative data was transcribed and captured in NVivo 12 software and analysed through thematic and content analysis by focusing on repeated words, trends and patterns of words, relationships, ideas or phrases of the respondents' text responses into meaningful themes.

6.8.1 Quantitative data capturing

Prior to capturing the quantitative gathered information from the participants into SPSS, a codebook was prepared. The codebook included an overview of all the instructions required as well as data from each subject, before it was converted to SPSS. The steps involved in creating the codebook were: defining and labeling each variable; allocating numbers to each of the online questionnaire responses; saving the recorded data; and finally, abbreviating names with numbers to permit insertion into SPSS (Pallant, 2011; MacInnes, 2016; Babbie et al., 2022).

6.8.2 Quantitative data cleaning

Data cleaning is the process of identifying errors and fixing them, to prevent their impact on the study (Van de Broeck & Fadnes, 2013; Awang et al., 2018). It has been established that IBM (SPSS) version 25 software was used to analyse the quantitative data. Although SPSS is a program that is frequently used for quantitative analysis, errors can still occur. Therefore, prior to data analysis, the researcher checked for possible data errors. These errors were entries made not in accordance with the intended composition and/or coding such as duplicates and missing values.

6.8.3 Quantitative descriptive statistics

Descriptive statistics is the statistical technique used to describe and summarise numerical data, by applying frequency distribution tables to establish the number of occurrences and percentages of variable data responses (Wilson, 2010). Sekaran and Bougie (2016) state that descriptive statistics show the frequencies, percentages, mean scores and degree of variability among dependent and independent variables of the data set collected. Kiyici and Yamak (2021) state that descriptive analysis uses numbers and graphics to increase data usability by condensing and summarising large volumes of data. For clarity and ease, descriptive statistics are presented in tables, pie charts, bar graphs, and histograms. Data analysis commences with descriptive statistics to create an impression in the reader's mind about the data collected (Sekaran & Bougie,

2016). This study used descriptive statistics to answer a range of study research questions, and data was presented in frequencies, percentages, mean scores, and degree of variability among dependent and independent variables of the data set collected.

6.8.4 Quantitative inferential statistics

Inferential statistics is based on interpretations drawn from the collected sample data to conclude trends in a larger population (Wilson, 2010; Selvan & Balasundaram, 2021). Similarly, Sekaran and Bougie (2016) affirm that inferential statistics aim to determine the relationship among variables and differences among two or more groups to draw research conclusions. Cooper and Schindler (2008) substantiate that inferential statistics evaluate a population sample and confirm the research hypothesis. Parametric and non-parametric tests are the two major tests of the research hypothesis to determine data distribution normality (Saunders et al., 2013; Hu & Plonsky, 2021; Charron & Annoni, 2021). Parametric tests are used when data collected is normally distributed (Hu & Plonsky, 2021). Conversely, non-parametric tests are used when data collected is abnormally distributed (Hu & Plonsky, 2021). For this study's inferential statistics, the IBM SPSS version 25 software application was used to test whether data is normally distributed or abnormally distributed, and therein informed statistical regression and correlation to be conducted.

6.8.5 Qualitative data transcriptions

The recorded audio for each interview was transferred from the Sony's ICD-UX512 voice recorder to the researcher's personal laptop. During the transfer process, confidentiality was maintained at all times, thus the recordings were transferred to the researcher's laptop for transcriptions, of which both the recorder and the laptop were only used by the researcher. Transcribing is an immensely tedious and time-consuming process (McLellan et al., 2003; Matheson, 2007; Loubere, 2017). Regardless of the tediousness of transcribing, French (1993) indicated that transcribing was useful for researchers to re-familiarise themselves with the data. Likewise, the researcher transcribed the interviews, which helped in getting re-acquainted with the data. It must be noted that interview transcriptions were immensely time-consuming. The researcher had to repeatedly listen to a section of an interviewee's recordings, in the cases where the recordings were not clear, due to poor sound and/or poor quality, to prevent data distortion. The researcher completed the transcripts process over a period of five months. Upon the completion of the

transcripts, the researcher cross-checked each audio interview against the typed transcript for accuracy and uploaded the transcriptions into NVivo 12 software for analysis.

6.8.6 Common Method Variance test

According to Fuller et al. (2016), Harman's single-factor test is a simple and widespread statistical tool that detects Common Method Variance (CMV) or Common Method Bias (CMB). Following this technique, researchers introduce all the scale items into exploratory factorial analysis and examine the unrotated factor solution to obtain the number of components with eigenvalues greater than 1 that explain the aggregate variance. The assumption here is that, if CMV exists, only one component will account for more than 50% of the covariance between the items and the criterion constructs (Podsakoff et al., 2003; Bozionelos & Simmering, 2022). The following set of Likert-scale questions were combined and tested for CMV; construction stakeholders' impact on the project budget, construction project cost effectiveness on the budget, construction project activities, and factors impacting the budget and construction project managers' experiences and perceptions.

6.8.7 Linear correlation and regression analysis

Linear correlation analysis measures the degree of the linear relationship's strength between variables (Schober et al., 2018). Schober et al. (2018, p. 1763) state that "in correlated data, the change in the magnitude of 1 variable is associated with a change in the magnitude of another variable, either in the same (positive correlation) or in the opposite (negative correlation) direction". The correlation test is applicable to normally distributed data with linear relationships between variables (Garson, 2012). On the other hand, linear regression analysis is characterised by only 1 independent variable (x) which is used to predict other variables' changes, and 1 dependent variable (y) which is being predicted (Schober et al., 2018). The values of the independent variable (x) are considered known constants in linear regression (Kutner et al., 2005; Schober et al., 2018). For this study, Pearson correlation and linear regression, which are applicable for jointly, normally distributed (for) data determining variables relationships, and (for) predicting changes in variables, were used, respectively.

6.8.8 Cronbach's Alpha test

Cronbach's Alpha test is used to measure internal consistency in determining the relatedness of items as a group (Hajjar, 2018). Internal consistency establishes the interrelationship of a set of items (Schmitt, 1996; Hajjar, 2018). Questions, indicators, or rates in the form of a scale are typically groupings of items measured with Cronbach's Alpha (Masegare, 2016). According to Sekaran and Bougie (2009), Cronbach Alpha is a reliability coefficient, that shows how well the items in a group are positively related to one another. A scale of at least 0.7 Cronbach Alpha's coefficient is considered reliable (Nunnally, 1978; Kumari et al., 2021). In the current study, Cronbach's Alpha coefficient was determined for internal consistency for the following set of Likert-scale questions: construction stakeholders' impact on the project budget, construction project cost effectiveness on the budget, construction project activities, and factors impacting the budget and construction project managers' experiences and perceptions.

6.8.9 Content and thematic analysis

Content analysis is grounded on the notion that texts are valuable data sources with immense capability to disclose valuable information regarding specific phenomena (Kondracki et al., 2002; Kleinheksel et al., 2020). Content analysis refers to a procedure in which participants and context are considered in organising text into groupings of related categories, to determine patterns, similarities, associations, and differences (Graneheim et al., 2017; Kleinheksel et al., 2020). Content analysis is applicable to both quantitative and qualitative data analysis (Krippendorff, 2018). Manifest and latent are the two forms of conducting content analysis. Manifest focuses on describing what is literally present in the text (Kondracki et al., 2002; Kleinheksel et al., 2020). The manifest content analysis focuses on easily observable data, without identifying deeper meaning (Kleinheksel et al., 2020).

The application of manifest content analysis would include identifying observable targets in the text, such as the number of times a particular word appears in an interview or the occupation of interviewees (Potter & Levine-Donnerstein, 1999). This reflects a surface-level analysis with an assumption that objective truth can be disclosed with very little interpretation. On the other hand, latent content analysis focuses on interpreting hidden, deep meaning within the text (Kleinheksel et al., 2020). In latent content analysis, the implications of the participants' experiences are deduced and emphasises the importance of the researcher in co-creating meaning from text (Kleinheksel et al., 2020).

According to Braun and Clarke (2006), thematic analysis is a process of analysing qualitative data, which entails the identification, analysis, and reporting of repeated patterns across the data set at hand. Kiger and Varpio (2020) define thematic analysis as a method for describing data, that involves the interpretation process in selecting codes and developing themes. Braun and Clarke (2006, p. 82) define a theme as a “patterned response or meaning” drawn from the data set which informs the research questions. Thus, themes are created through the examination of the content and context of the transcribed information (Vaismoradi et al., 2016; Braun & Clarke, 2022). Thematic analysis emphasises the cultural, social, and structural contexts which influence individual experiences, ultimately enabling the development of themes in knowledge creation and revealing meanings through the interactions between the researcher and participants (Kiger & Varpio, 2020).

The process of coding, assessing meaning, and providing a description of the social reality through the development of themes, are all components of content and thematic analysis (Vaismoradi, et al., 2016; Braun & Clarke, 2022). Content and thematic analysis are similar in nature in the sense that “both involve codes and coding” and both integrate manifest analysis, thus interpreting variables that are directly observable, and latent analysis, thus interpreting variables that are unobservable constructs in deducing meaning (Neuendorf, 2018:211). Content and thematic analysis are differentiated, in that content analysis is applicable to both quantitative and qualitative research (Neuendorf, 2018; Kleinheksel et al., 2020). Quantitative content analysis focuses on objectivity, observability, and measurability of data (Kleinheksel et al., 2020), while the qualitative content analysis is focused on the researcher’s interpretation of individuals’ experiences (Kleinheksel et al., 2020). On the other hand, the thematic analysis only applies to qualitative research (Neuendorf, 2018; Kiger & Varpio, 2020; Braun & Clarke, 2022). Considering that the research at hand is a mixed method, both content and thematic analysis were applied through examination of each data in relation to the research objectives, and therein application of codes to the various themes and patterns identified. The analysis enabled the researcher to focus on both manifest and latent information relevant to the research objectives and permitted logical argument through textual meaning.

6.8.9.1 Transcription thematic development and coding in NVivo

Prior analysis, the researcher attended numerous NVivo qualitative data analysis workshops hosted by the University of KwaZulu Natal, presented by statisticians from either qualitative or mixed methods field. Furthermore, the researcher watched numerous YouTube video webinars on qualitative data analysis using NVivo and read through several qualitative research chapters from previous dissertations and theses for further insights into analysing qualitative data. Deductive and inductive triangulation coding was utilised for this study, guided by the interview questions to generate themes. Deductive codes are utilised when the researchers already know what they are trying to find, and then the researcher goes through the dataset or transcripts and attribute words and phrases that are fitting to that particular category or node. On the other hand, inductive codes are utilised when the researcher goes through transcripts and codes content that is relevant to the research study, attributed, and given a name informed by research objectives. The first phase of analysis conducted by the researcher was to print all the transcripts and read through the content for familiarisation and highlighted all the key text relevant to research objectives, concurrently allocating inductive thematic annotations to the selected key text/content. This process enabled the researcher to preliminarily develop themes to be utilised, in addition to the themes informed by the interview questions.

During coding, themes were deductively developed extracted from the interview questions, and additional themes were developed based on highlighted inductive content from the printed transcriptions. Furthermore, additional themes inductively emerged during coding when the researcher went through the transcriptions. Most of the themes developed during the first coding, were further queried during the second phase in developing a thematic framework. A thematic framework process involved grouping the codes into positives that contained success factors, and negatives that contained failure factors. The remaining codes which could not be allocated to positives and negatives were analysed and allocated to the following themes which emerged: project scope variables, use of innovation and technology, stakeholders' training and experience, stakeholders' responsibility, and accountability. Codes within all the identified themes were further reviewed and analysed starting with codes that were used once or had few references, ultimately identifying the same codes with a different wording and merging them together while the insignificant codes to the research study objectives were deleted. Thereafter, child-codes representing sub-themes were aggregated to the parent codes representing main themes.

6.9 Reliability, Validity, and Trustworthiness

The following section focuses on reliability and validity in association with the quantitative research of this study and trustworthiness, in association with qualitative research aspects of this study.

6.9.1 Reliability

Reliability refers to the extent to which a research measurement tool produces consistent outcomes (Zikmund et al., 2010; Du Plooy-Cilliers et al., 2015; Maree, 2016). Same results should be obtained when the research instrument is utilised at different timeframes or administered to different units of analysis of the same population (Zikmund et al., 2010; Maree, 2016). Reliability was achieved by asking multiple questions of the same concept in different ways (Bradburn et al., 2004; Zikmund et al., 2010; Maree, 2016). The results are reliable, based on the consistency of the respondents' answers. In this study, reliability of the findings was promoted by asking multiple questions on each objective. Precision has an influence on the reliability of the findings, and it incorporates homogeneity, reproducibility and stability (Khan et al., 2011).

Precision refers to the proportion of relevant studies identified by a search strategy expressed as a percentage of all studies identified by that method (Khan et al., 2011; Du Plooy-Cilliers et al., 2015). The researcher used academic search engines such as Google scholar and Google books, which are directly linked to academic databases such as Sage, Emerald or Science Direct, comprising academic journals. Key phrases and words in field project management in relation to stakeholders and budget in the construction industry, were used to search and gather literature to maximise relevance. The researcher reviewed the most relevant academic studies.

6.9.2 Validity

Validity refers to the degree of accuracy an instrument is at measuring what it is intended to measure and to which the study results are possible to estimate the facts of the respondents drawn for the study (Khan et al., 2011; Du Plooy-Cilliers et al., 2015; Maree, 2016). Validity measures the accuracy of the study findings; valid findings should be free of bias and be generalisable to other settings (Bradburn et al., 2004; Petticrew & Robert, 2008; Zikmund et al., 2010; Khan et al., 2011; Du Plooy-Cilliers et al., 2015; Maree, 2016). Construct validity refers to

the use of multiple, heterogeneous indicators that increase the likelihood of adequately identifying the construct of interest, was used for this research (Linn, 1993; Haynes & Kubany, 1995; Zikmund et al., 2010; Du Plooy-Cilliers et al., 2015; Maree, 2016). Construct validity incorporates content validity, criterion validity, convergent and divergent validity.

6.9.2.1 Content validity

Content validity refers to the degree to which elements of the research measurement tool is relevant and covers all the aspects with respect to the targeted population construct (Haynes et al., 1995; Du Plooy-Cilliers et al., 2015; Maree, 2016). Content validity emphasises covering scope entirety of the construct without going beyond the concept being measured (Vogt et al., 2004; Goodwin, 2009; Muijs, 2010; Zikmund et al., 2010; Maree, 2016). For the purpose of this research, all the content in the questionnaire and interview schedule were exclusively aimed towards the achievement of the research objectives; to investigate the extent to which project stakeholder complexities contribute to project cost overruns in South Africa within the construction industry, to determine the level of project stakeholders' involvement and communication with regards to the project budget within the construction industry in South Africa, to explore project managers' experiences with regards to the factors that influence the project budget in relation to project stakeholders within the construction industry in South Africa and ultimately develop a model which may be used by project managers to curb stakeholder-related project cost overruns.

6.9.2.2 Criterion validity

Criterion validity focuses on correlation of the variable scores of the elements of the research measurement tool (Zikmund et al., 2010; Du Plooy-Cilliers et al., 2015; Maree, 2016). Higher correlation reflects high levels of validity (Du Plooy-Cilliers et al., 2015; Maree, 2016). Conversely, a lower correlation reflects low levels of validity (Du Plooy-Cilliers et al., 2015; Maree, 2016). Criterion validity is categorised into two: predictive validity or concurrent validity (Zikmund et al., 2010; Du Plooy-Cilliers et al., 2015; Maree, 2016) Predictive validity establishes that the scores from a measurement process gives an accurate forecast with respect to the construct (Haynes et al., 1995; Given, 2008; Muijs, 2010; Zikmund et al., 2010; Bernard, 2011). Concurrent validity measurement procedure occurs when two different measurement procedures are carried simultaneously (Haynes et al., 1995; Given, 2008; Muijs, 2010; Zikmund et al., 2010). For the purpose of this study, concurrent validity was established in designing the research questionnaire, to accurately establish the extent to which construction project managers can effectively and

efficiently liaise with project stakeholders to alleviate stakeholder complexities and cost overruns by triangulation design.

6.9.2.3 Convergent and divergent validity

Convergent validity refers to measuring the same concept with very different methods (Haynes et al., 1995; Goodwin, 2009; Zikmund et al., 2010) and is achieved when different methods yield similar or the same results (Vogt et al., 2004; Zikmund et al., 2010). In this research, convergent validity was achieved by means of utilising both closed-ended quantitative questions and interview qualitative open-ended questions in the research questionnaire/s with the aim to yield similar results. Divergent validity, which measures a concept to discriminate that concept from other closely related concepts, was not part of this study because construction management is part of project management (Goodwin, 2009). Therefore, construction management concepts in relation to the budget and stakeholders, cannot be measured in isolation from project management concepts. In a nutshell, validity aims to minimise biases and is dependent on the research design, instrument and analysis.

6.9.3 Trustworthiness in qualitative research

Qualitative research trustworthiness can be evaluated by adopting the five strategies of Lincoln and Guba's framework, namely, credibility, transferability, dependability, conformability, and authenticity (Lincoln & Guba, 1985; Creswell, 1998; Denzin & Lincoln, 2000; Lemon & Hayes, 2020; Bafandeh Zendehe et al., 2022). The following section details the applicability of trustworthiness in qualitative research and the study at hand based on credibility, transferability, dependability, conformability, and authenticity.

6.9.3.1 Credibility

Credibility measures the value of qualitative research truthfulness based on confidence in the truth of the data and interpretations (Cutcliffe & McKenna, 1999; Lemon & Hayes, 2020; Bafandeh Zendehe et al., 2022). Credibility focuses on whether the qualitative research findings are accurate and correct (Gray, 2018). To allow raw data to be scrutinised and promote credibility, Gray (2018) further encourages the use of audio recording devices, rather than the researcher's notes. Also, informally confirming the accuracy of participants' understanding during the data collection process promotes credibility (Lincoln & Guba, 1985; Gray, 2018; Bafandeh Zendehe et al., 2022).

The researcher's representation, research methods, and participants' views inform the truthfulness, accuracy, and correctness of qualitative research credibility (Tobin & Begley, 2004; Johnson et al., 2020; Prawira et al., 2022). Lincoln and Guba (1985) recommended techniques such as persistent observation, prolonged engagement, data collection triangulation, and researcher triangulation to address credibility. To achieve credibility for this study, audio recordings were utilised to allow raw data scrutinisation, and probing questions in the form of data collection triangulation were used. In addition, researcher triangulation was used during interviews to ascertain participants' understanding.

6.9.3.2 Transferability

Transferability pertains to the extent to which qualitative research findings can be transferred or generalised to other settings or groups (Nowell et al., 2017). Tobin and Begley, (2004) argue that transferability is applicable to the case-to-case transfer. Therefore, transferability is facilitated by the researcher by providing thick descriptions to those who seek to transfer the findings to their settings (Lincoln & Guba, 1985; Lemon & Hayes, 2020). The transferability of qualitative research was demonstrated by providing a detailed description of the research findings, and the content of the interviews with selected participants' quotes. Aligned to Tobin and Begley, (2004), the qualitative research's findings are transferable based on case-to-case transfer, due to the diverse nature of stakeholders' budgetary impact on construction projects in different geographical areas.

6.9.3.3 Dependability

Dependability is achieved when research readers are able to scrutinise the research process (Lincoln & Guba, 1985; Nowell et al., 2017). The research process should be clearly traceable, logical, and documented (Tobin & Begley, 2004; Bafandeh Zendeh et al., 2022). Records such as field notes, raw data, and transcripts that can help researchers to relate, systemise, and cross-reference qualitative data should be kept, to ascertain the study's dependability (Halpren, 1983; Koch, 1994; Nowell et al., 2017; Bafandeh Zendeh et al., 2022). Similarly, dependability for this study research process was achieved by indicating the dates when interviews were conducted with the interviewees (traceability), safely archiving recorded audio, and documenting the transcripts.

6.9.3.4 Confirmability

Credibility, transferability, and dependability need to be established as a prerequisite for confirmability (Guba & Lincoln 1989). According to Tobin and Begley (2004), confirmability focuses on establishing how the researcher derived the findings and interpretations from the data. The researcher should be able to demonstrate how interpretations and conclusions were reached (Tobin & Begley, 2004; Nowell et al., 2017; Lemon & Hayes, 2020). Furthermore, confirmability is ascertained by the motives for the selected methodology, theoretical underpinnings, and analytical choices throughout the research study in order for readers to understand why and how decisions were made by the researcher (Koch, 1994). In this study, the researcher achieved qualitative research confirmability by repeatedly listening to the interview recordings and reading the transcripts to derive the findings and interpretations from the data and ultimately reach research inferences. Further, the reasons for the selected methodology, theoretical underpinnings, and analytical choices were explained in detail.

6.9.3.5 Authenticity

Qualitative research authenticity pertains to the power and control of the participants' voices during the interview process (James & Busher, 2006; Lemon & Hayes, 2020). Authenticity focuses on the extent to which the researchers fairly and faithfully show a range of different realities and convey the feeling, tones, and experiences of participants' lives as they are lived, in relation to the study (Whitaker & Atkinson, 2019). The voice and experiences of the participants were made visible for this study by articulating their views and providing direct quotations from the interviews. Therefore, all aspects which determine trustworthiness (credibility, transferability, dependability, conformability, & authenticity) were observed in the qualitative research part of this study.

6.10 Ethical considerations

Ethical issues such as honesty, safety, plagiarism, informed consent and respect for the rights of entities carry legal implications and therefore need to be taken into consideration; these are crucial when undertaking a research project (Welman & Kruger, 2001; MacColl et al., 2005; Hennink et al., 2010; Du Plooy-Cilliers et al., 2015; Tomaselli, 2018). The researcher should at all times follow the ethical underlying principles; the obligation to act moral, the responsibility to avoid any harm and the respect of the participants involved in the research study (MacColl et al., 2005; Hennink et al., 2010; Plooy-Cilliers et al., 2015; Walliman, 2017). The following ethical issues should be taken into consideration by the researcher and the university in respect of the

participants; informed consent, self-determination, minimisation of harm, anonymity and confidentiality (MacColl et al., 2005; Hennink et al., 2010; Du Plooy-Cilliers et al., 2015).

Informed consent refers to the permission granted by the participants to the researcher to form part of the research study (MacColl et al., 2005; Hennink et al., 2010; Plooy-Cilliers et al., 2015). When obtaining informed consent, the researcher has a duty to provide adequate information about the study in a comprehensible format (MacColl et al., 2005; Hennink et al., 2010; Plooy-Cilliers et al., 2015; Walliman, 2017). The participants should make voluntary decisions to participate in the research study with the full understanding of its implications (MacColl et al., 2005; Hennink et al., 2010; Plooy-Cilliers et al., 2015). Participants should self-determine their involvement in the study and should not be manipulated in any way so as to gather information (Hennink et al., 2010; Plooy-Cilliers et al., 2015; Walliman, 2017). Participants have the right to withdraw or refuse participation without negative consequences (MacColl et al., 2005; Hennink et al., 2010; Plooy-Cilliers et al., 2015). The research study should not put the participants at risk of any harm. The identities of participants should be kept anonymous and be protected at all times (MacColl et al., 2005; Hennink et al., 2010). In addition, all information and data gathered from the participants ought to be kept confidential (MacColl et al., 2005; Hennink et al., 2010; Walliman, 2017).

The aforementioned ethical research issues are fundamental and followed at the University of KwaZulu-Natal. Ethical clearance approval is the prerequisite to collect data at the University of KwaZulu-Natal, where the researcher was registered for doctoral studies. The researcher followed all the University's ethical clearance guidelines and procedures which involved the following steps. The researcher was required to ask for permission and obtain a consent gatekeeper letter from the entity where the researcher was conducting the research study. The study was conducted in South Africa with the South African Council for Project and Construction Management Professions (SACPCMP) Board. Therefore, the researcher contacted SACPCMP Board to ask for permission to conduct the study with the board for the participation of construction project managers registered in their database, and approval was granted in the form of a consent gatekeeper letter (See Appendix C). Furthermore, the researcher was required to prepare data collection instruments. These were required to have all ethical issues clearly articulated to the participants.

In this research study, a questionnaire, which later was converted to an online survey and interview questions, were the instruments utilised to gather data. Therefore, the researcher prepared the questionnaire, which comprised of the first two pages clearly detailing the research ethical issues. The first page of the questionnaire and interview questions were in the form of a consent request letter to the participants, explaining what the study was about, the study objectives and how the participants' input would assist the researcher to achieve the research objectives. The letter clearly stated that participation was voluntary, no monetary gains would be gained for participation and all information gained from the research would be used for research purposes and treated with the utmost confidentiality. The second page was the participation consent confirmation template (See Appendix A&B). All the documentation was submitted to SACPCMP and having read and understood the consent request, SACPCMP approved, by signing and dating the consent confirmation template, showing their consent on behalf of their members, to participate in the research study project (See Appendix E).

Having received the gatekeeper letter and prepared the research data collection instruments, the researcher completed the ethical application form, which detailed all ethical issues with respect to the research study. Thereafter, the ethical clearance application was submitted to the Graduate School of Business and Leadership Research Ethics Committee/Higher Degrees Committee and to the university research ethics committee for Human and Social Sciences, for approval. The ethical clearance application comprised of the research questionnaire, research interview schedule and the completed ethical clearance application form signed by the research supervisors. The ethical clearance application was approved for the researcher to proceed with data collection (See Appendix D). To meet ethical obligations during the quantitative data collection stage, the first online question required the participants to consent prior to completing the questionnaire (See Figure 6.3). Participants who completed the questionnaire online, consented both online and also via the SACPCMP professional board umbrella consent approval. For qualitative data collection, the consent letter was presented to the participants, together with the interview questions, and interviewees signed the consent letter to indicate the approval to participate in the study.

Figure 6.2: Online questionnaire consent form

The screenshot shows a web interface for an online questionnaire. At the top, there are navigation tabs: 'Questions' (underlined), 'Responses' (with a badge showing '152'), and 'Settings'. The main content area is titled 'Managing stakeholder complexities: A model to curb project costs overruns in the construction industry in South Africa'. Below the title, it says 'Dear Participant,' followed by a paragraph introducing the researcher, Moses Nyathi, and the research project. A second paragraph explains the study's aim. Below this is a question: 'Having read the details of the study, I consent to participate in this study by answering the below questions.' To the right of the question is a 'Multiple choice' dropdown menu. Below the question are two radio button options: 'Yes, I consent to participate in this research study' and 'No, I do not consent to participate in this research study'. Each option has a small 'X' icon to its right.

Source: Extracted from the study online questionnaire

6.11 Conclusion

In conclusion, this chapter discussed the research philosophical worldview aligned and deemed appropriate for the study. Thus, a pragmatism worldview which focuses on finding answers and practical solutions to problems by specifically selecting complementary methods, was chosen as the appropriate philosophy for this study. Next, aligned pragmatism philosophical worldview, a thorough explanation and justification of selecting the mixed methods approach was provided. Here, the mixed methods approach, which comprises quantitative and qualitative research was explained and applied. The explanations were two-fold, focusing on various components of quantitative and qualitative research approaches relevant to the study. Next, reliability, validity and trustworthiness considerations of the study were discussed. Lastly, the chapter detailed procedure and processes which were undertaken to meet the study ethical obligations. The next chapter provides a presentation and analysis quantitative data findings, obtained from the online questionnaire responses.

CHAPTER SEVEN - QUANTITATIVE DATA PRESENTATION AND ANALYSIS

7.1 Introduction

The previous chapter detailed the philosophical worldview underpinning this study and informed the research methodology paradigm undertaken in collecting and analysing data. Thus, the mixed methods approach paradigm incorporates quantitative and qualitative research methodology informed by a pragmatic philosophical worldview. This chapter focuses on the quantitative data presentation, and analysis of the findings obtained from the online questionnaire responses. Descriptive and inferential statistics data is presented in pie charts, graphs, tables and scatterplots. Firstly, the socio-demographic information accompanied by logistic regression is presented and analysed, followed by project stakeholder complexities that contribute to project budget cost overruns and stakeholders' involvement in different construction project life cycle phases. Next, project stakeholders' influence on the project budget based on project managers' experiences is presented and analysed. Lastly, multinomial, logistic regression model inferential statistics are provided.

7.2 Population response rate and construction project location

The professional board gatekeeper distributed the questionnaire online to 900 active construction project managers across provinces. However, due to the level of consent received, 152 construction project managers participated, equaling a 17% response rate after the gatekeeper had sent four reminders (Table 7.1). Equal to this study, the response rate and number of reminders, Sarfaty et al. (2015) achieved the same response rate of 17% after four reminders were sent. Similarly, several authors encountered a low online response rate; these include Naidoo (2011) who achieved 16.58% response rate, Amolo (2015) achieved a 19.56% response rate, Tsimtsiou et al (2015) achieved a 23.5%% response rate and Wieschowski et al. (2020) achieved a 7% response rate. In general, the findings by Yan and Fan (2010) emanating from numerous researchers, revealed that online surveys commonly have a low response rate. Table 7.1 depicts the participants' geographical variable distribution. The Gauteng province constituted 33%, KwaZulu Natal province 18%, Western Cape province 14%, Eastern Cape±± province 11%, Limpopo province 7%, Mpumalanga province 6%, Northern Cape province 5% and both Northwest and Free State province constituted 3% each. The findings show a relative response

rate reflecting the population distribution, that is, Gauteng Province having more construction project managers compared to other South African provinces.

Table 7.1: Population, sample and response rate

South African Province	Population representation per province	Response rate frequency
Gauteng province	351 (39%)	50 (33%)
KwaZulu-Natal province	144 (16%)	27 (18%)
Western Cape province	108 (12%)	21 (14%)
Eastern Cape province	99 (11%)	17 (11%)
Mpumalanga province	72 (8%)	9 (6%)
Limpopo province	54 (6%)	11 (7%)
Free State province	36 (4%)	5 (3%)
Northern Cape province	18 (2%)	7 (5%)
Northwest province	18 (2%)	5 (3%)
Total	900(100%)	152 (100%)
Actual response rate	152 / 900 = 17%	

7.2 Common Method Variance test

Table 7.2 shows a CMV of the combined Likert-scale questionnaire items. The CMV equals 14% less than 50% for all the combined Likert-scale items, which implies that the overall CVM is acceptable to proceed with data analysis. A CVM of less than 50% denotes an acceptable bias of the questionnaire instrument.

Table 7.2: Common Method Variance test

Common Method Variance/Bias test		
Total	% of variance	Cumulative
10.231	13.461	13.461

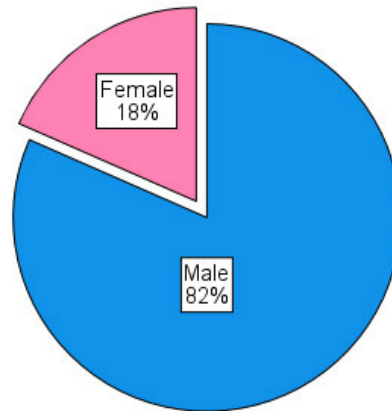
7.3 Demographic information

The socio-demographic information of the construction project managers operating in South Africa are presented and analysed in this section. The socio-demographic variables presented and analysed in this section, encompass construction project managers' gender, age group, level of education, educational background, projects completed, and work experience.

7.3.1 Gender

Figure 7.1 depicts the gender sample profile of the participants. Of the 152 participants, 18% were females and more than quadruple the percentage of females, 82% were males, reflecting a predominant male participation compared to females. Therefore, the construction industry in South Africa is a male-dominated sector.

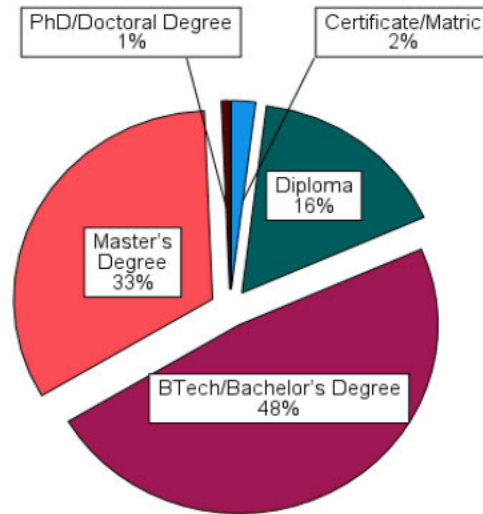
Figure 7.1: Gender profile



7.3.2 Level of education

The level of education influences the competence of construction project managers' capabilities to effectively liaise with numerous stakeholders and ultimately complete the project within the budget. Thus, all participants were requested to indicate their level of education. Figure 7.2 depicts the participants' level of education with 48% having attained bachelor's degree, 33% with a master's degree, 16% with a diploma, 2% with a matric certificate and 1% having attained a doctoral degree. Participants were generally educated, with the majority having attained a bachelor's degree. Managerial level positions are commonly occupied by educated people, which is a reflection of this study, with the majority of participants in possession of a bachelor's degree.

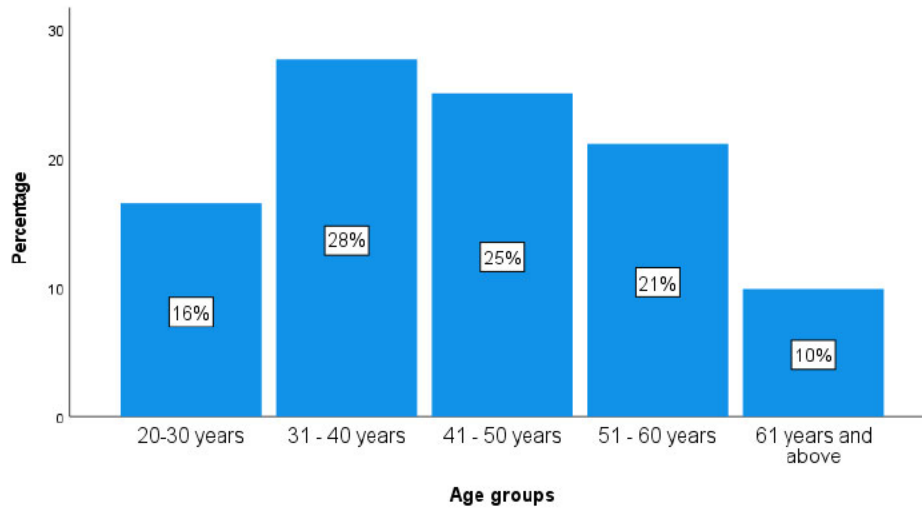
Figure 7.2: Level of education



7.3.3 Age group

The participants' age group ranged from 20 years to over 61 years. Depicted in Figure 7.3 is the age groups of the participants, thus; the age group between 20-30 years constituted 16%, the age group between 31-40 years constituted 28%, the age group between 41-50 years constituted 25%, the age group between 51-60 years constituted 21% and the age group of 61 years and over constituted 10%. In general, the majority of the participants were between 31-50 years old.

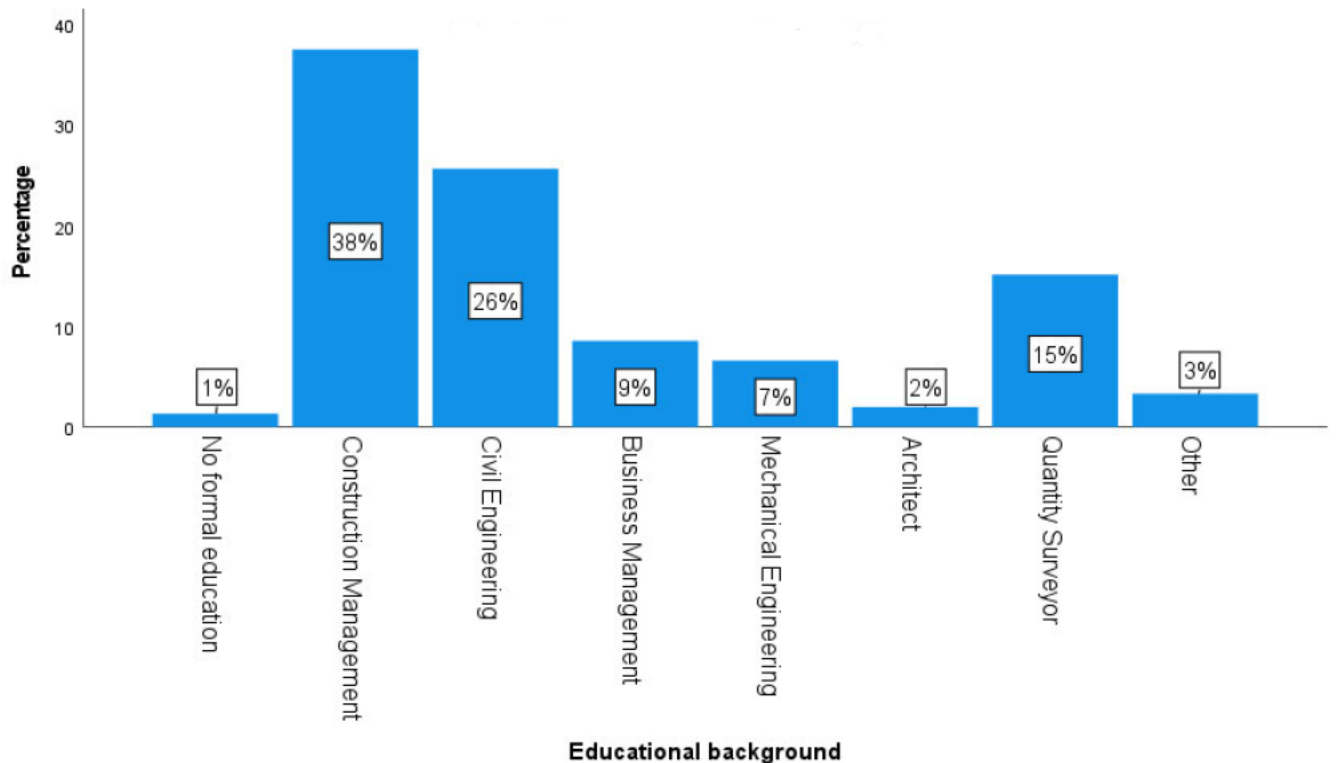
Figure 7.3: Age group



7.3.4 Educational background

Similar to the level of education, the educational background has an influence on the competence of construction project managers' capabilities to effectively liaise with numerous stakeholders, technical know-how and ultimately complete the project within the budget. With reference to Figure 7.4, the majority, 38% of participants, had a construction management background and significant percentage, 26% of the participants had a civil engineering background. Nine percent of the participants had a business management background, while the minority of the participants were represented by a percent (1%) with no formal education. In general, the construction industry in South Africa is dominated by construction management and civil engineering professionals as project managers.

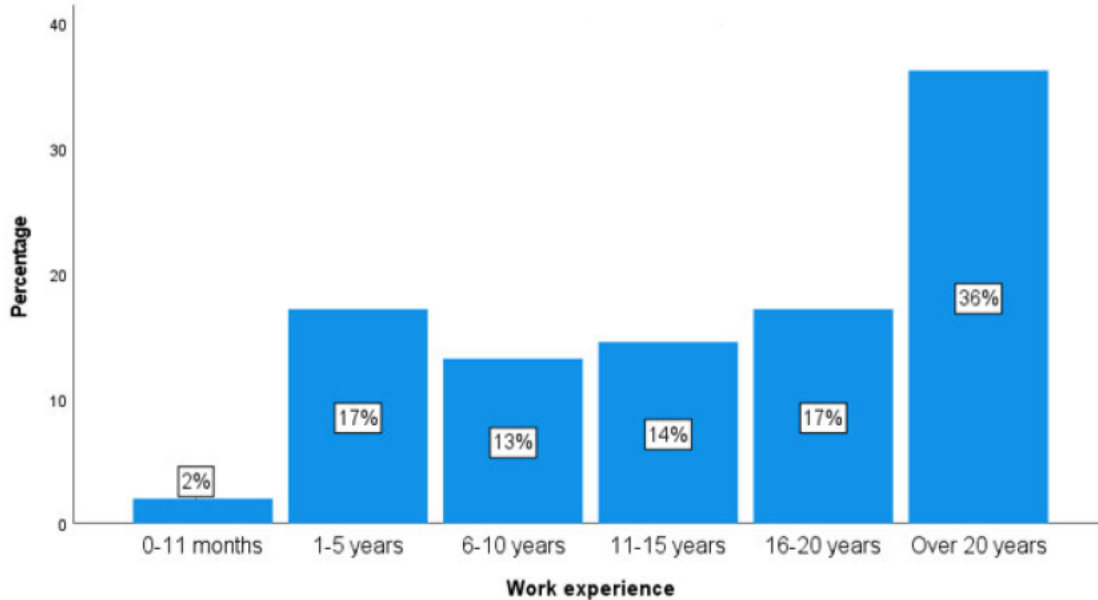
Figure 7.4: Educational background



7.3.5 Work experience

Similar to the level of education and educational background, work experience influences the competence of construction project managers' capabilities to effectively liaise with numerous stakeholders and ultimately complete the project within the budget. The minority comprising 2%, had less than a year's worth of work experience. The majority, comprising 36% of the participants had over 20 years of work experience and 17% had either 1-5 years or 16-20 years' work experience (See Fig. 7.5). This result reflects that managerial positions in the construction industry are held by personnel with lengthy work experience. In general, most of the construction project managers have adequate work experience in the South African construction industry. Therefore, participants' responses were informed by past experience, which is valuable for this study.

Figure 7.5: Work experience

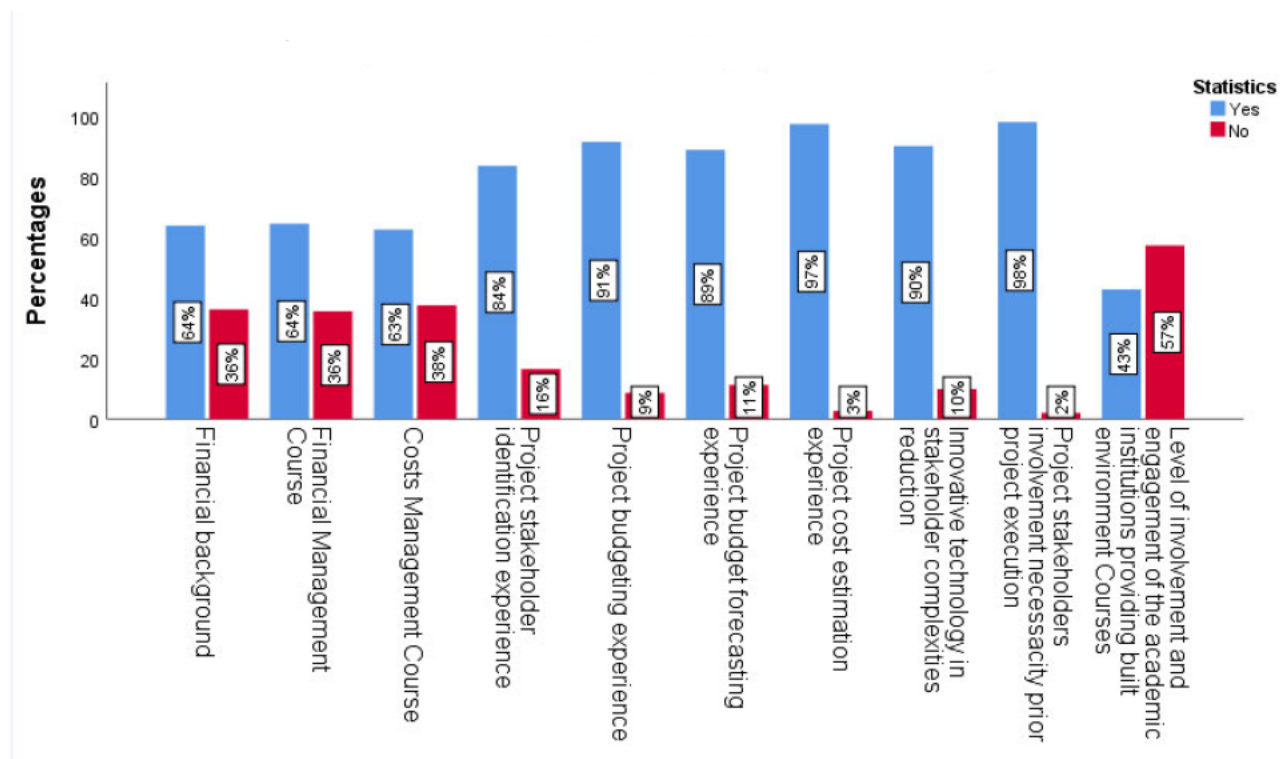


7.3.6 Educational background, experience and perceptions

The next diagram, Figure 7.6, shows the participants' educational background, experience and perceptions associated with the project budget and stakeholders. The majority of the participants had experience in project cost estimation (97%), budgeting (91%), forecasting (89%) and stakeholder identification (84%). The findings indicate that the participants were well experienced

with project budget and stakeholder related duties. Regarding stakeholder involvement, the majority of the participants - 98% - advocate for stakeholders' involvement prior project execution. This result clearly shows the importance of involving project stakeholders before the implementation of the project. The group above average, thus 64% of the participants, had a financial background and had completed a financial management course. Similarly, 63% of the participants had completed a cost management course. These results imply that in addition to project budget and stakeholder-related experience, participants had sound financial background and financial related qualifications.

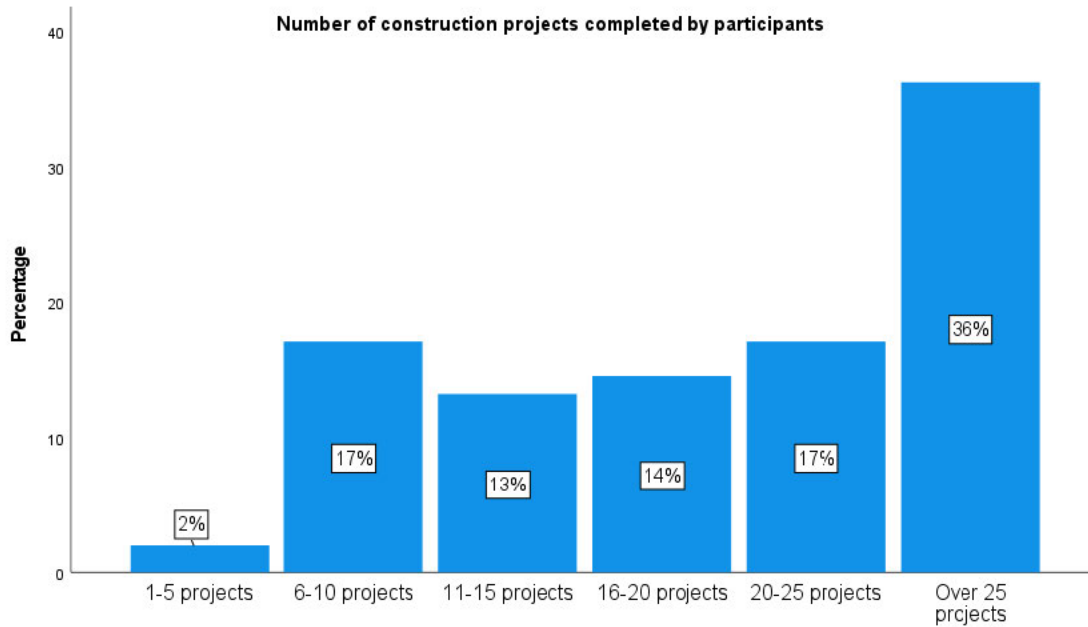
Figure 7.6: Educational background, experience and perceptions



7.3.7 Construction projects completed

The study also paid attention to construction projects completed by the participants which ties in with the construction project managers' work experience. As in construction project work experience, 36% of the participants completed more than 25 construction projects and equally, 17% completed 6-10 years or 20-25 projects (See Fig. 7.7).

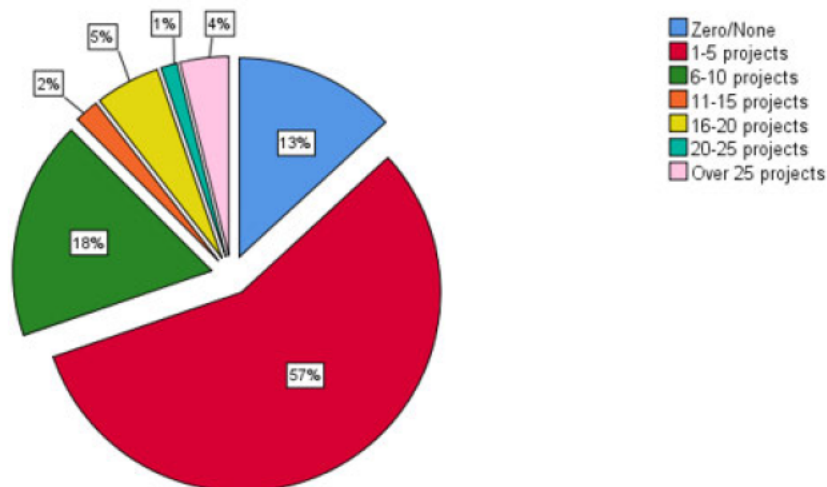
Figure 7.7: Construction projects completed



7.3.8 Construction projects completed with cost overruns

The pie chart below, in Figure 7.9, shows that the majority of the participants - 57% - completed 1-5 projects overruns, and 18% of the participants completed 6-10 projects over budget. These results imply that experience plays a significant role in project cost overruns. Thus, most construction project managers gradually take corrective action on their first to five project failures, and a significant number of construction project managers improve on their 6th to 10th project.

Figure 7.8: Construction projects completed with cost overruns



7.4 Construction project cost overruns logistic regression model

Table 7.3 shows the variables included in the logistic regression model to evaluate the influence of five important variable predictors on cost overruns. The predictors included were education, location/province, experience, educational background and the number of projects completed selected as independent variables. Furthermore, predictors were re-categorised for each of the interpretation (see Table 7.3) whereby responses with low frequency and high similarities were combined in order to conduct logistic regression. The dependent variable was denoted by the “construction projects completed with cost overruns”. Herewith, construction projects completed with cost overruns were categorised as Low (< 5 projects with project overruns) and defined as respondent reporting, with five or less projects having experienced cost overruns and as high (> 5 projects with project overruns) defined as respondent reporting > 5 projects having experienced cost overruns.

Table 7.3: Construction project cost overruns binary logistic regression variables.

Characteristics: project cost overruns predictors	Frequency (%)	
	Low (5 or less projects)	High (> 5 projects)
Education		
Some diploma or less	5 (3)	23 (15)
Bachelor's degree	19 (13)	54 (36)
Postgraduate degree	22 (14)	29 (19)
Location/Province		
Gauteng	18 (12)	31(20)
Eastern/Northern Cape	1(1)	22 (14)
Western Cape	8 (5)	14 (9)
Kwazulu-Natal	10 (7)	18 (12)
Limpopo/Mpumalanga	4 (3)	16 (11)
Northwest Cape/Free state	5 (3)	5 (3)
Experience		
5 years or less	3(2)	26 (17)
6 – 10 years	3(2)	17(11)
11 – 15 years	12(8)	10 (7)
16 – 20 years	6 (4)	20 (13)
> 20 years	22 (14)	33 (22)
Educational Background		
Construction Management	14(9)	43 (28)
Civil/Mechanical Engineering	15 (10)	34 (22)
Quantity Surveying/Architecture	9 (6)	17 (12)
Business Management/Other/No formal	8 (5)	12 (8)
Projects completed		
< 10 projects	6 (4)	42 (28)
11 – 20 projects	12 (8)	25(16)
> 21 projects	28 (18)	39 (26)

Table 7.4 shows logistic regression indicating the odd ratios of each characteristic, 95% CI and p-value to evaluate the influence of five characteristics on project cost overruns. Odds Ratios (OR) as well as 95% Confidence Intervals were reported. Results generally suggest that education, number of years of previous experience and number of past projects completed significantly, affect odds of experiencing high project cost overruns. Education was categorised into 'Some diploma or less', which was the reference and 'Bachelor's degree' and 'Postgraduate degree'. The model shows that the OR for bachelor's degree is insignificant (OR = 3.00, 95% CI = 0.82, 12.87, p-value = 0.11) while the OR Postgraduate education is significant reflecting increased odds of high project cost overruns (OR = 8.81, 95% CI = 2.17, 41.82, p-value = <0.01). The large 95% CI for Postgraduate education suggests that the estimate is imprecise. Similarly, the OR for number of years of previous experience 11 – 15 years was also significant (OR = 7.81, 95% CI = 1.12, 63.53, p-value = 0.04), though the large 95% CI suggest that the estimate is imprecise.

The model also shows that when compared to the Gauteng province/location, projects conducted in Eastern or Northern Cape had much lower odds of experiencing project cost overruns (OR = 0.03, 95% CI = 0.00, 0.19, p-value = <0.01). No other effect values for province/location reached significance. Finally, the fewer the past projects completed, the higher (were) the odds of project cost overruns (OR > 21 projects = 6.11, 95% CI = 1.34, 32.78, p-value = 0.02). Correspondingly, Table 7.2 results show an increasing rate of cost overruns for participants who had completed less than ten projects (<10 =28%) and a significant decrease rate of cost overruns after completing ten projects or more (11-20 = 16%). This implies that the more the projects completed, the better the construction projects managers' competence was in meeting budgetary goals. Consequently, it infers that experience considering the number of projects completed and therein lessons learned drawn from previous cost overruns, plays a critical role in curbing cost overruns.

Table 7.4: Construction project cost overruns logistic regression output.

Characteristics : project cost overruns predictors	Model Output		
	Odds Ratio	2.5%, 95% CI	p-value
Education			
Some diploma or less	<i>Ref</i>		
Bachelor's degree	3.00	0.82, 12.87	0.11
Postgraduate degree	8.81	2.17, 41.82	0.01
Location/Province			
Gauteng	<i>Ref</i>		
Eastern/Northern Cape	0.03	0.00, 0.19	0.01
Western Cape	1.76	0.39, 8.85	0.47
Kwazulu-Natal	0.55	0.16, 1.80	0.32
Limpopo/Mpumalanga	0.35	0.07, 1.48	0.17
Northwest Cape/Free state	2.46	0.45, 14.38	0.30
Experience			
5 years or less	<i>Ref</i>		
6 – 10 years	0.49	0.05, 4.16	0.51
11 – 15 years	7.81	1.12, 63.53	0.04
16 – 20 years	0.97	0.11, 8.98	0.98
> 20 years	2.99	0.43, 24.06	0.28
Educational Background			
Construction Management	<i>Ref</i>		
Civil/Mechanical Engineering	1.17	0.40, 3.40	0.77
Quantity Surveying/Architecture	1.96	0.53, 7.36	0.31
Business Management/Other/No formal	1.55	0.27, 9.28	0.62
Projects completed			
< 10 projects	<i>Ref</i>		
11 – 20 projects	3.33	0.73, 17.48	0.13
> 21 projects	6.11	1.34, 32.78	0.02*

7.5 Project stakeholder complexities contribution to project cost overruns

In the next section, data pertaining to the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa, is presented and analysed. Here, aspects associated with project stakeholder's participation and involvement on the construction project budget, stakeholders' impact on the project budget, levels of cost effectiveness in executing project activities, which affects the budget and diverse stakeholder-related factors which impact the budget, are discussed.

7.5.1 Construction project stakeholders' involvement in the budget

Depicted in Table 7.5, the construction project managers (95%), quantity surveyors (85%), client (75%), and the architects (67%) are the most involved in budget allocation and expenditure decision-making. On the contrary, lawyers (6%), suppliers (9%), plumbers (8%), and the

community, are the least involved, while stakeholders such as civil engineers (56%), financiers (51%), electrical engineers (51%), mechanical engineers (47%) and project administrators are moderately involved in budget allocation and expenditure decision-making. Based on difference-in-proportions z-tests, the construction project managers, quantity surveyors, clients, architects, lawyers, suppliers, plumbers, and the community have a p-value of <.001*, which means the results are highly significant. Therefore, project managers, quantity surveyors, architects, and clients are perceived as important in budget project meetings, while lawyers, suppliers, plumbers and the community are perceived as not necessary in budget project meetings.

Table 7.5: Construction project stakeholders' involvement in project budget meetings

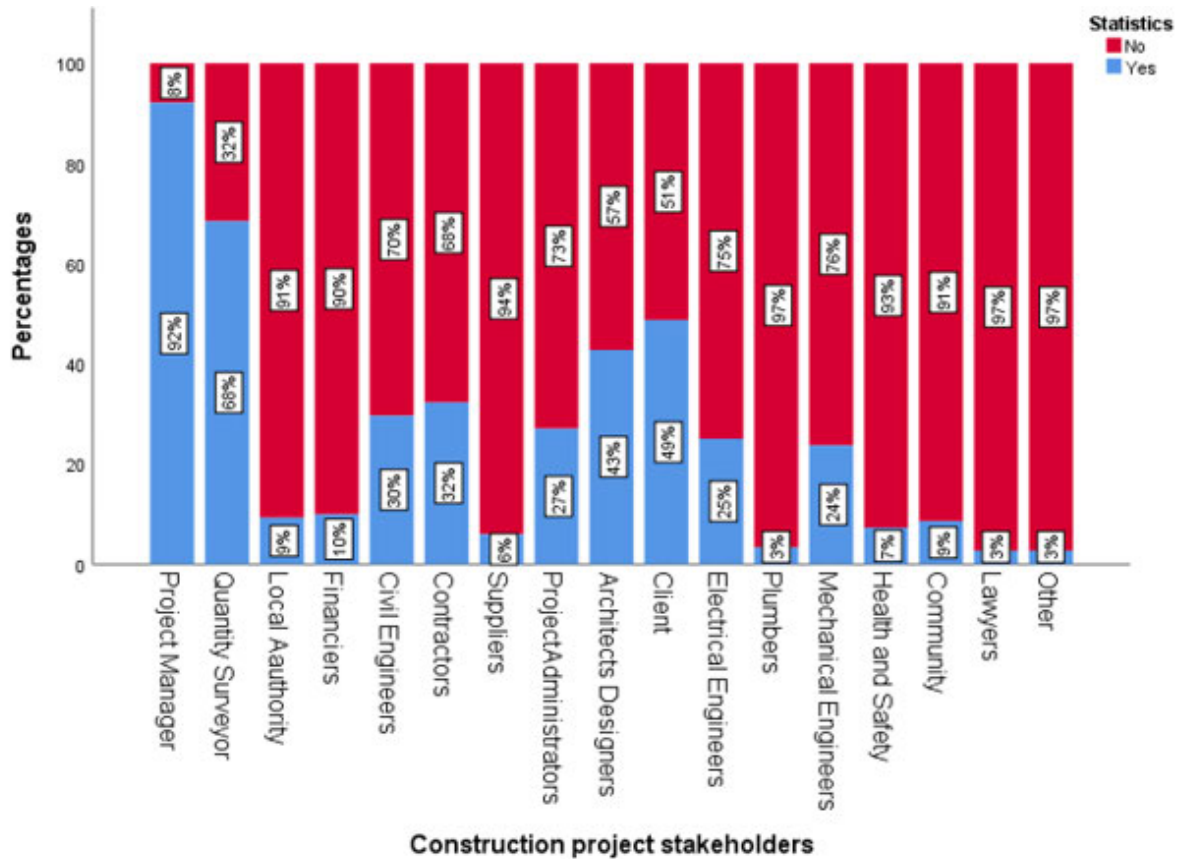
Construction stakeholders' impact on the project budget	Responses as Frequency (%)		n	p-value
	Yes	No		
Project Manager	144 (95)	8 (5)	152	<.001*
Quantity Surveyor	129 (85)	23 (15)	152	<.001*
Local Authority	35 (23)	117 (77)	152	<.001*
Financiers	78 (51)	74 (49)	152	.808
Civil Engineers	85 (56)	67(44)	152	.168
Contractors	60(39)	92(61)	152	.012*
Suppliers	13(9)	139(91)	152	<.001*
Project Administrators	68(45)	84(55)	152	.224
Architects / Designers	102(67)	50(33)	152	<.001*
Client	114(75)	38(25)	152	<.001*
Electrical Engineers	77(51)	75(49)	152	.935
Plumbers	12(12)	140(92)	152	<.001*
Mechanical Engineers	72(47)	80(53)	152	.570
Health and Safety	38(25)	114(75)	152	<.001*
Community	22(14)	130(86)	152	<.001*
Lawyers	9(6)	143(94)	152	<.001*
Other	6(4)	149(96)	152	<.001*

7.5.2 Construction project stakeholders' accountable for the budget overruns

Figure 7.9 indicates that construction project managers rated at 92% and quantity surveyors rated at 68%, are the most held accountable for the project budget overrun. These ratings signify the importance and role of construction project managers and quantity surveyors in project financial administration and accountability. The clients rated at 49%, architects rated at 43% and contractors rated at 32% are moderately accountable for the project budget overrun. On the other hand, project stakeholders such as local authority, financiers, civil engineers, suppliers, project

administrators, health and safety, electrical engineers, plumbers' mechanical engineers, the community, and lawyers are the least accountable for the project budget overrun all rated at less than 31%. Therefore, the findings show that construction project managers and quantity surveyors are the stakeholders held accountable for the project budget overruns.

Figure 7.9: Construction project budget accountability



7.5.3 Construction project stakeholders' impact on the budget

Table 7.6a shows that construction project managers (67%), clients (64%), quantity surveyors (56%), and architects (55%) are the stakeholders with the highest-level of impact on the project budget, all with a p-value of <.001*. The findings clearly show that the project stakeholders who have high levels of impact on the project budget are the same stakeholders involved in project budget meetings (See section 7.2.1). Contractors and financiers also impact the project budget with a sum of moderate rating and high rating of 65% and 55%, respectively. A sum of moderate rating and high rating impact on the project budget is reflected in the stakeholders; namely, civil

engineers (56%), electrical engineers (46%), mechanical engineers' (44%) and community (40%). These findings signify the engineering profession's moderate importance in the construction industry and the importance of the community consultation where the project is being executed.

On the contrary, the findings show a percentage sum of 'no impact' rating and 'low impact' rating of 72% for health and safety personnel, 85% for lawyers and 90% for plumbers, all with a p-value of <.001* reflecting minimal to non-impact on the project budget. In general, stakeholders perceived to have a high impact on the project budget include the project manager, financiers, civil engineers, contractors, quantity surveyors, architects / designers, and the client(s). At the same time, stakeholders perceived to have a minimal to non-impact, include health and safety personnel, lawyers and plumbers.

Table 7.6a: Construction stakeholders' impact on the project budget

Construction stakeholders' impact on the project budget	Responses as Frequency (%)				X ²	df	p-value
	No impact	Low impact	Moderate impact	High impact			
Project Managers	-	22 (15)	22 (15)	102 (70)	87.671	2	<.001*
Project Administrators	20(17)	48 (40)	26 (22)	26 (22)	15.200	3	.002*
Local Authorities	26(21)	45 (35)	25 (20)	31 (24)	8.024	3	.046*
Financiers	21(17)	20 (16)	25 (20)	58 (47)	31.806	3	<.001*
Civil Engineers	3(2)	51 (36)	43 (31)	43 (31)	40.229	3	<.001*
Contractors	7(5)	31 (23)	42 (31)	57 (42)	38.854	3	<.001*
Suppliers	22(17)	41 (32)	42 (33)	24 (19)	10.690	3	.014*
Health and Safety personnel	29(24)	59 (48)	25 (21)	9 (7)	42.852	3	<.001*
Quantity Surveyors	1(1)	25 (17)	35 (24)	85 (58)	102.658	3	<.001*
Architects /Designers	1(1)	25 (17)	40 (27)	83 (55)	95.698	3	<.001*
Client/s	1(1)	15 (10)	35 (23)	98 (66)	147.779	3	<.001*
Electrical engineers/ Electricians	9(7)	59 (43)	42 (30)	28 (20)	39.101	3	<.001*
Plumbers	40(33)	69 (57)	9 (7)	4 (3)	89.738	3	<.001*
Mechanical engineers	10(7)	57 (43)	33 (25)	33 (25)	33.226	3	<.001*
Community where the construction is executed	22(18)	38 (32)	30 (25)	30 (25)	4.267	3	.234
Lawyers	60(55)	33 (30)	11 (10)	6 (5)	66.218	3	<.001*

In addition, Table 7.6b shows the Cronbach Coefficient Alpha reliability tests for the Likert-scale items used to measure the construction stakeholders' impact on the project budget. The Cronbach's Alpha equals 0.769 for all the combined 16 items greater than 0.6, which implies that the overall scale was reliable.

Table 7.6b: Cronbach's Alpha: Stakeholders' impact on the project budget

Cronbach's Alpha	N of Items
0.769	16

7.5.4 Construction project cost effectiveness on the budget

The findings extracted from Table 7.7a presents the sum of the participants' satisfaction (Satisfied and very satisfied ratings) regarding cost effectiveness in executing diverse construction activities. The significant mean score of >3 reflects participants' satisfaction and the significant mean score of <3 reflects participants' dissatisfaction. In addition, the p-value <.001* shows that the item measured is statistically significant and Chi-square (X^2) test is to establish any association between the variables. The findings show that the following activities are executed in a cost-effective manner with the mean value >3 and p-value <.001*, namely; the civil works (52%), mechanical works (53%), administrative tasks (45%), project plan development (55%), project plan execution (50%), directing and managing (53%), controlling (53%), project closure (45%), performance reporting on project budget (56%) and cost performance management (54%). Conversely, findings show that the following activities are not executed in a cost-effective manner with the mean value <3 and p-value <.001*, namely; design changes conducted by the architects (39%) and project reworks executed by contractors (47%).

The majority of the participants were neutral, which may imply bias and variability due to the uniqueness of projects. Therefore, a varying cost effectiveness in executing listed activities from project to project. There is significant satisfaction that civil works, mechanical works, electrical works and administrative tasks are done in a cost-effective manner. There is significant satisfaction that the development and execution of the project management plan, the directing and managing of the project execution, the controlling of project deliverables and the project closure are all done in relation to the budget. There is also significant satisfaction with project cost performance management and performance reporting on project budget. However, there is a significant dissatisfaction with the way project reworks and design changes are done in relation to being cost effective.

Table 7.7a: Construction project cost effectiveness on the budget

Cost effectiveness of the project budget	Responses as Frequency (%)					n	Mean (Std. Deviation)	t	df	p-value
	Very dissatisfied	Dissatisfied	Neutral	Satisfied	Very satisfied					
Civil works are done in a cost-effective manner	2 (1)	28 (19)	42 (28)	55 (36)	25 (16)	152	3.48 (1.016)	5.827	151	<.001*
Mechanical works are done in a cost-effective manner	2 (1)	21 (14)	49 (32)	64 (42)	16 (11)	152	3.47 (0.906)	6.359	151	<.001*
Electrical works are done in a cost-effective manner	1 (1)	17 (11)	51 (34)	64 (42)	19 (12)	152	3.55 (0.875)	7.692	151	<.001*
Special works are done in a cost-effective manner	12 (8)	30 (20)	50 (33)	46 (30)	14 (9)	152	3.13 (1.084)	1.497	151	.137
Administrative tasks are done in a cost-effective manner	2 (1)	27 (18)	55 (36)	48 (32)	20 (13)	152	3.38 (0.968)	4.774	151	<.001*
Project reworks are done in a cost-effective manner	23 (15)	48 (32)	48 (32)	20 (13)	13 (8)	152	2.68 (1.142)	3.410	151	.001*
The development of the project charter in relation to the budget	16 (11)	26 (17)	52 (34)	38 (25)	20 (13)	152	3.13 (1.166)	1.391	151	.166
The development of the project management plan in relation to the budget	8 (5)	21 (14)	39 (26)	60 (39)	24 (16)	152	3.47 (1.079)	5.337	151	<.001*
Execution of the project management plan in relation to the budget	8 (5)	19 (13)	49 (32)	55 (36)	21 (14)	152	3.41 (1.044)	4.815	151	<.001*
Directing and managing project execution in relation to the budget	4 (3)	24 (16)	43 (28)	61 (40)	20 (13)	152	3.45 (0.996)	5.621	151	<.001*
Controlling the project deliverables in relation to the budget	2 (1)	23 (15)	47 (31)	58 (38)	22 (15)	152	3.45 (0.963)	6.318	151	<.001*
The implementation of project changes in relation to the budget	23 (15)	28 (18)	39 (26)	45 (30)	17 (11)	152	3.45 (1.242)	.327	151	.744
The project closure in relation to the budget	13 (9)	25 (16)	46 (30)	44 (29)	24 (16)	152	3.27 (1.168)	2.848	151	.005*
Performance reporting on project budget	6 (4)	25 (16)	37 (24)	57 (38)	27 (18)	152	3.49 (1.086)	5.529	151	<.001*
Project cost performance management	9 (6)	32 (21)	29 (19)	58 (38)	24 (16)	152	3.37 (1.155)	3.933	151	<.001*
Design changes by Architects are done in a cost-effective manner	28 (18)	32 (21)	39 (26)	38 (25)	15 (10)	152	2.87 (1.259)	1.288	151	.200

Similar to Table 7.7b, results from Table 7.6b shows Cronbach's Alpha of 0.909 for all the combined 16 items, which is greater than 0.6 and that indicates that reflects a high reliability overall scale.

Table 7.7b: Cronbach's Alpha: Project cost effectiveness on the budget

Cronbach's Alpha	N of Items
0.909	16

7.5.5 Factors impacting construction project budget

Findings from Table 7.8a shows that numerous factors and issues related to: cost estimation (68%), competence and skills (51%), cost control (55%), procurement (56%), design (51%), stakeholder interrelationships (50%), political interference (52%), and corruption (57%) highly impact the construction budget. While factors such as mismatch of contractors (43%), and quality compliance issues' (39%) moderately impacts the construction budget. It is clear that the foregoing factors significantly affect the project budget; therefore, they should be incorporated in the model to alleviate cost overruns.

Table 7.8a: Construction project activities and factors impacting the budget

Factors impacting the project budget	Responses as Frequency (%)				X ²	df	p-value
	No impact	Low impact	Moderate impact	High impact			
Cost estimating impact to the project budget	- -	12 (8)	36 (24)	100 (68)	83.892	2	<.001*
Competence and skills related issues' impact to the project budget	- -	14 (9)	59 (39)	77 (52)	42.120	2	<.001*
Cost control impact to the project budget	- -	20 (14)	46 (31)	81 (55)	38.245	2	<.001*
Procurement related issues' impact to the project budget	- -	27 (18)	39 (26)	82 (56)	33.905	2	<.001*
Communication issues' impact to the project budget	1 (1)	32 (22)	58 (41)	51 (36)	54.901	3	<.001*
Legal compliance issues' impact to the project budget	5 (4)	41 (31)	47 (36)	39 (29)	32.727	3	<.001*
Health and safety issues' impact to the project budget	4 (3)	48 (38)	43 (34)	31 (25)	36.857	3	<.001*

Process issues' impact to the project budget	4 (3)	46 (35)	52 (39)	30 (23)	41.818	3	<.001*
Client's agent impact to the project budget	3 (2)	37 (27)	49 (36)	47 (35)	40.118	3	<.001*
Design related issues' impact to the project budget	1 (1)	24 (16)	48 (32)	77 (51)	84.933	3	<.001*
Lack of co-operative relationships among stakeholders' impact to the project budget	1 (1)	21 (14)	52 (35)	74 (50)	85.027	3	<.001*
Mismatch of contractors' impact to the project budget	1 (1)	21 (15)	66 (46)	57 (39)	76.986	3	<.001*
Quality compliance issues' impact to the project budget	3 (2)	26 (18)	60 (41)	57 (39)	60.411	3	<.001*
Damage of materials due to bad weather conditions impact to the project budget	8 (6)	40 (33)	40 (33)	34 (28)	22.918	3	<.001*
Employee absenteeism's impact to the project budget	12 (10)	39 (32)	50 (40)	23 (18)	27.419	3	<.001*
Community where the construction is executed's impact to the project budget	5 (4)	35 (26)	41 (30)	53 (40)	37.343	3	<.001*
Political interference's impact to the project budget	4 (3)	20 (14)	44 (31)	73 (52)	76.901	3	<.001*
Corruption related issues' impact to the project budget	9 (7)	13 (10)	35 (26)	78 (57)	76.901	3	<.001*
Fraudulent related activities' impact to the project budget	11 (8)	19 (14)	43 (32)	61 (46)	46.657	3	<.001*

The components of Table 7.8b are reliable which is reflected by a Cronbach's Alpha of 0.897 for all the combined 19 items.

Table 7.8b: Cronbach's Alpha: Project activities and factors impacting the budget

Cronbach's Alpha	N of Items
0.897	19

7.5.6 Construction project cost estimation and control

Figure 7.12 shows the construction project manager (89%), client (59%) and the consultants such as quantity surveyors (92%), civil engineers (65%), and architects (69%), electrical engineers (62%) and mechanical engineers (63%). Of the foregoing stakeholders involved in cost estimation, the construction project manager (96%), quantity surveyors (88%), and client (51%) are the main stakeholders who are involved in cost control.

Figure 7.10: Construction project stakeholders' involvement in cost estimations

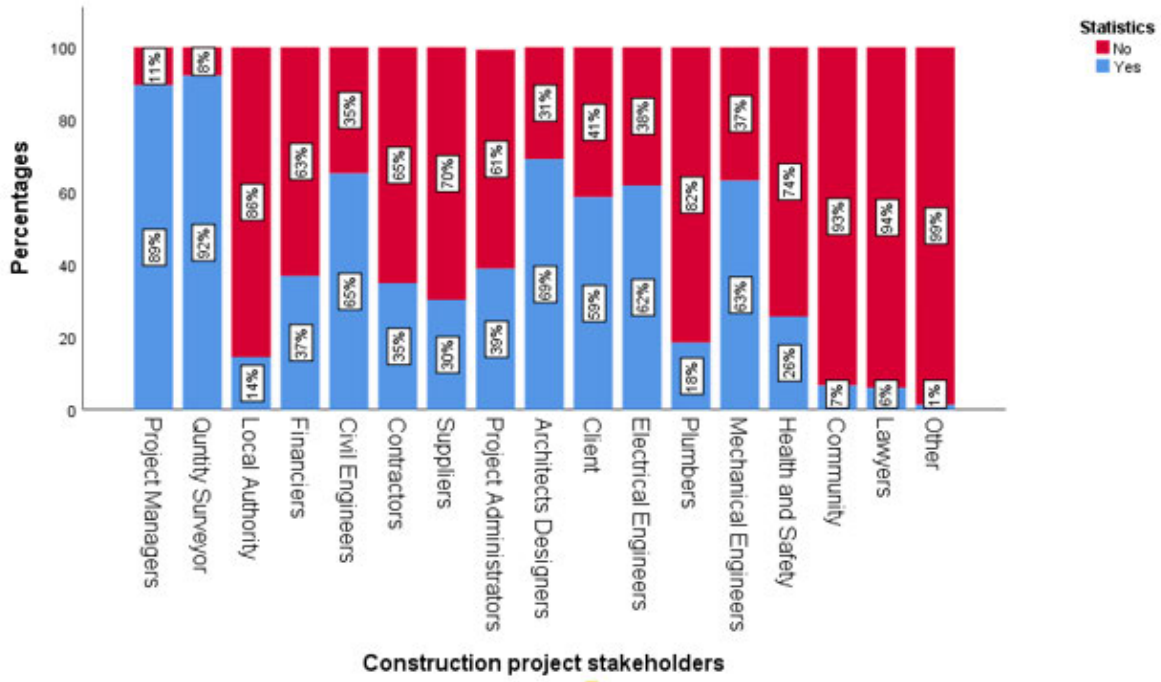


Figure 7.11: Construction project stakeholders' involvement in cost control



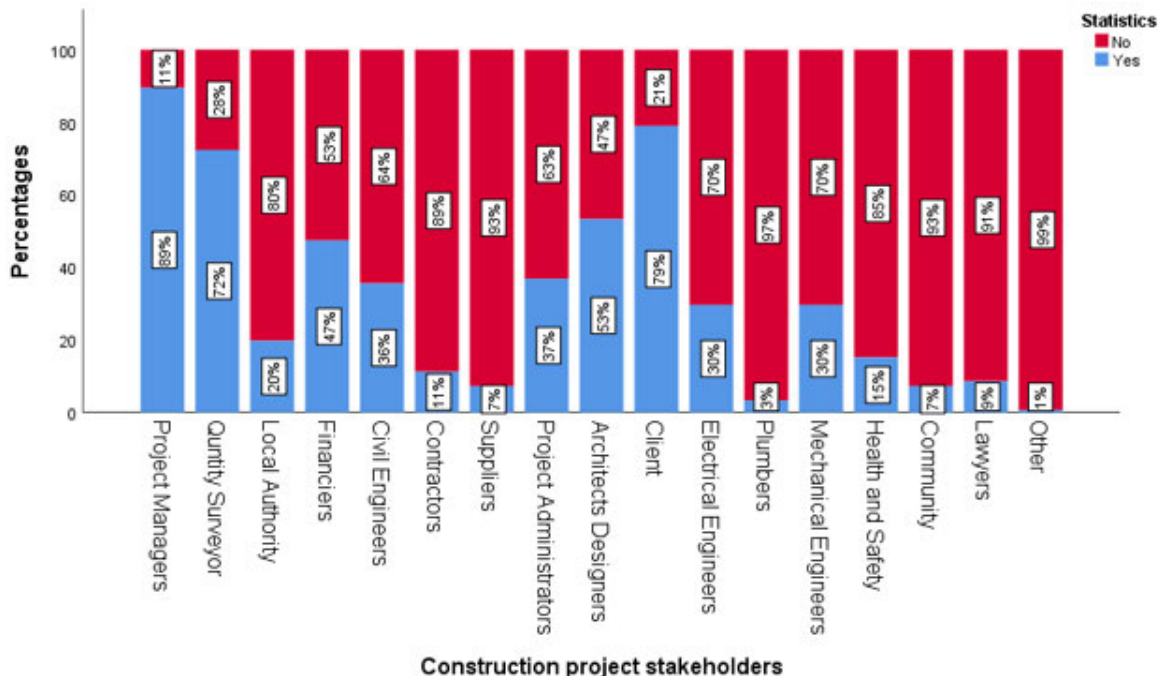
7.6 Construction project life cycle – Stakeholder involvement

The following data presentation and analysis pertain to stakeholders' level of involvement in different phases of the construction life cycle on project activities, associated with the project budget. Therefore, data will be presented and analysed starting with project initiation, followed by project planning, project execution, project controlling and monitoring, and lastly project closure.

7.6.1 Construction project stakeholders' involvement in project initiation

Regarding project activities associated with the project budget, Figure 7.12 shows high levels of involvement of the following construction project stakeholders, project managers (89%), clients (79%), quantity surveyors (72%), and architects (53%). Conversely, contractors (11%), suppliers (7%), lawyers (9%), and plumbers (3%) are the least involved stakeholders during project initiation phase on project activities associated with the project budget. To note, participants indicated that only 1% of the 'other' stakeholders not mentioned in the lists are involved during the project initiation phase, reflecting the comprehensiveness of the stakeholders' list and special needs of certain projects. The findings suggest that project managers, clients, quantity surveyors and architects are required during construction project initiation.

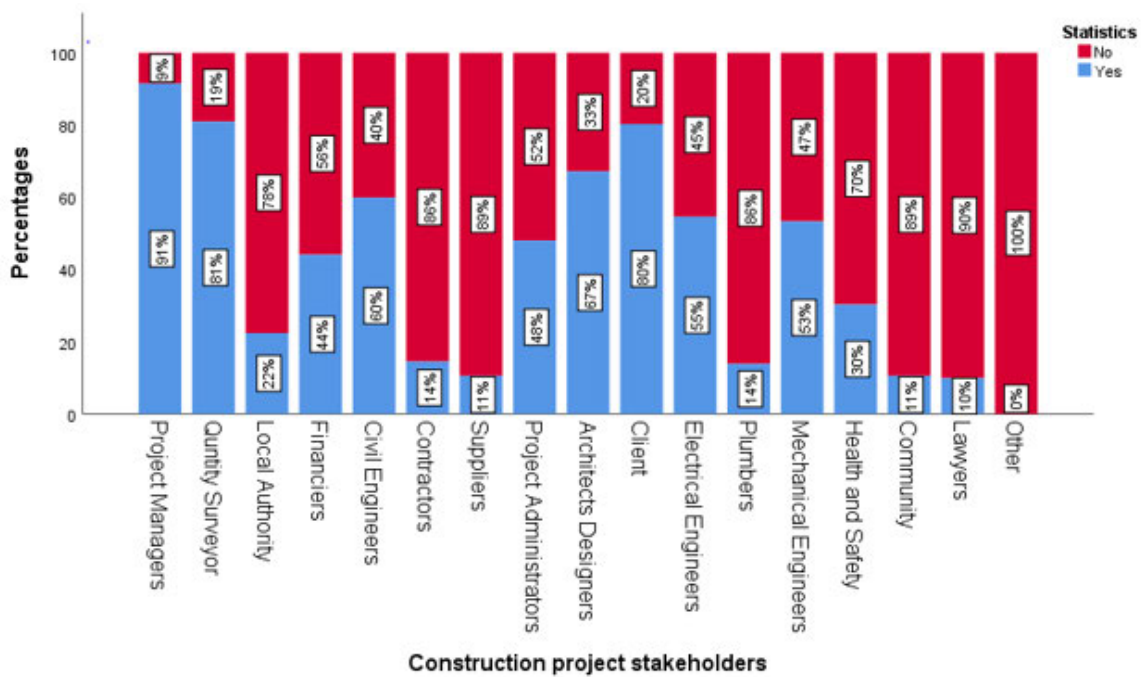
Figure 7.12: Construction project stakeholders' involvement in project initiation



7.6.2 Construction project stakeholders' involvement in project planning

Figure 7.13 shows that project managers (91%), quantity surveyors (81%) clients (80%), architects (67%), civil engineers (60%), electrical engineers (55%), and mechanical engineers are highly involved in activities associated with the budget during project planning. Similar to project stakeholder involvement during project initiation, contractors (14%), plumbers (14%) suppliers (11%), community (11%) and lawyers (10%) are the least involved stakeholders in executing project activities associated with the project budget during the project planning phase. The findings suggest an increase in project stakeholders' involvement compared to the project initiation phase. In addition to the project manager, client, quantity surveyor, and architect involved during project initiation, the following stakeholders, thus; civil engineers, electrical engineers, and mechanical engineers' level of involvement increases during project planning.

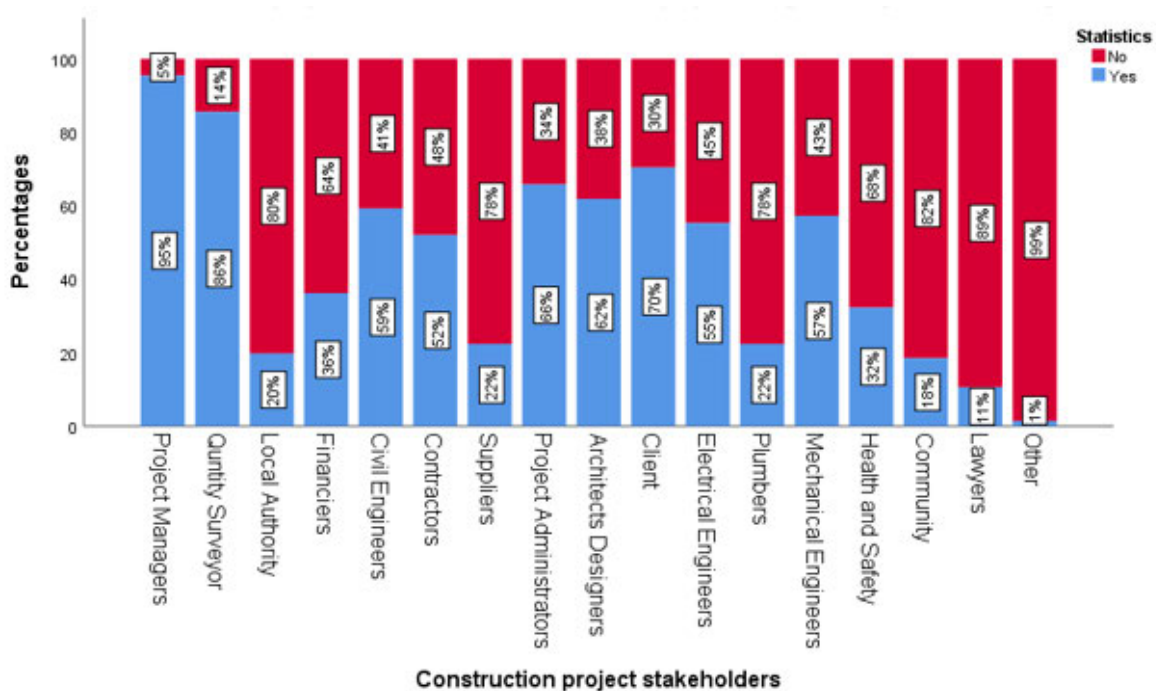
Figure 7.13: Construction project stakeholders' involvement in project planning



7.6.3 Construction project stakeholders' involvement in project execution

Similarly, to Figure 7.13 on construction project planning phase, Figure 14, shows that the following stakeholders are significantly involved in project budget during execution, namely, project managers (95%), quantity surveyors (86%), civil engineers (59%), contractors (52%), architects (62%), electrical engineers (55%), mechanical engineers (57%), clients (70%) and project administrators (68%). Noticeably, contractors and project administrators are more involved in project execution in comparison to project initiation and planning phase.

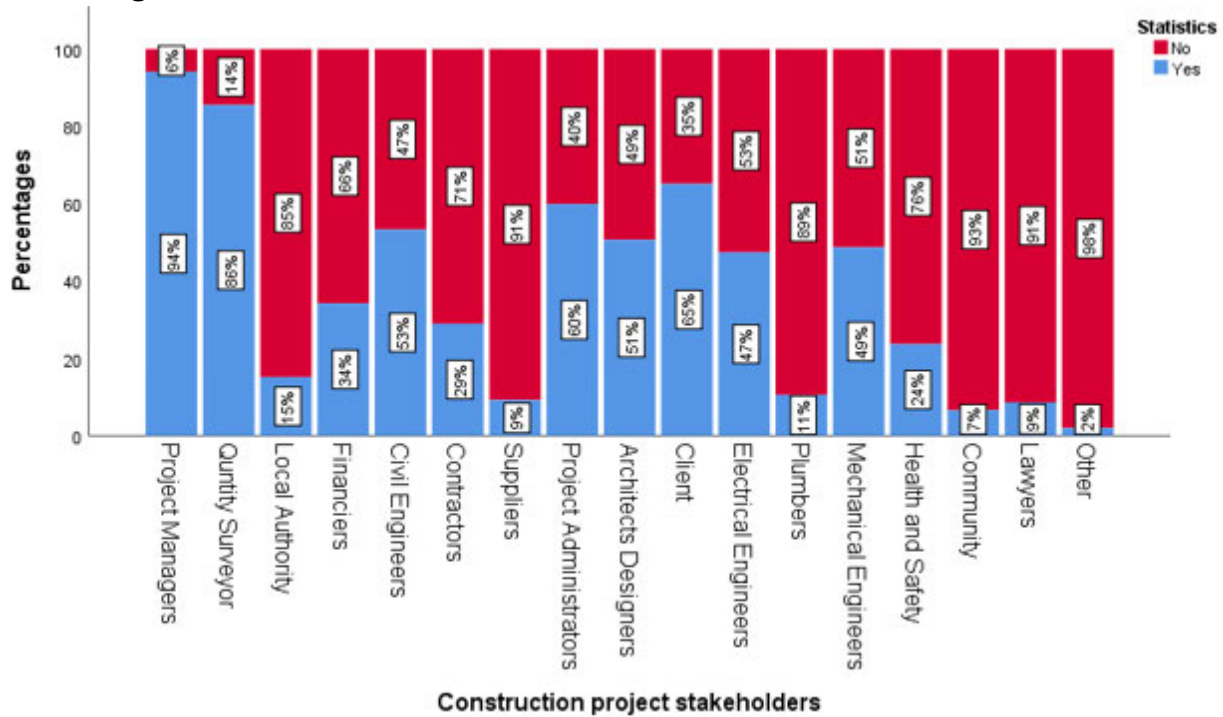
Figure 7.14: Construction project stakeholders' involvement in project execution



7.6.4 Construction project stakeholders' involvement in project controlling and monitoring

Figure 7.15 shows that the following stakeholders are significantly involved in project budget controlling and monitoring, namely; project managers (94%), quantity surveyors (86%), clients (65%), project administrators (60%), civil engineers (53%) and architects (51%). The results suggest that few project stakeholders are involved in controlling and monitoring the project budget, compared to the project stakeholders involved during the construction project life cycle.

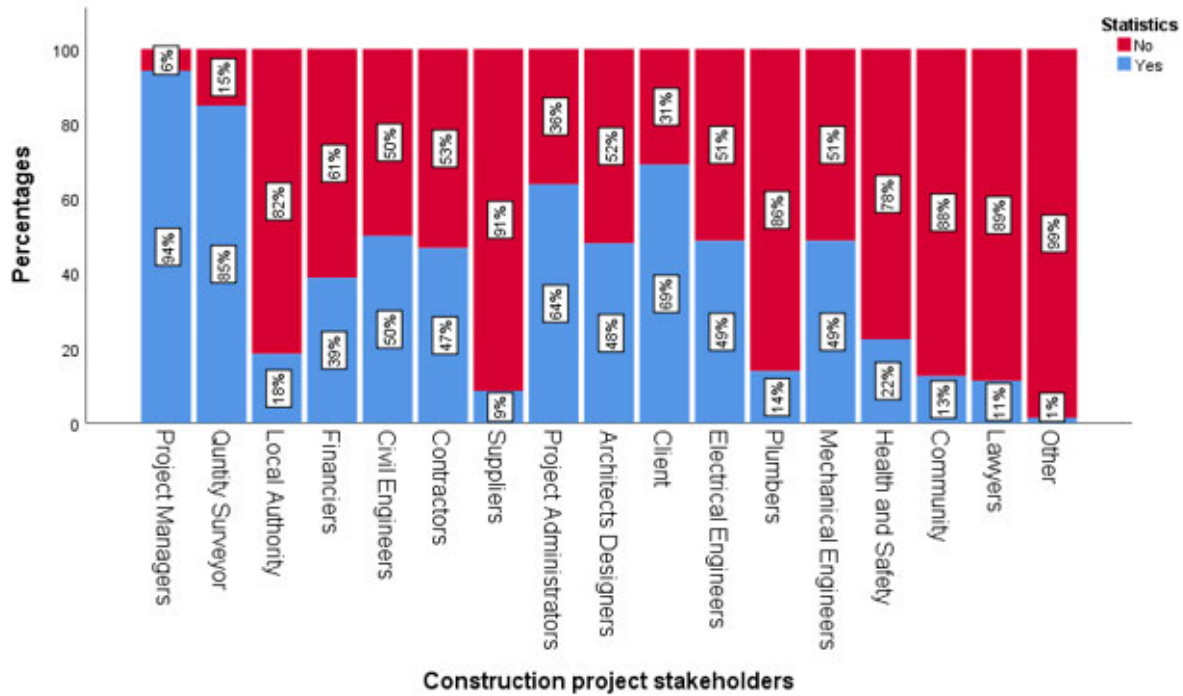
Figure 7.15: Construction project stakeholders' involvement in project controlling and monitoring



7.6.5 Construction project stakeholders' involvement in project closure

It is clear, in Figure 7.16, that construction project managers (94%) and quantity surveyors (85%) are involved in project budget administration, reviews and reporting during project closure. These results imply that construction project managers and quantity surveyors are the major stakeholders involved in project cost allocation, expenditure and reporting throughout the project, from conception to closure. The client/s (69%) and project administrators (64%) are significantly involved in the project budget during project closure. Similar to construction project managers and quantity surveyors, the client/s are involved in the project throughout its life cycle warranted by their ownership stake on the project. Consultants such as civil engineers (50%), architects (48%), electrical engineers (49%), and mechanical engineers (49%) are averagely involved in project budget administration, reviews, and reporting during project closure. Consultants play a major role in different phases of the construction project. Therefore, their involvement in the project budget during project closure will be a reference to their level of requirements.

Figure 7.16: Construction project stakeholders' involvement in project closure



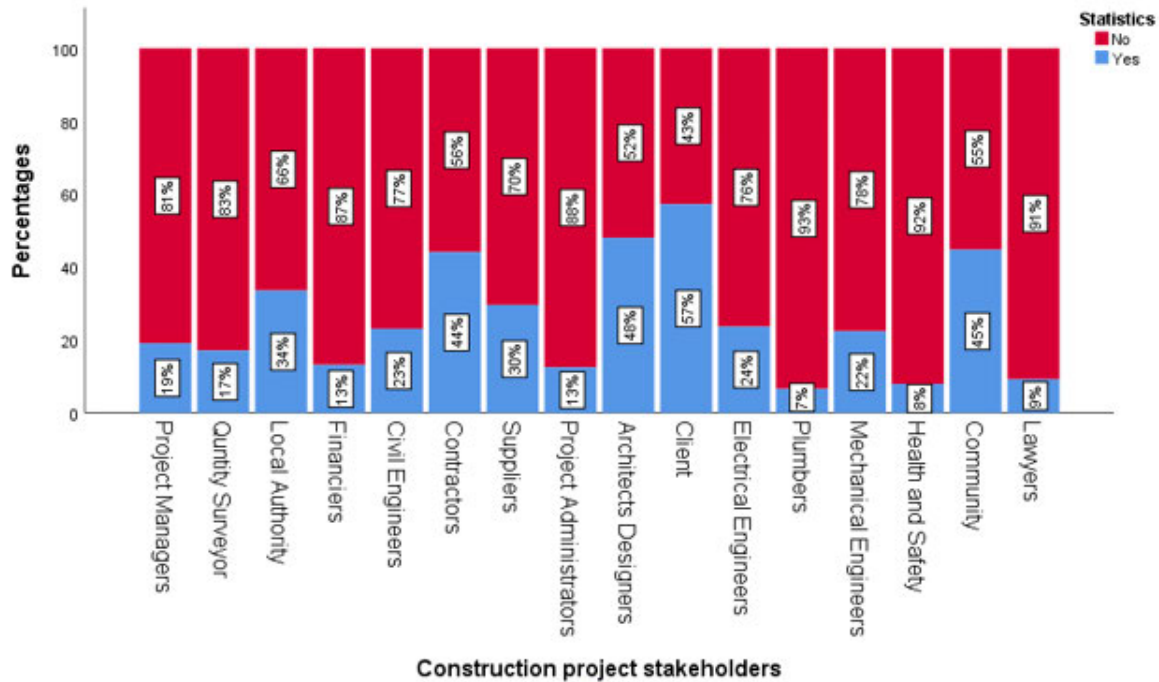
7.7 Project stakeholders' influence on the project budget: Project managers' experiences

The below section presents and analyses data which pertains to construction project managers' experience/s with regards to project stakeholders' and project budgets within the construction industry in South Africa. Herewith, data about the construction projects completed over the budget, project stakeholders posing a threat to the project budget, and project managers' experiences, perceptions, and responsibilities are presented and analysed.

7.7.1 Construction projects stakeholders posing a threat to the project budget

The findings in Figure 7.18 show that the following stakeholders pose a threat for project budget achievement, namely the client (57%), architect (48%), community (45%) and the contractors (44%). Therefore, more attention should be paid to the following stakeholders, the client, architect, community, and contractors, in trying to alleviate project cost overruns.

Figure 7.17: Construction projects stakeholders posing a threat on the project budget



7.7.2 Construction project managers' experiences and perceptions

Standing out in Table 7.9 is that participants strongly agree that the following construction project managers' experiences and perceptions significantly affects the project costs. That is; participants strongly agree that the project scope should be very clear to avoid project overruns, accounting for 81% with the mean of 4.68 >3, late design changes negatively affects the project costs accounting for 79% with the mean of 4.74 >3, lengthy internal approval processes negatively affects the project costs at 76% with the mean of 4.65 >3, numerous changes by architects to the scope negatively affects the project costs 72% with the mean of 4.64 >3 (72%), and arranging the project leadership team before project execution, is important to avoid project cost overruns - 62% with the mean of 4.47 >3. The findings suggest that more attention should be focused on the foregoing aspects because there significantly impact the project budget.

In the same notion, participants agreed that the following construction project managers' experiences have significantly impacted the project costs. That is, reworks constituting 41% with the mean of 3.81 >3 and poor support from executives have a negative effect on the project budget 44% with the mean of 3.94 >3. The Cronbach's Alpha for construction project managers' experiences and perceptions was not tested, due to the deliberate diversity and nature of the inconsistently asked questions. For example, participants strongly disagreed that lengthy internal

approval processes (68%) and arranging the project leadership team during project execution do not affect project budget (46%) were asked inversely to 'lengthy internal approval processes negatively affect the project costs' and 'arranging the project leadership team before project execution is important to avoid project cost overruns', respectively.

Table 7.9: Construction project managers' experiences and perceptions

Construction project managers' experiences and perceptions	Responses as Frequency (%)					n	Mean (Std. Deviation)	t	df	p-value
	Strongly disagree	Disagree	Undecided	Agree	Strongly agree					
I have dealt with reworks on my previous projects	6 (4)	15 (10)	25 (16)	62 (41)	44 (29)	152	3.81 (1.084)	9.203	151	<.001*
The project scope should be very clear to avoid project overruns	2 (1)	2 (1)	8 (5)	18 (12)	122 (81)	152	4.68 (0.750)	27.701	151	<.001*
Lengthy internal approval processes negatively affect the project costs	2 (1)	1 (1)	9 (6)	24 (16)	116 (76)	152	4.65 (0.739)	27.540	151	<.001*
Lengthy internal approval processes do not affect the project costs	103 (68)	26 (17)	10 (7)	3 (2)	10 (7)	152	1.63 (1.132)	14.970	151	<.001*
Arranging the project leadership team before project execution is important to avoid project cost overruns	2 (1)	3 (2)	10 (7)	43 (28)	94 (62)	152	4.47 (0.813)	22.338	151	<.001*
Arranging the project leadership team during project execution does not affect project budget	70 (46)	44 (29)	24 (16)	8 (5)	6 (4)	152	1.92 (1.089)	12.216	151	<.001*
Numerous changes by Architects to scope negatively affects the project costs	-	2 (1)	8 (5)	32 (21)	110 (72)	152	4.64 (0.645)	31.439	151	<.001*
Late design changes negatively affect the project costs	-	2 (1)	4 (3)	26 (17)	120 (79)	152	4.74 (0.572)	37.410	151	<.001*
No consideration of benchmarks in estimates affects the project costs	6 (4)	8 (5)	25 (16)	43 (28)	70 (46)	152	4.07 (1.092)	12.102	151	<.001*
People are a major contributing factor to exceeding the project budget	1 (1)	5 (3)	35 (23)	51 (34)	60 (40)	152	4.08 (0.903)	14.736	151	.002

Handling of project changes affects the project budget	2 (1)	-	28 (18)	49 (32)	73 (48)	152	4.26 (0.850)	18.235	151	<.001*
Lack of understanding of the project management software usage (e.g MS Project, Agile, etc) affects the project budget	17 (11)	18 (12)	66 (43)	32 (21)	19 (13)	152	3.12 (1.127)	1.295	151	.197
Support from executive have effect on costs	4 (3)	8 (5)	27 (18)	67 (44)	46 (30)	152	3.94 (0.964)	12.026	151	<.001*

7.7.3 Construction project manager's responsibilities

Table 7.10a presents project activities related to costs that construction project managers typically execute, and all the items are statistically significant with <.001*. The majority of the participants, 76%, always include materials, prices and delivery costs, and 64% always consider inflation when conducting cost estimations. While 64% dispute that when they are doing cost estimation, they only include the price of materials and do not include extra costs such as delivery costs, storage costs, and the related project-related cost items. These findings suggest that construction project managers consider several factors when conducting project cost estimates.

Table 7.10a: Construction project manager's responsibilities

Construction project manager's responsibilities	Responses as Frequency (%)					X ²	df	p-value
	Never	Rarely	Sometimes	Very frequently	Always			
When I am doing cost estimation, I include both materials prices and delivery costs?	- -	2 (1)	9 (6)	26 (17)	115 (76)	216.053	3	<.001*
When I am doing cost estimation, I only include the price of materials and do not include extra costs such delivery costs, storage costs, etc?	98 (64)	36 (24)	10 (7)	5 (3)	3 (2)	210.961	4	<.001*
The projects I have dealt with, inflation is considered when doing cost estimations?	1 (1)	3 (2)	19 (13)	32 (21)	97 (64)	203.395	4	<.001*
Taking steps to reduce threats to meeting project cost objectives?	1 (1)	- -	20 (13)	60 (39)	71 (47)	85.947	3	<.001*
Evaluation of risks related to cost throughout project life cycle?	1 (1)	7 (5)	16 (11)	41 (27)	87 (57)	162.342	4	<.001*
Possible project changes are taken into consideration when doing cost estimation?	5 (3)	6 (4)	29 (19)	57 (38)	55 (36)	84.053	4	<.001*

Tasks with high probability of exceeding costs are prioritised?	1 (1)	7 (5)	28 (18)	55 (36)	61 (40)	97.342	4	<.001*
Cost control measures are utilised?	- -	4 (3)	20 (13)	56 (37)	72 (47)	77.895	3	<.001*
Project cost audits are done during project execution?	- -	6 (4)	28 (18)	57 (38)	61 (40)	53.000	3	<.001*
Contracts with contractors are closed based on prior agreed costs?	9 (6)	11 (7)	35 (23)	50 (33)	47 (31)	49.842	4	<.001*
Take into account unforeseen cost related risks?	2 (1)	3 (2)	28 (18)	63 (41)	56 (37)	107.934	4	<.001*
Hidden costs are taken into account?	5 (3)	7 (5)	33 (22)	63 (41)	44 (29)	80.500	4	<.001*

Table 7.10b: Construction project managers' experiences and perceptions

The components of Table 7.9b are consistent and reliable, which are reflected by a Cronbach's Alpha of 0.788>06 for all the combined 12 items.

Table 7.10b: Cronbach's Alpha: Project managers' experiences and perceptions

Cronbach's Alpha	N of Items
0.788	12

7.8 Construction project cost overrun multinomial logistic regression model

The next section focuses on the construction project cost overrun multinomial logistic regression model. Firstly, tests of normality of the Likert-scale variables transformed from 'construction project stakeholder's impact on the budget', 'construction project cost effectiveness on the budget' 'construction project activities and factors impacting the budget', 'construction project managers' experiences and perceptions' and 'construction project manager's responsibilities' is conducted to assess which informs the suitable regression model. Thereafter, inferential statistic pertaining to multinomial logistic regression model fitting information and goodness-of-fit, multinomial logistic regression pseudo r-square values, multinomial logistic regression likelihood ratio tests and Pearson correlation are presented.

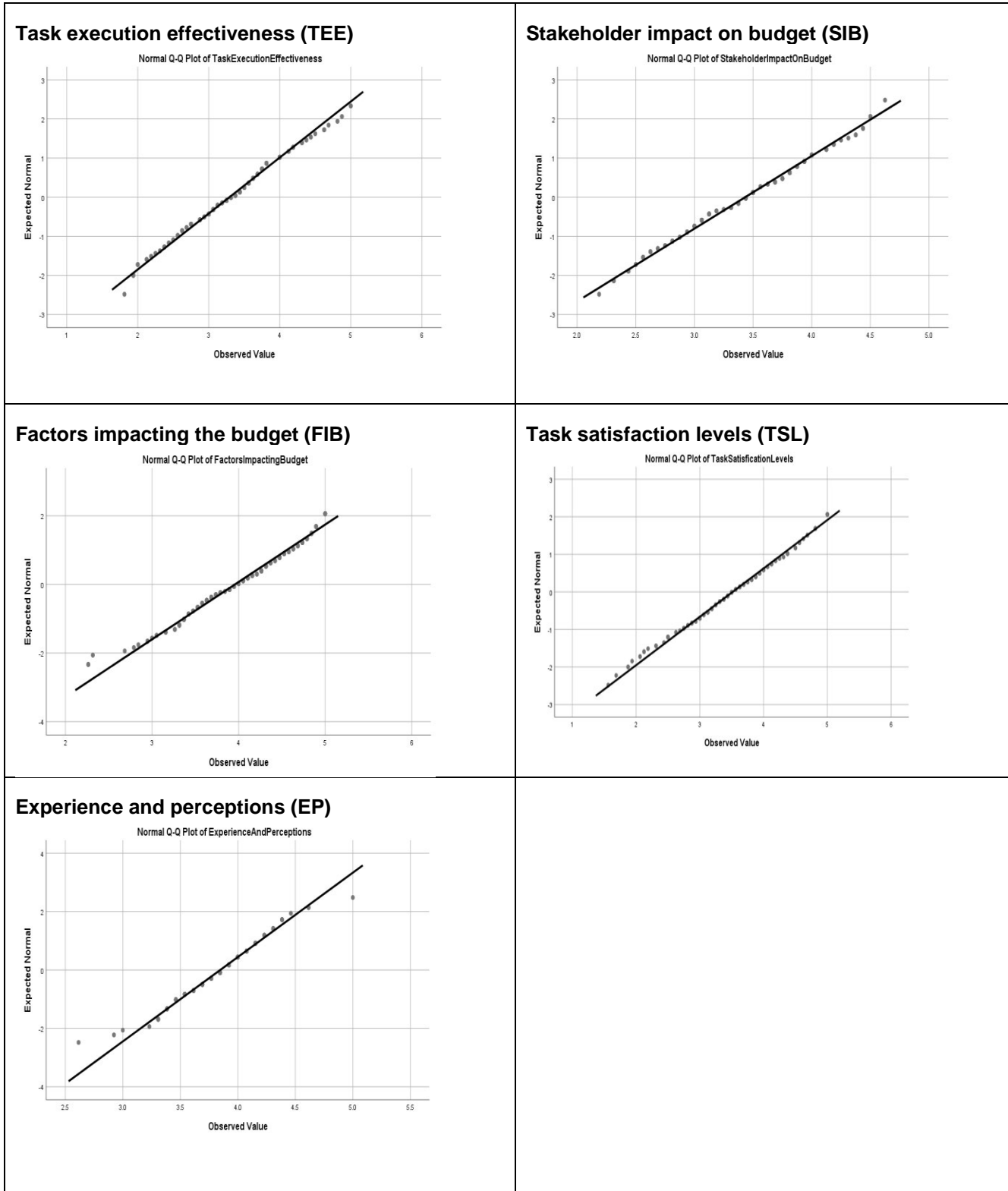
7.8.1 Tests of normality - Likert-scale means

Prior running the regression, Likert scale data was transformed to means and normality tests conducted, to determine whether the transformed data was parametric or non-parametric. Kolmogorov-Smirnova and Shapiro-Wilk are used to determine normality, which informs the regression model (Razali & Wah, 2011). Table 7.11 shows that both Kolmogorov-Smirnova and Shapiro-Wilk are not significant for all the scales, therefore the data is parametric and normally distributed. Kolmogorov-Smirnova reports the following insignificant scores, Task execution effectiveness (TEE) $p = .200$; Stakeholder impact on budget (SIB) $p = .053$; Factors impacting the budget (FIB) $p = .064$; Task satisfaction levels (TSL) $p = .200$, and Experience and perceptions (EP) $p = .018$. Similarly, Shapiro-Wilk reports the following insignificant scores, Task execution effectiveness (TEE) $p = .288$; Stakeholder impact on budget (SIB) $p = .221$; Factors impacting the budget (FIB) $p = .014$; Task satisfaction levels (TSL) $p = .200$, and Experience and perceptions (EP) $p = .018$. In addition, table 7.11 comprising of scatterplots shows data linearity, therefore supporting linear regression modelling and Pearson correlation.

Table 7.11: Tests of Normality - Kolmogorov-Smirnova and Shapiro-Wilk

Tests of Normality	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Task execution effectiveness (TEE)	.056	152	.200*	.989	152	.288
Stakeholder impact on budget (SIB)	.072	152	.053	.988	152	.221
Factors impacting the budget (FIB)	.070	152	.064	.978	152	.014
Task satisfaction levels (TSL)	.041	152	.200*	.988	152	.214
Experience and perceptions (EP)	.080	152	.018	.983	152	.051

Figure 7.18: Tests of normality - Scatterplot normality test



7.8.2 Multinomial logistic regression model fitting information and goodness-of-fit

According to Alkushi, and Althewini (2020) multinomial logistic regression predicts the dependent variable when model fitting information is significant, and goodness-of-fit of the Pearson and Deviance are insignificant. Table 7.12 shows the multinomial logistic regression model fitting information and the goodness-of-fit. The model fitting information is significant with a p-value <.001*. Contrary, the goodness-of-fit is insignificant with a p-value =1.000 for both the Pearson and Deviance. Significant model fitting information and goodness-of-fit (Pearson & Deviance) means that the full model statistically predicts the dependent variable better than intercept-model only with 100% probability.

Table 7.12: Multinomial logistic regression model fitting information and goodness-of-fit

Model	Model fitting criteria	Likelihood ratio tests		
	2 Log Likelihood	Chi-Square	df.	Sig.
Intercept Only	1026.173			
Final	786.366	239.807	140	.000
		Goodness-of-fit		
Pearson		3798.214	4760	1.000
Deviance		786.366	4760	1.000

7.8.3 Multinomial logistic regression Pseudo R-Square values

SPSS statistical calculation of the Pseudo R-Square values for Cox and Snell, Nagelkerke and McFadden measures are shown in table 7.13. 'Cox and Snell' and 'Nagelkerke' measures indicate that up to 79.4% of the stakeholder's impact on the project budget outcome variance can be explained by TEE, FIB, TSL and EP independent variables included.

Table 7.13: Multinomial logistic regression pseudo r-square values

Pseudo r-square	
Cox and Snell	.794
Nagelkerke	.794
McFadden	.234

7.8.4 Multinomial logistic regression likelihood ratio tests

Additionally, and more importantly, the likelihood ratio tests, which show the overall independent variable effects are presented in Table 7.14. , shows that FIB and TSL are statistically significant, which means these have a significant impact on the model in comparison to TEE and EP, which are statistically insignificant. This suggests a high likelihood of FIB and TSL contribution on stakeholder impact on the budget.

Table 7.14: Multinomial logistic regression likelihood ratio tests

Effect	Model fitting criteria	Likelihood ratio tests		
	2 Log Likelihood of Reduced Model	Chi-Square	df.	Sig.
Intercept	834.112	47.746	35	.074
Task execution effectiveness (TEE)	842.798	56.432	35	.012
Factors impacting the Budget (FIB)	894.231	107.865	35	.000
Task Satisfaction Levels (TSL)	865.057	78.691	35	.000
Experience and Perceptions (EP)	823.290 ^a	36.924	35	.380

7.8.5 TEE, SIB, FIB, TSL and EP Pearson correlation

Table 7.15 reports a positive and statistically significant correlation between the following variables: TEE and FIB ($r=0.266$, $P=0.001$), TEE and TSL ($r=0.631$, $P<0.001$), SIB and FIB ($r=0.495$, $P<0.001$), FIB and TSL ($r=0.391$, $P<0.001$), and finally a positive and significant correlation between FIB and EP ($r=0.287$, $P<0.001$). The afore-correlation implies that the stakeholder-relates variables positively affect project budget varyingly.

Table 7.15: TEE, SIB, FIB, TSL and EP Pearson correlation

Pearson correlation variables		Task execution effectiveness (TEE)	Stakeholder Impact on Budget (SIB)	Factors impacting the Budget (FIB)	Task Satisfaction Levels (TSL)	Experience and Perceptions (EP)
Task execution effectiveness (TEE)	Pearson correlation	1	.145	.266**	.631**	.081
	Sig. (2-tailed)		.074	.001	.000	.324
	N	152	152	152	152	152
Stakeholder Impact on Budget (SIB)	Pearson correlation	.145	1	.495**	.107	.207*
	Sig. (2-tailed)	.074		.000	.191	.011
	N	152	152	152	152	152
Factors impacting the Budget (FIB)	Pearson correlation	.266**	.495**	1	.391**	.287**
	Sig. (2-tailed)	.001	.000		.000	.000
	N	152	152	152	152	152
Task Satisfaction Levels (TSL)	Pearson correlation	.631**	.107	.391**	1	.009
	Sig. (2-tailed)	.000	.191	.000		.916
	N	152	152	152	152	152
Experience and Perceptions (EP)	Pearson correlation	.081	.207*	.287**	.009	1
	Sig. (2-tailed)	.324	.011	.000	.916	
	N	152	152	152	152	152

7.9 Conclusion

In conclusion, this chapter focused on quantitative data presentation, and analysis of the findings obtained from the questionnaire responses. The data was presented in pie charts, graphs and tables. Firstly, descriptive and inferential statistics findings concerning the socio-demographic information were presented. It was established that the South African construction industry is male-dominated, and that the majority of construction managers are well educated with extensive work experience. Furthermore, the logistic regression model showed that the more projects completed, the better the construction projects managers' competence reflected in meeting budgetary goals. Subsequently, data pertaining to project stakeholder complexities that contribute to project budget cost overruns was presented and analysed. It was established that design changes conducted by the architects and project reworks executed by contractors, significantly contribute to cost overruns. Also, the findings reflected that project managers, quantity surveyors, clients and architects are the main construction stakeholders involved in budget-related tasks and activities. Therefore, the aforementioned stakeholders' shortfalls significantly contribute to project stakeholder complexities and project cost overruns.

Thereafter, data pertaining to project stakeholders' involvement in different construction project life cycle phase was discussed. It was established that project managers, quantity surveyors, and clients are actively involved throughout the project life cycle. Furthermore, the findings reflected that contractors are intensively involved during the project execution phase, while project administrators are extensively involved in the project controlling and monitoring phase. Next, data on project stakeholders' influence on the project budget, based on project managers' experiences, was presented and analysed. It was established that the following stakeholders, namely the client, architect, community, and contractors, are the major contributors to project cost overruns. Also, it was established that a clear project scope with no changes is required to curb construction project cost overruns. Lastly, multinomial logistic regression model inferential statistics were presented and a high likelihood of FIB and TSL contribution on stakeholder's impact on the budget was established. The next chapter provides a presentation and analysis qualitative data findings, obtained from the interviews.

CHAPTER EIGHT - QUALITATIVE DATA PRESENTATION AND ANALYSIS

8.1 Introduction

The previous chapter focused on the presentation and analysis of quantitative data. Quantitative data was presented in charts, graphs, and tables. Subsequently, this chapter presents and analyses qualitative data. Qualitative data will be narratively presented and analysed with extract interviewees' quotations, data visualisation figures extracted from NVivo, and tables summarising the key findings. Firstly, the table comprising themes and sub-themes is presented. Subsequently, data is presented and analysed in accordance with the identified themes and sub-themes. Therefore, the chapter is structured based on themes as follows: project scope change variables, stakeholders' involvement in project budget development, stakeholders' involvement in project budget development, stakeholders' communication regarding the project budget and project managers' experiences: factors that influence the project budget. Then, the chapter is concluded by providing a summary of the qualitative findings.

8.2 Data presentation and analysis

The following core themes depicted in Figure 8.1 represented by parent nodes, that are pivotal to construction stakeholder complexities and project cost overruns, were finalised, and will be presented and analysed in this chapter, namely project scope variables, stakeholders' experience, training, stakeholders' involvement in developing the project budget, stakeholders' communication regarding the project budget and project managers' experiences as factors that influence the project budget. Core themes were finalized informed by the research study objectives;

- To investigate the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa.
- To determine the level of project stakeholders' involvement and communication with regard to the project budget within the construction industry in South Africa.
- To explore project managers' experiences with regard to the factors that influence the project budget, in relation to project stakeholders within the construction industry in South Africa.
- To develop a model which project managers may use to curb stakeholder-related project cost overruns.

Figure 8.1: Core themes

Core themes				
⊕	Name	↔	Files	References
⊕	○ Project scope change variables		11	41
	○ Stakeholders' communication regarding the project budget		8	14
⊕	○ Project managers' experiences - factors that influence the pr		6	13
	○ Stakeholders' involvement in project budget development		7	10
	○ Stakeholders' experience and training		8	9

8.2.1 Project scope change variables

The participants identified project scope variables emanating from project stakeholder complexities as the primary cause of project cost overruns. Concerning project scope variables, participants highlighted scope variables related to but not limited, to design changes, incomplete design, faulty design, misrepresentation of information, construction site terrain and scope changes during execution, resulting in variation orders, which all ultimately led to additional costs. Interviewee 8 inculcated that variation orders are additional funds which were initially not part of the project budget, or the money spent from the contingency to execute additional work:

“...variation order is basically a document, I would say a legal document which authorises the contractor to do additional work, an additional work that was not initially in the scope of works for instance we are building a road the client can come and say, please I need you to come and put an additional pipework on this site and that was not part of your package, then there is a need to be a variation order to approve that. A variation orders it's also like a financial tracking tool where you actually specify if there is work which is not being done, you actually specify okay this work is not being done, therefore we can use this additional money to do this work or we are taking money from contingency to add on to this additional work.” (Interviewee 8)

Based on NVivo querying and content analysis visualisation in determining data relationships among participants, it was revealed that scope changes was a common cause of project budget overruns among all participants. Figure 8.1 shows the visualisation of scope-related variables highlighted by all the participants, as the root cause of construction project cost overruns.

Figure 8.2: Level of participation on the project scope variables

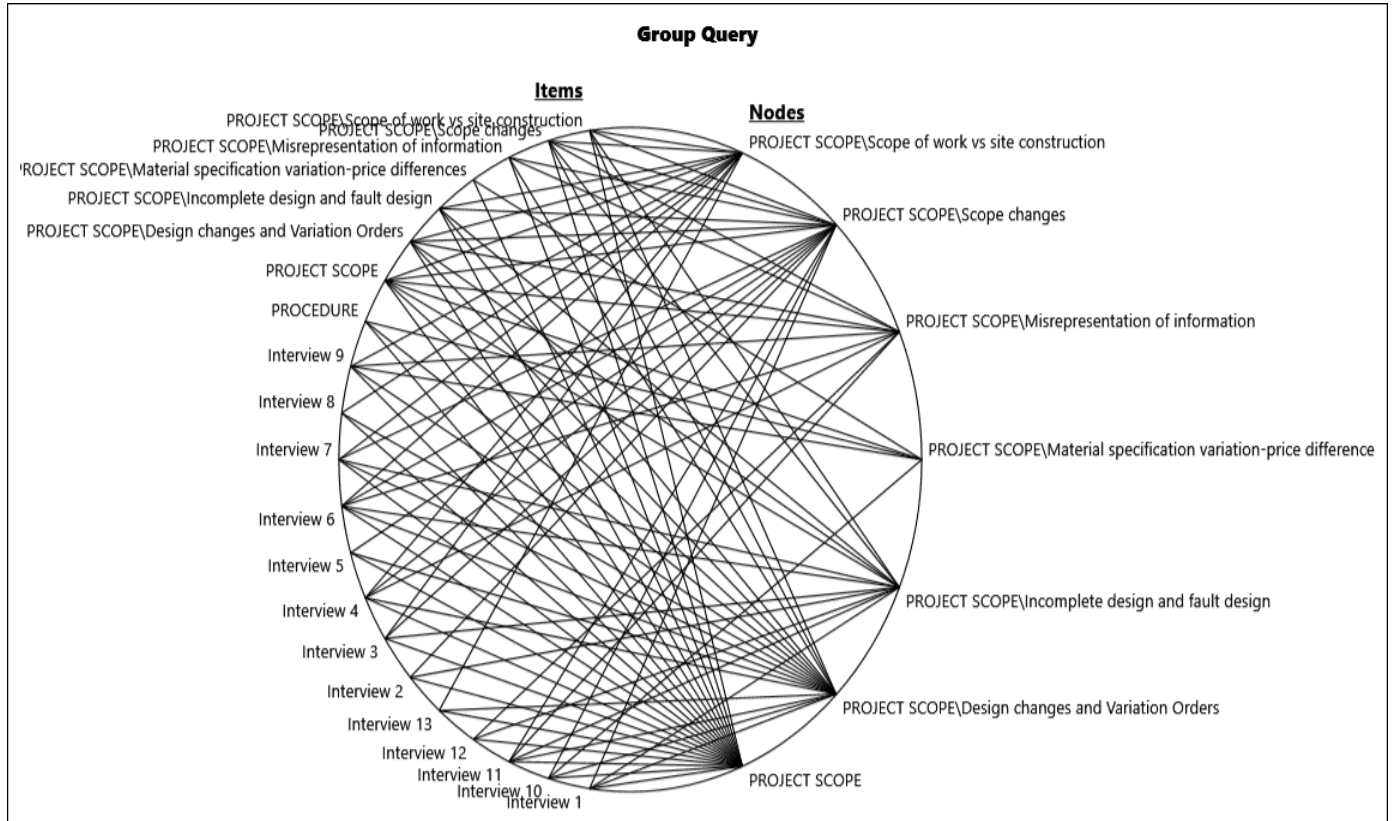


Figure 8.3 depicts the theme of project scope changes represented by the parent node, and the underlying sub-themes represented by child nodes. It was established that the following construction stakeholders contribute to project scope changes varying, which ultimately contributes to project cost overruns; client, architect, end-users, quantity surveyors, consultants comprising of diverse engineering professional fields (e.g geotechnical engineers, mechanical engineers, structural engineers), contractors, health and safety practitioners, government as a client, political office bearers, and the community.

Figure 8.3: Stakeholders' contribution to scope alterations

Core themes			
⊕ Name	↔	Files	References
○ Project scope change variables		11	41
○ Client project alterations		6	10
○ Architect and engineers project alterations		5	8
○ Contractors project alterations		2	4
○ End-user project alterations		3	4
○ Community project alterations		2	3
○ Consultants project alterations		3	3
○ Government as a client project alterations		2	3
○ Political office bearers project alterations		2	3
○ Quantity surveyors project alterations		2	2
○ Health and safety practitioners' obligations to the project		1	1

8.2.1.1 Client project alterations

Participants were of the view that the client significantly impacts the scope in numerous ways, resulting in scope changes and contributing to project cost overruns. The client, as the construction project owner, may change their mind with regards to the project specifications:

"...the project starts taking another direction because you find out that the client has change of view" (Interviewee 1)

"... let's start with the project client, he is actually the primary project driver, the first thing is that he has a brief that brief drives the budget.... if the client gives you a brief and then later on changes his mind, that causes a lot of problems." (Interviewee 2)

"...the clients, they change their minds, they give you the hard time, and they can easily explode their budget....if you had said we are only allowing the bath for R5 000, you can go to another shop for that bath which is R5 000 but if the client goes out and shops for something else and tells you that I like this bath for R13 000, then in that case you advise

them that what they are requesting is more expensive and their budget is only R5 000.”
(Interviewee 3)

Participants enlightened that in some circumstance, the complexity in relation to the design and scope arise because the client may not know what exactly they want and/or they fail to interpret their project needs:

“...where designs might be total wrong, therefore, fails to meet the client’s needs and intentions because you find out that the client might not necessarily know what they want.”
(Interviewee 1)

“...it only means that at that inception stage, you as an employer you have not clearly defined and made sure that the scope is interpreted correctly” *(Interviewee 6)*

Also, the client’s demands arise during execution, thus what was initially agreed upon and what the client is now interested in during the implementation phase, may differ.

“...the client says, this is the scope of work but thus not really what I want, then they want something else on site, but it’s not within the budget” *(Interviewee 4)*

“...so, the key there is to manage the changes and a lot of projects fail because the client said he wanted an apple now he wants a bigger apple or an orange... If you are to say change it from pink to blue, then thus a change of scope and the contractor is going to say, here is my invoice – this is new work now, I am on site for longer, moving a toilet becomes a big job like that and thus also when the contractor says I am going to make my money.” *(Interviewee 7)*

The above finding suggests that prior to the approval of the design and scope, the project manager and architect should ensure that the client’s needs are accurately interpreted and integrated in the design. This extends to indicating to the client that any changes to the scope have financial implications, particularly during project execution, where contractors are likely to take advantage of the stipulated changes to increase their profits at the expense of the client.

8.2.1.2 Architect and engineers project alterations

Interviewee 11 enlightened that adopting historical designs without contextualising it to the current project location environmental factors, results in changes when the project reaches execution stage, ultimately leading to additional costs. This result suggests that each project's background and uniqueness is important in detailing the design. Therefore, when the design team utilises historic data informing their designs, the site environmental factors of the construction project at hand, should not be overlooked. Services of the geotechnical engineers should be utilised to understand the design fit of the project to the location, to prevent scope changes during the execution phase. The following statements in relation to the design, change the variables, which contribute to project cost overruns as mentioned by the interviewees.

*“...if your design is faulty, then you are going to get a horrible surprise when you execute.”
(Interviewee 2)*

“...it is the design factor. The guys who design do not actually rely on facts of historical, typical infrastructure. A lot of guys who design nowadays, they copy identical infrastructure into their design without actually knowing the background to that particular infrastructure they copied..... the building might not fit the terrain when the infrastructure is being developed.” (Interviewee 11)

“...but when you do implementation, you realise soon, that here, this person did not do a proper design through research. You need to have a geotechnical because of all the sub-bases. If you don't actually do it, it becomes a problem.” (Interviewee 12)

Furthermore, interviewees were of the view that scope changes arise because the architect's design was incomplete when the construction project tender was awarded.

“...mostly, when you take the project for tender, the drawings are not yet 100% complete. So, as you continue construction, the drawings change and the client increases their wish list and all that causing the budget to change or to go up.” (Interviewee 3)

“...unfortunately some of these projects we cannot have everything at the inception stage, but its part and parcel of the projects.....so it's very difficult to say, let's have a clearly defined scope whilst sometimes it's not possible by the time when you go out for tender....you find that there are a lot of mistakes, loopholes, omissions which manifest

itself when the contractor is onsite and now you suddenly realise we don't have a drawing for this, what must we do with this and everybody looks around and then you know there is going to be a problem.” (Interviewee 6)

“...you might go and start the project while the design is 60% or 90%, mostly the design is not 100% when you start the project.”(Interviewee 7)

Also, conflict of interest of consultants who are both designers and contractors contribute to poor scoping and poor designs.

“...what's happening nowadays is that you are getting the scope, poorly constructed bill of quantities, poor designs because the professional teams are having to tender the work as well, so they are cutting corners so that they come within their budget” (Interviewee 6)

8.2.1.3 End-user project alterations

Interviewee 5 revealed that in cases where the end-user is not involved at the beginning of the project, scope changes arise during construction informed by the end-user, which will alter the design, ultimately altering the budget. Similarly, interviewee 10 revealed that some scope changes arise between the end-user and the client emerging from the difference of interests, concerning the type of materials. Changes in the design and type of materials informed by the end-user, affect the project budget because of price differences. These findings suggest that any change associated with the design and project materials alters the project budget:

“...so, I do a lot of low-cost housing, and one of the problems we have on the low-cost housing is that we never know who the end user is going to be for the low-cost house. And you have different religious beliefs, some of them do not like the toilet inside the house, they want the toilet on the outside of the house, so you end up by building these houses, then you've got to change them so that the toilet is on the outside not on the inside and some of them do not like trees on the property because they believe in superstition” (Interviewee 5)

“...I will give an example, somebody will say No I just want a simple ceramic tile and somebody else say no put a Poseidon tile, that already difference in preference informs your budget, so for me I think the issues of contention is number one on your scope....For me a conflict in terms of scope what should be included in the scope, what should be the scope? Second, specification I will go back to my example the client will say just use simple ceramic tiles and you go to users, users let’s say your headmaster and teachers says no no we don’t want that, we want Poseidon tiles here, that already speaks to your budget so for me the main things that will affect your budget is your scope number 1 and number 2 your specifications” (Interviewee 10)

From a positive perspective, interviewee 11 encouraged the involvement of the end-user at the early stages of the project to prevent scope changes which arise due to end-user’s requirements being not included in the project budget:

“...the headmaster of that school which were constructing, because in as much as architects have their own specifications, you will find that headmasters probably have certain things that from experience they require in projects so the moment that we invited them in planning, we actually managed to include those items in our project planning. Because I think there were things like soccer fields, they wanted specific sprinklers and stuff like that which the architect had not pointed out.” (Interviewee 11)

8.2.1.4 Quantity surveyors project alterations

The quantity surveyors are responsible for costing the project, thus developing the Bill of quantities informed by the scope (Chandramohan et al., 2020). Participants were of the view that inadequate experience may result in quantity surveyors overlooking or omitting scope items when costing or developing the project budget.

“...lack of competence from the quantity surveyor or the one who drafts the budget. They might have missed things or overlooked things. ” (Interviewee 3)

“...one of the reasons for the delays is because they employ in-house professionals, quantity surveyors, engineers and architects but they lack experience and the scoping is wrong, so the initial project is wrong. That’s the problem” (Interviewee 5)

This implies that quantity surveyors 'experience is essential in alleviating cost overruns associated with budget miscalculations.

8.2.1.5 Consultants project alterations

Consultants play different roles in developing the design and scope, depending on their profession project requirements. Their contribution to the scope is remunerated, based on the tasks executed and/or value of the project. Some consultants may expand the scope of works to increase their consultation fees. However, it is inevitable to develop the design and scope without consultants' services as it possesses a risk of variations at a later stage of the project. Forgoing the aforementioned, the following statements in relation to the expansion of the design by consultants attributing to project cost overruns, were highlighted by the interviewees;

"...as we started work, the hospital will continue and ask why you are doing that, the machines today are not this size, we do not need a room this big anymore, so we had 144 variation orders. So, the department of public works, they actually don't engage properly with the end-user as well as the other consultants" (Interviewee 5)

"...major stakeholders is the client, the project manager, the quantity surveyor, the civil structural, the mechanical and electrical engineers, maybe the health and safety agent as well. We call them professional service providers, all of them are called PSPs those are the stakeholders that have got something to do with the project budget. So the challenge that we have there is that we find that the civil structural guy is designing these things and obviously his fees are a percentage based, if the construction value comes up to R10million so he calculates his fees as the percentage of the construction value which is maybe 5% or 6% so there is a tendency of trying to inflate or alter the design in such a way that you put high specifications on the design such that the construction value goes up and yena (him/her) as well he gets a percentage in terms of his fees." (Interviewee 9)

"...I have a budget of 10 million I want to do this, maybe from a client's point of view, but the moment you appoint a consultant they would probably start telling you, for you to do this maybe you also need to do 1, 2, 3 it will make life simpler, so you find costs may start ballooning even at that planning phase when you're involving different stakeholders" (Interviewee 11)

8.2.1.6 Contractors project alterations

Participants argued that contractors' survival is dependent on winning tenders, as a result they misrepresent costing information by underpricing their bid offers in order to be the cheapest and win the tender.

"...contractors become the most affordable to win the tender. However, there will be hidden costs or where a client delays paying, they are quick to submit an interest related payment or stop work and proceed until the payments have been done or from the design team so they are trying to look for loopholes just to get money.... you find out that at the end of the day the tendering for example R2.5million. However, when the job is complete, it is now R6million. Its deliberate, the contractor would have done that knowing that there are these some loopholes." (Interviewee 1)

"...sometimes you find that when it comes to tenders, right now the economy is very bad so everyone wants a job so people tend to cut on the profit a lot so that we get the tender and we keep on going, we don't go bankrupt so you will find that we try to compromise when it comes to pricing.... we later revisit the whole BOQ and reprice it correctly" (Interviewee 4)

The above finding reveals the disadvantage of the low value tender system in South Africa which is prioritised, based on the cheapest pricing. Considering contractors' interest, this suggests that the tendering system should be reviewed in regard to pricing.

8.2.1.7 Health and safety practitioners' obligations to the project

Interviewee 8 emphasised the crucial role of health and safety in the construction industry and financial implications therein, therefore, implying that aspects concerning health and safety should be integrated in the project scope and budget. Failure to integrate health and safety obligations may impact the scope and result in additional funds, taking corrective action.

"...most of the contractors in the Eastern Cape are not competent, they are cutting corners, they are not doing work as per the regulation, I mean construction industry is heavily regulated especially when you talk of an example is a Health and safety there are strict requirements on health and safety employees must go for medical checks before they start work, employees must have protective clothing, there must be a site office with

certain items in the office, contractors must appoint competent people to manage their projects, like the foremen, the site inspector, all those people but contractors are just taking short-cuts which is a huge challenge.” (Interviewee 8)

8.2.1.8 Government as a client: project alterations

Participants argued that when the government is the client, the construction project managers are excluded from scoping and are handed over a scope that is already developed without the involvement of the project manager. Also, the project budget contingencies are undisclosed to the project manager. As a result, the scope is incorrect, translating to an incorrect project budget.

“...the government does not involve us on the first stage of project that is the pre-feasibility stage and we don't know the contingency. The government does the pre-feasibility stage; the problem is that their scope is always wrong so the budget will be wrong. Then they start pooling consultant's general from the feasibility stage onwards, when you finish your feasibility, you generally find that the scope is double what they initiated in pre-feasibility. So, what then happens is that the project is delayed by a year or 2 years because it takes that long for them to go back that is the approval process, because they will need to get additional money for the project. (Interviewee 5).

“...the scope that is poorly identified at the beginning and if thus not very clear, everything else flows after that is not 100% correct, scope is the biggest problem” (Interviewee 6).

8.2.1.9 Political office bearers project alterations

Participants revealed that stakeholders from the political sphere, such as councilors, influence construction scope changes which negatively impacts the project budget. In pursuit of political party support from the communities, political office bearers interfere in construction projects by requesting more workers to form part of the project team, more than the budgeted workforce.

“...there are these factions in communities that we work in thus a problem especially in our societies where we have multi-parties, your ANC, your DA, your EFF, all these guys are in their corners, and they have different interest in the project and that needs to be managed” (Interviewee 10)

“...Councilors, they try to use the political muscle requesting certain items and even trying to force people to be employed more than the resources needed on site...you find a new councilor will come and say, is it not possible we have this or stuff like that. Those are the kind of change usually we will be looking at” (Interviewee 11)

This suggests that political interference imposed by political bearers should be considered proactively and planned for when budgeting.

8.2.1.10 Community project alterations

Participants were of the view that community influences the scope and budget in public construction projects in trying to promote their needs.

“...the users are very crucial, e.g the community, the education department in the example of a school. The community can also stop or affect the project if they are not consulted or participate in the project to move on and other specialists depending on the nature of the project.” (Interviewee 1)

“...Councilors as they would have an idea of what work is priority and what the people on the ground actually need.” (Interviewee 11)

8.2.2 Stakeholders' experience and training

Participants highlighted that the government policy obligations such as Black Economic Empowerment (BEE) poses a complexity, particularly where stakeholders enforce policy and/or are recruited based on policy, rather than adequate training and experience.

“...we try to assign people just because of numbers, thus Black Economic Empowerment (BEE) that has compromised a lot projects, we have numbers but there is no experience behind those numbers.” (Interviewee 8)

“...the main issues was work stoppages from the construction mafia and forums, we had a huge issue in Port Elizabeth, Eastern Cape the SMEs went about all Municipal project and they closed all the sites and were demanding 30% stake of the contract based on the Broad-based black economic empowerment (BEE) regulatory requirement.” (Interviewee 9)

This suggests government policy on BEE should be an amendment to balance between policy and project competence requirements.

Interviewee 8 was of the view that project managers should be “all-rounders” in terms of skills associated with managing a construction project; however, they lack technical skills.

“...as a contractor and as a project manager, you find out that in certain situations project managers are very very incompetent, they do not have the technical know-how like we said at the beginning, the project manager must be an all-rounder and there are some projects that are very technical oriented. Sadly, there are no assistant project managers positions where they can be taught and mentored” (Interviewee 8)

Also, it was established that contractors lack ethical conduct and experience, while quantity surveyors possess inadequate competence in developing the project budget, which all contribute to cost overruns. Forgoing the aforementioned narrative, the following statements in relation to project stakeholder competency attributing to complexity and project cost overruns, were mentioned by the interviewees.

“...now the majority of contractors are lacking ethical conduct. Be that as it is, they have got no knowledge of the scope they are being given in terms of the employment, they don't have knowledge.” (Interviewee 12)

“...yes this happens nhe, you bring in the contractor he says I can do it and he can't, or he says I can get this done in 3 months, you know and in 3 months' time, he is not done.” (Interviewee 7)

“...lack of competence from the quantity surveyor or the one who drafts the budget.” (Interviewee 3)

Participants highlighted that lack of competence arises from the inadequate training. It was established that stakeholders such as engineers and project managers have limited training in financial management and technical skills.

“...I would say training is very poor and it got worse over years, there are no more schools anymore for artesian, technical skills. (Interviewee 2)

“...there is a technical project, some of them highly and extremely technical, unless he has been trained and skilled in those types of projects.....we have seen this one before and they will flood him with claims and all sorts of things and he can't interpret them, the financial aspect. They will take advantage of him.” (Interviewee 6)

“...Engineers and Project managers receive very limited training in terms of business and financial management.” (Interviewee 13)

Revisiting the research objective *“to investigate the extent to which project stakeholder complexities contribute to project overruns within the construction industry in South Africa,”* it was established that diverse project stakeholders influence the project scope varyingly, ultimately impacting the project budget because it depends on the project scope. The findings suggest that various project stakeholders' scope-related variables, particularly scope changes, significantly contribute to construction project overruns. In a nutshell, conflict of interest among stakeholders' expectations and needs possess complexity towards completing the project within budget. Also, project stakeholders' inexperience and inadequate training significantly contribute to project cost overruns. In summary, the following project scope variables emanating from project stakeholder influences and stakeholders' level of experience and training presented in Table 8.2, which ultimately contribute to project cost overruns, were identified:

Table 8.1: Project scope and competency variables

Project scope variables	Stakeholder attribution
Design changes	Architect, client, engineers, consultants
Incomplete design	Architect, client, engineers/ consultants
Fault design	Client, engineers, consultants
Misrepresentation of information	Contractors, consultants
Construction site terrain	Consultants (geotechnical engineers)
Scope changes during execution	Client, contractors, community, consultants, end-users, political office bearers
Incorrect design	Client, consultants, government
Inadequate experience/ incompetency	Project managers, architect, quantity surveyors, engineers, consultants
Inadequate training/ incompetency	Project managers, quantity surveyors, engineers

Constructed by the researcher

8.2.3 Stakeholders' involvement in project budget development

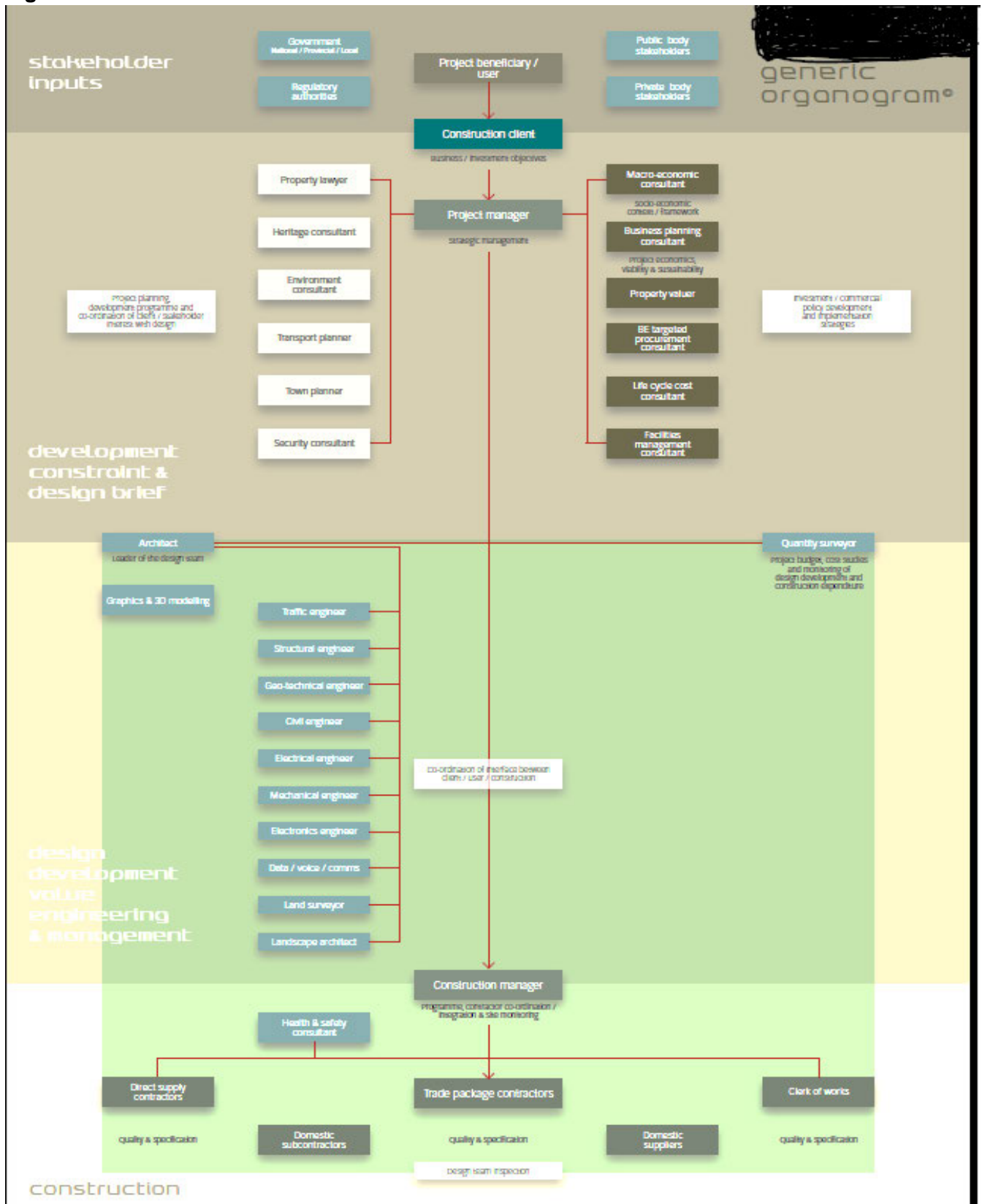
This theme focused on the level of project stakeholders' involvement, thus determining the stakeholders affected by the project budget decision making and may influence the project budget direction and expenditure. It was established that project stakeholders, including the construction project manager, quantity surveyor, architect, civil engineer, consultants, engineers and geotechnical engineers, should be involved in design development, which informs the project budget. In addition, the project end-users such as community and specialists relevant to the project should be consulted, regarding their expectations and project requirements, respectively.

"...stakeholders who need to be involved are obviously your project managers, quantity surveyor, architect, consultants, engineers and you will need geotech consultants' reports who are involved at the initial stage. You will need details on the soil type which will therefore determine the design and the required foundation by the civil engineer or structural engineer. Therefore, the design is informed by the soil type or reports from geotech engineers. All these consultants will make up the built environment team and are crucial stakeholders....the users are very crucial, e.g the community, the education department in the example of a school. The community can also stop or affect the project if they are not consulted or participate in the project to move on and other specialists depending on the nature of the project.....as long as you have got your client, project manager, quantity surveyor, architect and engineers, those are the guys who determine the budget. There might be specialist, if it's a heritage site, you will need ecology heritage specialist' guys, and you need environmental impact assessment" (Interviewee 1)

Interviewee 2 explained that stakeholders, including the end-user, government, regulatory authorities, public bodies, private bodies, construction project manager, architect, town planning practitioners, property lawyers, heritage consultants, environmentalist, security personnel, business planning consultants, property evaluators, BEE targeted procurement, architect, quantity surveyor, structural engineers, geotech, electrical, civil, mechanical, electronics, suppliers, and other specialists should all be considered when developing a construction budget, because they all have a bearing on the budget, depending on the nature of the project. Furthermore, interviewee 2 offered and provided a stakeholders' involvement framework list developed over a period of 20 years (see Figure 8.2).

“...the end-user is the person you got to look after. Here you have government, regulatory authorities, public body stakeholders and this can be all kinds of public body stakeholders, you also have got private body stakeholders, then you have a project manager, even before you get to the architect, look at the people who are involved, town planning, property lawyers, heritage consultants, environmentalist, security, microeconomics, business planning consultants, property evaluators, BEE targeted procurement, there are a lot of people involved. Then you get the professional team and here you have an architect, quantity surveyor, and then you have all your consultants, traffic, structural engineers, geotech, electrical, civil, mechanical, electronics, data. These are still broad categories because very often there are aspects of specialisation looking into these categories. You can also have other specialists, then you have the construction manager, you have suppliers, domestic’s suppliers, and public works and the list goes on.”
(Interviewee 2)

Figure 8.4: Construction stakeholders' involvement framework list



Adopted from interviewee 2

The implications from interviewee 2 are that there are numerous stakeholders involved in construction projects with diverse interests, which may affect the project budget. Therefore, stakeholder consultations and involvement should be diligently conducted.

Aligned to interview 2, based on the notion of numerous stakeholders' involvement, professional service providers such as health and safety, civil engineers, structural engineers, mechanical engineers, and electrical engineers, are essential to provide input relevant input associated with their profession, as emphasised by interviewee 9.

"...the major stakeholders are the client, the project manager, the quantity surveyor, the civil structural, the mechanical and electrical maybe the health and safety agent as well. We call them professional service providers... It depends whether there is discipline required on the project."(Interviewee 9)

Interviewee 3 regarded the professional quantity surveyor as the major stakeholder in developing the project budget, as per profession informed by the client, architect and engineers' inputs.

"...the professional quantity surveyor is the major person who advises the client on what's going on but he/she will not have the power to increase or decrease costs or the project, the power will depend on what the architect, engineer, or the other consultants may deem necessary for that project. (Interviewee 3)

Interviewee 4 recommended the inclusion of the project administrators as they are responsible for financial record keeping.

"...construction manager or project construction manager, the engineers, In case there is a construction manager and a project manager, then both of them have to be involved. Sometimes you also have your clerk of works, your project administrator because they are there to record everything, the foreman we do not normal need him, when it comes to budgets, but I think those are the main key holders that we really need for the project budget." (Interviewee 4)

The inclusion end-user or the principal-agent representing the end-user was also emphasised by the participants. Failure to include the end-user and/or the principal-agent (project manager) may result in misrepresentation of the project requirements, leading to distorted project budget.

“...it’s always have got to be the end-user, for example if I am designing the house for you, you need to be part of it. In the example of the hospital, the superintend needs to be involved upfront not the middleman and in your case you need to be at the meeting with the architect, thus where the problems come in, we always leave out the end-user.”
(Interviewee 5)

“...in your design team you have got your; principal agent who can be anyone he can be an architect, he can be quantity surveyor, he can be an electrical engineer, he can be a mechanical engineer, he can be a civil engineer, your principal agent is the one who is coordinating the team, the head of the design team is called the Principal agent. Some people call this person the project manager but the term that we use in our contracts is principal agent SADPA endorsed forms of contract like your JBCC.” (Interviewee 10)

Interviewee 6 argued that the uniqueness of the project ultimately informs the required skill set from a diverse pool of stakeholders required.

“...it will vary from project to project, and it depends on the agreement signed between the parties in terms of the building contract you have got the principal agent who is general the architect and he works with the principal quantity surveyor who manages the funding”
(Interviewee 6)

Revisiting the research objective “to determine the level of project stakeholders’ involvement with regards to the project budget development within the construction industry in South Africa, it may be inferred that the following stakeholders are essential in developing the project budget: client, project manager, quantity surveyor, architect and engineers, or consultants from different specialisations, relevant to the project, are adequate in developing the project budget. The aforementioned stakeholders were identified by the majority of the participants and are expected to consult with end-users of the project, to determine their expectations, regulatory authorities and the project regulatory obligations, in order to integrate end-user’s needs and meet regulatory obligations, ultimately developing a comprehensive budget. Furthermore, secondary stakeholders

such as suppliers, should be consulted to determine materials prices, and in the case of the community, to determine their project expectations with financial implications. Arguably, the inclusion of each stakeholder will be dependent on the project's uniqueness and requirements. Drawn from the findings, Table 8.3 shows the list of stakeholders who are mandatory in terms of involvement and consultation.

Table 8.2: Project stakeholders' involvement in budgeting

Mandatory involvement:
Client
Client end-user (For example building a house for a client end-user)
Quantity surveyor, engineers
Architect
Civil engineer,
Consultants, and/or engineers
Geotechnical engineers
Specialists
Mandatory Consultation
Community
Public end-users (For example building a school, thereby including the headmaster)
Suppliers
Health and safety practitioners
Government
Specialists

Constructed by the researcher

In totality, Table 8.4 shows a comprehensive list of construction project stakeholders who were identified from the overall findings.

Table 8.3: Deduced construction project stakeholders

Construction project stakeholders
Construction Project manager
Client
Client end-user (For example building a house for a client end-user)
Quantity surveyor, engineers
Architect
Civil engineer
Consultants, and/or engineers
Geotechnical engineers
Specialists
Community
Public end-users (For example building a school, thereby including the headmaster)
Suppliers
Health and safety practitioners
Government (National/Provincial/Local)
Specialists
Regulatory authorities
Property lawyer

Heritage consultant
Environment consultant
Transport planner
Town planner
Security consultant
Property valuer
BEE targeted procurement consultant
Life cycle cost consultant
Facilities management consultant
Traffic engineer
Structural engineer
Electrical engineer
Mechanical engineer
Electronics engineer
Data / voice / comms specialist
Land surveyor
Landscape architect
Health and safety consultant
Direct supply contractors
Trade package contractors
Clerk of works
Domestic subcontractors
Domestic suppliers

Constructed by the researcher

8.2.4 Stakeholders' communication regarding the project budget

Communication aims to convey project information from the sender to the receiver, to reach mutual understanding in executing project tasks (Burke, 2018). Project communication is regarded as essential towards project success, and it impacts different areas of the project such as safety, time, cost, and knowledge areas, all with financial implications. Here, interviewee 10 emphasised that communication should be conducted in an understandable form and be timely to the parties involved.

"...of those 10 knowledge areas, in my case I would say communication is the most important, so communication definitely impacts project success. So, communication must be done in the forms that is understandable to your beneficiaries and timely.Poor time management, poor cost management and interestingly poor Health and safety management. If you do not manage your health and safety correctly you end up getting injuries, people get injured and thus a cost and you lose productivity and it led to project cost overruns, poor communication, if communication is not proper, it will lead to problems that will affect your budget, communication actually affects all the other knowledge areas, which includes the topic of the budget. So those are the issues, poor stakeholder management, if you do not manage them proper then you are in a problem." (Interviewee 10)"

Interviewee 2 highlighted that miscommunication may occur among stakeholders of different levels of education. Therefore, it is necessary to consider the latter in terms of the project stakeholders being communicated to, and to use language that matches their education levels and understanding. These findings reveal that the way communication is conveyed, informs understanding, and that effective communication can be achieved by considering different levels of education in conveying information.

“...I would say communication has been the most fundamental challenge because it’s all about communication. It’s very interesting, you can say something to somebody, give them instructions and you come back 3 days later, and you can be very surprised the way they took the instructions. You ask yourself whether were even in the same room together, I do not know.... you have statutory bodies that you have to deal with, you have financiers that you have to deal with, people who actually put out the money for the project, the sponsors. And then in the professional team, because a man is an engineer, it doesn’t mean that he is necessarily a good communicator, he might be an engineer, but his verbal skills and written skills are not good. Then of course, you go to the builders, at senior management level you are dealing with people who mostly well-educated but the moment you move to the building site, there is a big gap between the management and people who actually work onsite.” (Interviewee 2)

Based on another angle, interviewee 5 enlightened that communication differs between the private and public sector. In the private sector, communication regarding the project budget is effective. Conversely, in the public sector, communication regarding the project budget is ineffective because some of the budgetary information is not shared with the construction project managers, particularly the project budget contingency. Also, there is no interaction between the project manager and the end-user.

“...on the private sector side, it very effective, on the public sector side we don’t seem to have a very good communication on of the budget because they don’t share with us what the contingency is.....and in the public sector no because the project construction manager and the end user don’t seem to interact, that’s were the biggest problem comes in” (Interviewee 5)

In agreement, participants highlighted the importance of communicating with the community or end-users. The community as the end-user is not directly involved in budgeting; however, failure to communicate with the community may result in community unrests and infrastructural vandalism, which ultimately affect the project budget. Therefore, it is essential to communicate with the community, in order to gain their buy-in to the project or for end-users to understand their expectations.

“...the community can also stop or affect the project if they are not consulted or participate in the project to move on....it’s not necessarily the people directly involved as the end user, like a school, we are not saying the kids but the parents and once the people buy in to a project, then we won’t see this vandalism of infrastructure where people burning property because they feel like it’s not their own thing.” (Interviewee 1)

“...end user clients and councilors as they would have an idea of what work is priority and what the people on the ground actually need....., once you communicate with them you have already managed their expectations whereas if you keep them in the dark with regards to the budget, they will keep requesting items assuming the funds are there.” (Interviewee 11)

Conversely, interviewee 13 argued that effective communication is not helpful in curbing project cost overrun while having a flawed budget from the onset.

“...I am not convinced that communication with stakeholders would have made much difference. The budgets were fundamentally flawed from the outset.” (Interviewee 13)

Interviewee 13 advocated for the use of technology to enhance communication efficiency and effectiveness, provided the project budget is not flawed from the onset. Based on the same notion, interviewee 3 recommends using a site instruction book and emails to enhance effective communication. Communicated scope changes via a site instruction book, and emails, should only be executed after approvals. This finding suggests that the scope changes approvals process, forms part of cost control in alleviating project cost overruns.

“...innovative technology would certainly assist with how and when information is communicated and how accessible it is. Project dashboard information would go far to achieve this. Develop an app that can draw on physical and financial information.” (Interviewee 13)

“...is having a site instruction book, and communication emails. If there are changes, you don't implement the changes, you will need to cost them, request for the changes to be signed for and approved prior to doing them.” (Interviewee 3)

Also, working closely with the client was encouraged by interviewee 7, thus communicating frequently and providing monthly reports that help in monitoring the project budget.

“...the project construction manager works very closely with the all the stakeholders, again if we are talking about the stakeholder being the investor or the client, they need to work very closely this is through communication and the way we do that is through monthly reports, it's key” (Interviewee 7).

Revisiting the research objective *“to determine the level of project stakeholders' communication with regards to the project budget within the construction industry in South Africa”*, it was established that communication affects the project and all the other aspects of the project which have financial implications. Importantly, to promote effective communication, different forms of communication should be utilised, depending on the stakeholders' level of education and the stakeholders' ability to interpret and understand the information conveyed. Arguably, it was recognised that effective communication does not resolve project cost overruns emanating from a finalised distorted project budget. This implies that effective communication should not be implemented in isolation of an accurate project budget.

8.2.5 Project managers' experiences: factors that influence the project budget

Drawing from project managers' experiences, Figure 8.5 shows the factors that influence the budget represented by child nodes. Herewith, the following factors that contribute to budget overruns were identified by the interviewees, namely: market conditions, local community strikes or unrest, South African regulatory framework, inadequate time allocated to budgeting, and contract misunderstanding.

Figure 8.5: Factors that contribute to project budget overruns

Core themes				
⊕	Name	↔	Files	References
⊖	Project managers' experiences - factors that influence the pr		6	13
	○ Market conditions		4	6
	○ Local community strikes or unrest		2	2
	○ South African regulatory framework		2	2
	○ Delayed corrective action		2	2
	○ Inadequate time allocated to budgeting		1	1
	○ Contract misunderstanding		1	1

8.2.5.1 Market conditions

Market conditions are environmental factors that affect numerous aspects of the project, such as procurement and materials prices changes (Regan et al., 2011; Musarat et al., 2021). Here, participants confirmed that inflation and exchange rates influenced by both local and international market conditions, affect the project procurement and material prices. Failure to factor in market conditions when developing a project budget, may result in an underestimated budget, which would be inadequate for the project. The following statements relating to market conditions variables, particularly inflation which contributes to project cost overruns, were highlighted by the participants.

“...there is government gazetted escalations, year to year escalations. You get check this out. Some projects take like 5 years and some take 2 years, you cannot give a price based on 2020 of materials yet the same person has to start in 2021 and finish in 2025, you have to factor in that in your pricing that is inflation rate.” (Interviewee 3)

“...there is also another thing we mustn't forget is that market dictates the price so even if there are records, history of price of this within a particular organisation and they base on that on working out the budget it's still dependent on the market, we have situations where the budget was, the employer's budget was so much based on previous rates and everything else,when it goes to tender, sometimes it comes out 20% higher and sometimes it comes 20% lower than the budget and then you start looking around and

say there is something which is wrong here, No, the markets will always determine the price not you.” (Interviewee 6)

“...its market determined, whatever estimates you do, you have to factor in market conditions and make sure you prepare a decent budget.....And based in Europe, the pricing of equipment materials, mind you this pricing was done 2 years ago because the project took 2 years to approve, and they can keep that price fixed for 2 years, because there, there is no inflation..... But in South Africa, there is this horrible thing called inflation, and every year prices go up by 6% or 7% and they can't understand....for example from the time you do the feasibility and by the time it is approved by the board, it might take a year or 2 years and in that time the price that you put there, let's say its R1million, when its approved in year or two, it's not R100million anymore, maybe it's now R106million, so you need to allow for that inflation.” (Interviewee 7)

Also, participants indicated that exchange rates mainly affect the project budget when the material/s are sourced internationally. In addition to exchange rate consideration, the lead time which may result to stoppages while waiting for materials to arrive, needs to be considered when purchasing project materials outside the country. This finding suggests that the exchange rates should be considered and included in contingencies if the exchanges are unfavorable. Also, this shows the importance of determining whether materials are locally or internationally supplied, prior to finalising the project budget.

“...on this other project what happened is the stuff that we wanted we couldn't get it locally, then it had to be imported but now we didn't factor the foreign exchange rate in our initial budget so that killed us for that particular unit because it was so expensive, so that also led to cost overruns.” (Interviewee 4)

“...when you order the equipment from Asia, you pay only on delivery and not earlier in case the Rands goes up and you have a problem.” (Interviewee 5)

“...unfortunately if you have got imported materials which we some of our projects specify all the time, I have been involved in the project in Free State where the specification calls for a ductile iron pipe for the water, just to transport water from reservoir to the reservoir,

ductile iron pipe very specific, and where do you get it from, you get it from India, Germany, Italy, from all those places, thus where they make them. So what happens now, because it is imported, it will always be paid at a certain rand value to the dollar and the fluctuations thereafter, the project has got to cover it.” (Interviewee 6)

8.2.5.2 Local community strikes or unrest

Local community strikes or unrest arising from project dissatisfaction aspect/s, ultimately lead to project stoppages and vandalism, all with financial implications. Project stoppages will translate to contractors claiming for standing time, and vandalism translates to reworks at an additional cost. Participants indicated that.

“...our biggest challenge or our biggest problem is with the local communities as much as they are not involved in budgeting but they tend to affect our budget in that when there is a small issue they come and toyi toyi and close the site and remember we would have signed the contract with the contractor and the contractor would claim for standing time with costs/penalties.” (Interviewee 9)

Interviewee 2 emphasised that labour costs are dependent on productivity levels. This suggests that the project team’s level of productivity should be considered when preparing the project budget.

“...when I came into the construction Industry many years ago, I was a young man those days, when we were calculating productivity we would measure that a bricklayer can lay on average 1500 a day that was the normal standard. Today, you are lucky if you get between 350 and 500 a day. So does that tell you something? So when people estimate costs and labour costs, they are working on productivity rate. Currently, on average I would say 350 a day.” (Interviewee 2)

8.2.5.3 South African regulatory framework

The South African regulatory framework dictates the tendering process, and partially, the recruitment of contractors and sub-contractors (South Africa, 2001). According to the South African regulatory framework (2004), the cheap tender bid should be selected and when recruiting contractors, the BEE policy should be implemented. In this regard, participants were of the view that the cheapest tender may not be the most accurate and the BEE qualifying contractors may

not be competent, resulting in project budget underestimation and poor-quality workmanship. Furthermore, participants postulated that the tender process and BEE policy lead to project budget underestimation and poor-quality workmanship, dually resulting in cost overruns due exhaustion of funds prior project completion and reworks. This finding suggests that the South African regulatory framework should be re-framed by selecting the tender bids with high project budget accuracy, and recruiting contractors based on their competency.

“...the national treasury says you have to give it to the highest scoring bidder at all times so which means the lowest price, so thus what you are restricted by so you find the guys in supply chain and management in most cases will not go and give it to the second, third and fourth guy, everybody is too scared, they are giving to the lowest price similarly when it gets to the construction, they give to the lowest price and sometimes the price aren't the right price.” (Interviewee 6)

“...it will be quality and sticking to time. I think those are the 2 major issues for me. If your quality is lagging behind, you have reworks at additional costs, overall, this impacts on the budget.” (Interviewee 8)

8.2.5.4 Inadequate time allocated to budgeting

Interviewee 7 indicated that inadequate time allocated to budgeting is also blamed as the cause of project budget overruns. This implies that adequate time should be allocated to project planning, in order to develop a comprehensive scope and budget, thereby alleviating project cost overruns.

“...so you do not spend the time before doing the project put a proper cost of the project. So there is usually a rush at the beginning and then you end up with a budget which is not up to standard or not a good budget, then you have problems later on. At the feasibility stage, the feasibility stage is rushed and you do not spend the time required for the feasibility because at the end of the day, the accuracy of the budget is about the accuracy of the level of engineering that you have done and how much you have defined the scope” (Interviewee 7)

8.2.5.5 Contract misunderstanding

Participants enlightened that contractors misunderstand contracts and their contractual misunderstanding contribute to project cost overruns. This suggests that contracts should be thoroughly interpreted to contractors to promote mutual understanding, particularly for contractual aspects with financial implications.

“...I think to be honest, most contractors don’t understand these contracts, thus the biggest challenge, they cannot even, because most of our contracts allow for the contractor to claim for the extension of time if there are delays, either the extension of time with costs or without costs but they do not know these things, they don’t know their contracts their rights actually as a result the contractor ends up being abused because you do not know.”
(Interviewee 9)

8.2.5.6 Delayed corrective action

Delays in reporting were highlighted by participants. As a result of fear by the principal agent or stakeholders responsible for project and cost changes, delay reporting to the client, resulting in delayed corrective action. Delayed corrective action which would have been resolved through a contingency result to project cost overruns, as the cost builds up. This finding suggests that project leaders should not fear reporting timeously as it is better than delayed corrective action and should be promptly taken up by project leaders to prevent cost overruns.

“...Leadership, whoever it is who is responsible for that project because if there is anything going wrong in terms of the project, I have seen some places where the agent will not want to report a project with cost overruns. He will say No No I can’t do that, you need to report this now so that they can make a plan for additional budget.” (Interviewee 6)

“...sometimes what happens is the professional team they are afraid to tell the client and they stay quiet and the price builds-up.” (Interviewee 7)

Revisiting the research objective “to explore project managers’ experiences with regards to the factors that influence the project budget in relation to project stakeholders within the construction industry in South Africa,” note that in order to curb project cost overruns, it was established that

stakeholders involved in preparing the budget, should consider factors such as the local community strikes or unrest, market conditions, South African regulatory framework, time allocated to budgeting and contract understanding that influences the budget (See table 8.4).

Table 8.4: Factors that influence the project budget

Factors that influence the project budget
Local community strikes or unrest
Market conditions
South African regulatory framework
Inadequate time allocated to budgeting
Contract misunderstanding

Constructed by the researcher

8.3 Conclusion

In conclusion, this chapter presented and analysed qualitative data. It was established that diverse project stakeholders influence the project scope varyingly, ultimately impacting the project budget, because it depends on the project scope. Scope variables such as design changes, incomplete design, faulty design, misrepresentation of information, construction site terrain, and scope changes during execution resulting in variation orders, contribute to project budget overruns. Conflict of interest among stakeholders' expectations and needs, possess complexity towards completing the project within budget. Also, project stakeholders' inexperience and inadequate training significantly contribute to project cost overruns.

Regarding stakeholders' involvement in preparing the project budget, it was established that the following stakeholders are essential in developing the project budget; client, project manager, quantity surveyor, architect and engineers or consultants from different specialisations relevant to the project, are adequate in developing the project budget. The aforementioned stakeholders were identified by the majority of the participants and are expected to consult with end-users of the project, to determine their expectations and regulatory authorities and the project regulatory obligations in order to integrate end-user's needs and meet regulatory obligations, ultimately developing a comprehensive budget. Furthermore, secondary stakeholders such as suppliers, should be consulted to determine materials prices and community, to determine their project expectations with financial implications.

Regarding project budget communication, it was established that communication affects the project and all the other aspects of the project which have financial implications. Importantly, to promote effective communication, different forms of communication should be utilised, depending on the stakeholders' level of education and the stakeholders' ability to interpret and understand the information conveyed. Arguably, it was recognised that effective communication does not resolve project cost overruns emanating from a finalised distorted project budget. In order to curb project cost overruns, it was also established that stakeholders involved in preparing the budget should consider factors such as the local community strikes or unrest, market conditions, South African regulatory framework, inadequate time allocated to budgeting and contract misunderstanding. The next chapter provides a discussion of both quantitative and qualitative findings and presentation of the model.

CHAPTER NINE – DISCUSSION AND MODEL

9.1 Introduction

In the previous chapters seven and eight, quantitative and qualitative data were presented and analysed, respectively. Subsequently, this chapter provides a comprehensive discussion and interpretation of the findings triangulated from chapter seven and chapter eight, concurrently correlating with the research objectives and literature review substantiation. The chapter is organised as follows: firstly, the socio-demographic information of the construction project managers operating in South Africa, is discussed. Secondly, the extent to which project stakeholder complexities contribute to project overruns within the construction industry in South Africa is included, followed thirdly, by the level of project stakeholders' involvement and communication, with regards to the project budget development within the construction industry in South Africa. Fourthly, the model inputs centered on the diverse construction project stakeholders follow. Lastly, the chapter's overall summary is provided. The foregoing sections of this chapter tie into the below objectives of the study.

- To investigate the extent to which project stakeholder complexities contribute to project overruns within the construction industry in South Africa.
- To determine the level of project stakeholders' involvement and communication with regards to the project budget, within the construction industry in South Africa.
- To explore project managers' experiences with regards to the factors that influence the project budget, in relation to project stakeholders within the construction industry in South Africa.
- To develop a model which may be used by project managers to avoid stakeholder-related project overruns.

9.2 Socio-demographic information

Gender was used to monitor the representativeness of the sample and validity of the findings. Quantitatively, the findings reported that 18% were female, while 82% were male, which is more than quadruple the percentage of females, and consistent with the qualitative participants' constituting of two females and eleven males. Thus, it reflects a predominant male participation in comparison to females. Regardless of the South African government's efforts to increase female inclusion in the formal economic activities, the low representation of females is a common

gender bias in the construction industry (Galea et al., 2015; Gebre, 2021; Norberg & Johansson, 2021). Therefore, the inferences of this study mainly reflect the views of males, notwithstanding the researcher's attempt to ensure an equitable representation of both sexes. These findings imply that the construction industry in South Africa is a male dominated sector. This can be regarded as a true reflection of the population composition of gender in the construction industry. These findings aligned with numerous studies (Galea et al., 2015; Gebre, 2021; Norberg & Johansson, 2021), that the construction industry is a male dominated sector both global and in South Africa.

The level of education influences the competence of construction project managers' capabilities to effectively liaise with numerous stakeholders and ultimately complete the project within the budget. Participants were generally educated, with the majority having attained a bachelor's degree (48%) and a master's degree (33%). Arguably, the interviewees stated that technical know-how incompetence is regarded as a significant factor contributing to project budget overruns. Furthermore, an emphasis on construction project managers' mentorship and the issue of being the "Jack of all trades" within the construction industry spectrum, was advocated. The implications of the findings support that educated people commonly occupy managerial-level positions (Sibiya et al., 2015; Kendrick, 2015; Heagney, 2016; Harrison & Lock, 2017). In the construction industry, construction project managers' education and competence should be an integration of diverse trades and skills required at different phases of the construction project life cycle.

External factors differ in each geographical area; therefore, the external geographical location of factors has an influence on the project stakeholders' needs and budgetary goals. The Gauteng province constituted 33%, KwaZulu Natal 18%, Western Cape 14%, Eastern Cape 11%, Limpopo 7%, Mpumalanga 6%, Northern Cape 5%, and both Northwest and Free State constituted 3% each. A percentage (1%) of the participants were both involved in construction projects across South African provinces and outside South Africa. Evidence from the literature shows variations in infrastructural developments from province to province in South Africa, influenced by and/or resulting from population capacity and economic activity (Saba, 2018; Laryea, 2019). Similarly, as in SACPCMP's (2019) indication, the findings show that there are more construction project managers in Gauteng, compared to other South African provinces. The findings reveal that

project-stakeholder causes of budget overruns differ from province to province. For example, in Gauteng, political influence was more prevalent, involving diverse political party office bearers compared to the Western Cape. In the Western Cape, none to minimal political interference on construction projects was highlighted, which may be because a single political party governs the Western Cape. In the Eastern Cape and KwaZulu Natal, forum groups and the construction mafia were prevalent stakeholders interfering with the projects, ultimately resulting in project budget overruns. The aforementioned findings clearly show construction sabotage emanating from diverse stakeholders, with varying influences on the budget at different locations in which the project is being executed. Therefore, stakeholder strategy differs from location to location, depending on the stakeholders identified, and their risk factors to the project budget.

9.3 Project stakeholders' complexities contribution to project budget overruns

The findings showed that construction project managers (67%), clients (64%), quantity surveyors (56%), and architects (55%) are the stakeholders with the highest-level of impact on the project budget, followed by financiers (47%) and contractors (42%), all with a p-value of $<.001^*$. Subjectively, stakeholders' interference on the project scope and project stakeholders' competency were found to be the key factors contributing to project cost overruns, emanating from project stakeholders' complexities. Project stakeholders' interference on the project scope varyingly pose complexities in achieving the budget that may result in reworks. The findings showed significant dissatisfaction on the cost effectiveness in dealing with design changes caused by the architects and contractors' shortcomings. Correspondingly, based on worldview and African perspective, extant literature reveals that design changes are one of the major causes of project cost overruns (Love et al., 2011; Chileshe & Kikwasi, 2013; Mukasera, 2016; Gituro & Mawasi, 2017; Seddeeq et al., 2019; Aslam, 2019; Tuyishime, 2020; Mohammad et al., 2021). This implies that design changes are the common cause of construction projects' budget overruns.

In South Africa, design changes were highlighted as a cause of project cost overruns, resulting in reworks (Khabisi et al., 2017; Mulalo et al., 2018). Herewith, construction project reworks are a phenomenon experienced globally (Aiyetan, 2013; Buys & Le Roux, 2013; Ullah et al., 2017; Mashwama et al., 2017; Annamalaisami & Kuppuswamy, 2021). Similar to this study's findings, the findings of Mashwama et al. (2018) reflect reworks as a contributor to cost overruns in South

Africa. These findings confirm that design changes and reworks remain one of the main causes of budget overrun and a threat to construction project fruition in South Africa. Therefore, the need to alleviate scope changes and reworks through the identification of stakeholders, who cause scope changes. It was established that clients (57%) significantly contribute to cost overruns, they change their minds, which alters the scope and the budget. Also, clients are unsure of exactly what they want during the project's design phase, resulting in an incorrect design and inevitable scope changes at a later stage of the project, negatively affecting the project budget. These findings align with Seddeeq et al. (2019) 's findings, that most construction projects have been characterised by an increased client involvement in changing the project scope. These findings imply that a client's involvement should be thoroughly monitored and the cost implications of scope change clearly communicated to the client.

Failure to consult with the client end-users, particularly in the public sector, results in scope omissions, which are included at an additional cost per the end-user's request and building requirement. In order to gain political support within communities, political office bearers enforce the employment of additional people, resulting in scope expansion. To increase their remuneration fees, consultants or professional service providers expand the project scope by adding features that might not be necessary. To increase profits, contractors' cut corners' in executing their tasks and maximise variation order claims. Cutting corners typically result in reworks due to failure to meet the building quality and health and safety requirements. Reworks are also a result of community vandalism arising from project dissatisfaction. Participants revealed that project reworks (47%, p-value <.001*) are not executed cost-effectively by contractors. Saba (2018) concedes that vandalism during execution resulting in reworks, is regarded as one of the causes of budget overruns in South African construction projects. Scope changes resulted in numerous variation orders, and contractual claims were found to cause cost escalation at Kusile and Medupi projects in South Africa and construction projects in Kenya (Gituro & Mwawasi, 2017; Tshidavhu & Khatleli, 2020).

Conflict of interest among stakeholders was identified as a significant complexity contributor to construction project budget overruns. This suggests that alleviation of conflict of interest among stakeholders may curb project budget overruns. Therefore, construction project managers should proactively engage with the client end-user before execution and must be technically

knowledgeable to avoid unnecessary scope additions by consultants. Contractual agreements that are mutually beneficial to the construction project manager, client, consultants, and the construction project, should be used to curb loopholes with financial implications. Furthermore, construction project managers should effectively communicate with the community and political office bearers to reach a rapport aimed at preventing vandalism and unplanned workforce increment. Effective communication should be conducted, considering the coordination of all relevant stakeholders affected by the decisions.

Proceeding with scope change-related cost implications, participants strongly agreed (81%) that the project scope should be very clear to prevent project budget overruns, and strongly agreed (79%) that late design changes negatively affect project costs. The findings showed that tender finalisation before the design completion, translated to an incomplete scope and bill of quantities, significantly contributing to construction project cost overruns. *"...you might go and start the project while the design is 60% or 90%, mostly the design is not 100% when you start the project."* (Interviewee 7). Ramabodu and Verster, (2013) and Seddeeq et al. (2019) acknowledge that incomplete design at the tender stage, contributes to construction project budget overruns. These findings infer that completion of the design, prior to tender, may be a solution to curb construction project budget overruns. Equally, a clear scope should accompany the completed design and be used for costing, when developing the bill of quantities. A completed design with a clear scope eliminates loopholes that consultants and contractors will likely take advantage of to siphon funds from the project.

9.4 Stakeholders' experience and training

It was established that inadequate experience and training of project stakeholders contributes to project cost overruns. Extant literature validates that lack of experience and training significantly contributes to project cost overruns (Mukuka et al., 2014; Shah, 2016; Ullah et al., 2017; Ali & Najm, 2021; Morena & Amoah, 2021). Concerning this study, competence and skills-related issues were found to highly impact the construction budget (51%, p-value <.001*). Findings revealed that the architect and quantity surveyors' inadequate competency resulted in incorrect designs and bill of quantities, emanating from omitting scope items and related costs, inevitably resulting from scoping changes. For example, interviewee 3 indicated that lack of competence from the quantity surveyor or the one who drafts the budget, might have resulted in missed or overlooked scope items during the initiation and planning stage. It is also of note that during the

execution stage, it was established that some of the stakeholders who form part of the project execution team, lack experience and training. Also, it was established that the construction industry is characterised by inadequate artisan and technical skills training. This implies that there is a need for training for construction project practitioners to improve competence levels in South Africa.

Similarly, to this study, technical incompetence and generic personnel incompetency were found to significantly contribute to construction budget overruns in the Democratic Republic of Congo and in Zimbabwe (Chigara et al., 2013; Nyoni, 2019; Bitamba & An, 2020; Bank & Mvukiyeha, 2021). In the same notion, contractors' incompetence was found to be the main reason for construction projects exceeding the budget in Kenya (Githenya & Ngugi, 2014; Boru, 2016; Oyieyo et al., 2020). From the South African context, these findings imply that there is a need to focus on technical skills and project managers' mentorships prior to managing construction projects. Here, the introduction of artisans' technical skills training facilities is recommended, allowing contractors and sub-contractors personnel to train through practicals. Technical skills training would, in turn, alleviate construction costs associated with reworks and low productivity.

9.5 Construction project budget stakeholders' involvement and communication

Construction projects are characterised by different stages and in each stage, diverse stakeholders with financial implications affect the project budget. According to Tessema, (2008) and PMI (2017), the following stages apply to the construction project life cycle - initiation (construction inception), followed by planning (construction design development) followed by project implementation (construction project execution and administration), and lastly closure (construction project commissioning). Traditionally, project controlling and monitoring was regarded as the fourth stage. However, to date project controlling and monitoring is applicable in all the project construction stages. Stakeholders' levels of involvement in project budget management processes differ at different stages of the construction life cycle. Certain stakeholders are directly involved in project budget development and control, while there are stakeholders who are involved in different stages of the construction project with impact on the project budget, and, however, are not involved in project budget development and control. Nevertheless, their involvement through communication and consultation is essential to develop a comprehensive budget and the meeting of project budgetary goals.

9.5.1 Construction project life cycle stakeholders' involvement

It was established that the following stakeholders are highly involved in the construction project from inception to closure: the construction project manager, clients, quantity surveyor, and the architects. The preceding stakeholders' involvement in association with the budget reflected a varied involvement at high levels in different stages of the project life cycle as follows: during the project initiation stage, project managers (89%), clients (79%), quantity surveyors (72%), and architects (53%). During the project planning stage: project managers (91%), quantity surveyors (81%) clients (80%), and architects (67%) are involved, while during the project execution stage, role-players include project managers (95%), quantity surveyors (86%), clients (70%) and architects (62%). During the project controlling and monitoring stage, the following are involved: project managers (94%), quantity surveyors (86%), clients (65%), and architects (51%). During the project closure stage, involvement includes the following: project managers (94%), quantity surveyors (85%), clients (69%), and architects (48%). These findings imply that the foregoing stakeholders are more vested in the construction project in comparison to other stakeholders. Similarly, numerous authors (Tessema, 2008; Kwok, 2018; Kloppenborg et al., 2018; Shahmehr, 2020; Abdelaty & Nesselhauf, 2020) support the involvement of the client, construction project managers, architects, and quantity surveyors from project inception to project closure. However, their level of involvement differs from stage to stage, depending on their input requirements for the project.

Noticeably, contractors' (52%) involvement increased during project execution. Contractors are responsible for construction project implementation, which warrants their increased involvement in project budget management processes during the construction project execution stage (Brook, 2016; Laryea & Watermeyer, 2016; Shahmehr, 2020; Zhao et al., 2021). Participants worryingly emphasised negative financial implications imposed by 'contractors' in the form of the construction mafia and contractor forums during the execution stage. Construction mafias illegally enforce their recruitment to the project with an expectation of income, without services rendered, while contractor forums enforce policy and are recruited based on Black Economic Empowerment (BEE) policy rather than adequate training and experience and were identified as a nuisance to the project budget.

Project administrators' involvement increased in the following stages, project execution (68%), project controlling and monitoring (60%), and project administrators (64%) of the project cycle stages. Project administrators assist the construction project manager in controlling and monitoring the project budget concurrently reporting on the project budget status, which typically happens during project execution, monitoring and controlling, and closures stages (Peters, et al., 2016; Mok et al., 2017). Therefore, the project administrators' involvement finding corresponds with extant literature inferring normalcy, informed by project administrators' duties within the construction project life cycle. Also notable was an increased involvement of the following consultants during the planning stage informed by their duties within the construction project life cycle, civil engineers (60%), electrical engineers (55%), and mechanical engineers (53%) and during the execution stage civil engineers (59%), electrical engineers (55%) and mechanical engineers (57%). During the planning, stage consultants assist in obtaining building permits and provide crucial input on requirements relating to engineering, equipment, machinery, electrical, air-conditioning systems, plumbing, and interior and exterior materials of the construction-building project (Tessema, 2008; Sears et al., 2015; Ghaffarianhoseini et al 2017; Nurrahmah & Tuti, 2021).

In the same trend, project execution and project changes require the coordination of relevant key stakeholders such as the client, project manager, architect, consultants, contractors, and subcontractors, to ensure that project alterations are completed in accordance with contractual and engineering requirements (Cunningham, 2018; Abdelaty & Nesselhauf, 2020), which warrants the involvement of consultants during the execution stage. The aforementioned tasks have financial implications; hence, the consultants increased involvement in project management budget processes. Thereafter, a sluggish decline in consultants' involvement in project budget management processes is experienced, that is, during the controlling and monitoring stage as follows: civil engineers (53%), electrical engineers (47%), and mechanical engineers (49%) and during the closure stage civil engineers (50%), electrical engineers (49%), and mechanical engineers (49%). Construction project monitoring and controlling are mainly the responsibilities of the construction project manager in consultation with diverse stakeholders involved in budget expenditure, including consultants (Iqbal et al., 2015; PMI, 2017; Shahmehr, 2020; Addo, 2021; Irfan et al., 2021). In addition, the construction project

manager is mainly responsible for project closure with minimum to moderate involvement of consultants (Gilliland, 2019; Abdelaty & Nesselhauf, 2020; Segbedzi & Hackman, 2021).

The foregoing empirical findings have implications for construction project managers' insights on developing a stakeholder strategy on the required levels of interaction, communication, and engagement with each identified stakeholder during different phases of a project informed by their level of involvement. In addition, the findings inform the construction project managers on strategising attention shifts among stakeholders at different stages of the project life cycle, aimed at completing the project within budget. The higher the level of involvement, the higher the probability of impact on the project budget and .therefore, the higher the expected construction project managers' interaction, communication, and engagement with the stakeholder in controlling the budget. Furthermore, the stakeholder's direction of impact on the budget should be determined, whether the stakeholder's involvement is positively pushing towards completing the construction project within budget, or negatively characterised by unfavourable expenditures informed by the stakeholder's interests, and not of the project's interest.

Extant literature acknowledges that contractors significantly contribute to project cost overruns emanating from incompetency, mismanagement of materials, site abandonment, malpractices, and misleading variation orders (Doloi, 2012; Mukuka et al., 2014; Gaetsewe et al., 2015; Obodoh & Chikasi, 2016; Oyieyo et al., 2020). On the other hand, Peters et al. (2016) and Mok et al. (2017) confirm that project administrators and construction project managers work together in monitoring and controlling the project budget. This, therefore, implies that an increased project administrator's involvement during project execution should be promoted, because it is favourable to the project through increased project budgetary monitoring and controlling. On the contrary, higher attention should be given to contractors during project execution because their involvement and interests may be unfavourable to the project's budgetary goals. The same criterion is applicable to all other stakeholders at different stages of the project, depending on their level of involvement, interests, and favourable influence on the project budget.

9.5.2 Stakeholders' involvement in developing the project budget

In developing the project budget, the findings showed that the construction project manager (89%), the client (59%), and the consultants such as quantity surveyors (92%), civil engineers (65%), and architects (69%), electrical engineers (62%) and mechanical engineers (63%) are the most involved in cost estimations. In addition, the construction project managers (95%), quantity surveyors (85%), clients (75%), and architects (67%) are the most involved in budget allocation and expenditure decision-making. In the same notion, the interviewees identified the following stakeholders as essential in developing the project budget: client, project manager, quantity surveyor, architect, and engineers or consultants from different specialisations. The foregoing findings are supported by literature; thus the quantity surveyor and construction project manager are typically responsible for developing the project budget with inputs from the client, architect, and consultants (Zulch, 2012; Sunindijo, 2015; Kloppenborg et al., 2018; Nurrahmah & Tuti, 2021). These findings suggest that internal stakeholders who are directly involved in managing the project costs are most involved in developing the project budget. Annamalaisami and Kuppuswamy (2021) acknowledge that stakeholders who are directly involved in the management of project finances are the best individuals to develop the project budget.

In addition to internal stakeholders and consultants, participants emphasised the inclusion of the end-user, and other relevant stakeholders who may affect the project budget, such as the regulatory authorities, community, suppliers, etc. *"...it's always have got to be the end-user, for example, if I am designing the house for you, you need to be part of it. In the example of the hospital, the superintendent needs to be involved upfront not the middleman and in your case, you need to be at the meeting with the Architect, thus where the problems come in, we always leave out the end-user."* (Interviewee 5). In support, it was also established that communication significantly impacts the project budget (77%, $p < 0.01$). This implies that end-users' consultation informs the project budget developers of items with cost implications that may not have been considered and integrated into the budget. Furthermore, secondary stakeholders, such as suppliers, should be consulted to determine materials prices, regulatory authorities communicated in determining the project regulatory obligations with financial implications, and the community in determining their project expectations with financial implications. Considering the uniqueness of each construction project, other relevant stakeholders with financial implications should be consulted in order to develop a comprehensive budget. Therefore, the

project budget may not be developed in isolation and absence of communication, consultation, and understanding of all relevant stakeholders with financial implications on the project budget.

9.6 Project managers' experiences: factors that influence the project budget

Based on construction project managers' experiences, quantitative findings showed that numerous factors such as cost estimation (68%), competence and skills (51%), cost control (55%), procurement (56%), design (51%), stakeholder interrelationships (50%), political interference (52%), and corruption (57%) highly impact the construction budget. While factors such as mismatch of contractors (43%) and quality compliance issues (39%) moderately impact the construction budget. Correspondingly, it was established from qualitative findings that stakeholders involved in preparing the budget should not overlook factors such as the local community strikes or unrest, market conditions, South African regulatory framework, inadequate time allocated to budgeting, and contract to curb project cost overruns. Clearly, the preceding factors negatively affect the project budget and should be incorporated into the model to alleviate cost overruns. In particular, cost estimation was singled out as a factor with the highest impact on the project cost, compared to other identified factors. Likewise, inaccurate cost estimation was found to be a global and African phenomenon (Ahady et al., 2017; Ronald & Lumbantoruan, 2019; Nyoni, 2019; Annamalaisami & Kuppuswamy, 2021). This implies that the stakeholders' capabilities involved in cost estimation should be prioritised.

Proceeding with the implications, local community strikes or unrest may be alleviated by engaging with local communities to gain their buy-in to the project. The market conditions-related issues may be alleviated by ensuring adequate, realistic contingency allocation after thorough market condition-related forecasting. Therefore, the future value of money dependent on the construction project duration, market conditions such as exchange rates, and inflation should be considered by construction project managers, clients, quantity surveyors, and the additional key stakeholders involved in developing the budget. A revision of the South African regulatory framework stipulates that as a recommendation, the highest-scoring bidder with the lowest bid wins the tender. The tender should be won based on the comprehensiveness of the project budget considering the bill of quantities and the underlying contingencies for unforeseen costs, . while adequate time allocation in developing the budget, concurrently integrating comprehensive feasibility studies and involvement of key competent stakeholders may alleviate cost overruns originating from time

allocation inadequacy. Although some factors such as market conditions, political interference, and corruption are external, the above-suggested measure at the prerogative of the construction managers may be implemented to lessen the impact on the budget.

9.7 Construction project management model to curb stakeholder-related cost overruns

It was established that there are numerous stakeholders who affect the construction project budget and influence the budget at different stages of the project. The pre-determined stakeholders for the quantitative approach emanating from preliminary literature and pilot study were: project managers, quantity surveyors, project administrators, architects, designers, local authorities, client/s, financiers, electrical engineers/ electricians, civil engineers, plumbers, contractors, mechanical engineers, health and safety personnel suppliers, community, and lawyers. Drawn from the interview findings, table 9.1, shows a list of construction project stakeholders who affect the project budget variedly. Notably, consultants are linked to the engineering professionals including but not limited to, civil engineers, mechanical engineers, structural engineers, geotechnical engineers, and diverse specialists.

Table 9.1: Construction project stakeholders' findings

Construction project stakeholders
Construction Project manager
Principal agent
Client
Client end-user (For example building a house for a client end-user)
Quantity surveyor, engineers
Architect
Civil engineer
Consultants, and/or engineers
Geotechnical engineers
Specialists
Community
Public end-users (For example building a school, thereby including the headmaster)
Suppliers
Occupational Health and safety practitioners (Health and safety practitioners)
Government (National/Provincial/Local)
Specialists
Regulatory authorities
Property lawyer
Heritage consultant
Environment consultant
Transport planner
Town planner
Security consultant
Property valuer
BEE targeted procurement consultant
Life cycle cost consultant

Facilities management consultant
Traffic engineer
Structural engineer
Electrical engineer
Mechanical engineer
Electronics engineer
Data / voice / comms specialist
Land surveyor
Landscape architect
Health and safety consultant
Direct supply contractors
Trade package contractors
Clerk of works
Domestic subcontractors
Domestic suppliers

Constructed by the researcher

The preceding findings show that there are numerous stakeholders' influences on the project budget, creating complexity for the project manager considering diverse stakeholders' interests, expectations, and lines of communications. In the same notion, scholars and construction project practitioners worldwide, and in Africa, have identified the following stakeholders who affect the project budget, namely shareholders, client/owners, designers, construction project managers, engineers, facilities managers, users of facilities/customers/end-users, legal authorities, team/employees, contractors, subcontractors, suppliers, banks, service providers, process providers, insurance companies, competitors, the press, media, government establishments, local authorities, neighbours, community representatives, local community, general public, visitors, customers, regional development agencies, civic institutions, and the natural environment pressure groups. (Newcombe, 2003; Smith & Love, 2004; Srinivasan & Dhivya, 2020). Leung and Olomolaiye (2010) identified consultants in terms of the budget as client/owners/sponsor, contractor, supplier, and community leaders. Landowners, financiers, clients, designers, consultants, builders, trade contractors, end-users, suppliers, lawyers, environmentalists, local residents, and archaeologists, regulatory agencies, local government and national government (Winch, 2002, 2010). Manowong and Ogunlana (2010) mentioned clients, owners, designers, financiers, construction managers, project leaders, contractors, subcontractors and suppliers.

Senaratne and Ruwanpura (2016) list the parent organisations, consultants, architect, client, environmentalists, contractors, subcontractors, suppliers, public, and the media in the above regard. The business partners, building designers, project team, construction supervision,

construction manager, contractors and investor/s were identified by Bizon-Górecka and Górecki (2017) and project owners, designers, supervisors, contractors and consultants identified by Gunduz and Almuajebh (2020). Mashwama et al. (2018) categorised stakeholders into primary and secondary stakeholders. On one hand, primary stakeholders comprise of: senior organisational managers, corporate directors, general managers, functional managers, project managers, work package managers, customers/end-users, suppliers, contractors, sub-contractors, creditors, employees, local agencies, state agencies, federal agencies, commissions, judicial, legislative, unions, and shareholder. On the other hand, secondary stakeholders comprise of: social organisations, political organisations, environmentalists, competitors, local communities, the general public, consumer groups, intervenor groups, private citizens, tourists, professional organisations, hospitals, school, media, families, and anyone else with an interest in the project. Undoubtedly, construction projects comprise of multiple stakeholders who can affect the project budget varyingly.

Reflecting on the conceptual framework and theoretical framework underpinning this study together with extant literature and the findings of the study, particularly considering the totality of the abovementioned stakeholders affecting the project budget. Holistically, the collective theoretical framework comprising stakeholder theory, goal-setting theory, system theory, and complexity theory embraces and characterises this study. The stakeholder theory ties in with the consideration of all stakeholders, interests, needs, influences, and expectations with the aim to alleviate project budget overruns. The goal-setting theory resonates with the construction project manager's commitment and performance toward the achievement of project budgetary goals. The system theory ties in with the consideration of stakeholders' systematic interconnectedness in affecting the overall project budget. Thus, stakeholders' involvement and/or consultation in managing influences and interests cannot be conducted in isolation from other relevant stakeholders.

This brings us to complexity theory considering the magnitude of stakeholders involved, coordination, and lines of communication; a construction project is a complex system composed of diverse stakeholders with diverse skillsets and duties, interests, needs, and expectations that indirectly or directly impact the project budget and ultimately the project's success. On one hand, diverse stakeholders must work together to apply their different skill sets and coordinate in

different phases of the construction project throughout the construction project life cycle to collectively produce a complete construction building project. However, on the other hand, stakeholders with an interest in the project but not actively or directly involved in the realisation of the project, also affect the construction project budget and ultimately the project's success. Therefore, the model in Figure 9.1, which informs the tabular format Table 9.2, considers the aforementioned complexities concurrently integrating the construction project life cycle stages on the stakeholder strategy, to curb budget overruns.

9.9 Construction project-stakeholder budget overrun mitigation model

The model comprises the following steps (Figure 9.1): identify the relevant stakeholder, profile the stakeholders, determine the stakeholders' impact on the budget, and stakeholders' strategy-plan of action implementation. The model will be used in collaboration with a template (Table 9.2) incorporating all the stages of the construction project life cycle, iterated in each phase to accommodate stakeholders who may emerge later. In the identification of stakeholders and profiling, all components of each stage should be considered. Thus, the business case/ benefit, feasibility studies, and the project charter are embedded in project initiation. Then, the schematic drawings, design development, construction documents, and construction bidding processes are embedded in the project planning, followed by the known-unknowns and unknown-unknowns and thus the risks that are anticipated and unanticipated risks, which may occur during project execution. Lastly, the project closure mainly focuses on the client's acceptance of the completed construction building.

The inform-involve-influence model developed by Sunder (2016) for banking and financial services was taken into consideration in developing the 'Construction project-stakeholder budget overrun mitigation model'. Therefore, stakeholders at each construction project life-cycle stage are identified, profiled, informed or consulted, or involved depending on their stake in the project and their impact on the budget and thereafter, influenced by implementing the strategy-plan of action informed by their impact on the budget. The "Construction project-stakeholder budget overrun mitigation model" steps will be iterated in each phase of the construction project to accommodate stakeholders who emerge after the construction project initiation stage, determine their impact on the project budgetary goals, and thereafter, strategise on stakeholder response. The emergence of certain stakeholders may trigger the involvement of additional stakeholders as

a stakeholder response due to necessity. For example, the emergence and interference of construction project mafias during the execution stage may necessitate the involvement of law enforcement.

9.9.1 Step 1: Identify the relevant stakeholders

In the first column of the template, all the stakeholders relevant to the construction project are identified and listed. Alternatively, the list of construction project stakeholders drawn from the findings in Table 9.1 may be used, whereby a tick (✓) or yes will be used to indicate the required stakeholders who have an influence on the construction project. Conversely, an (X) or no will be used to indicate stakeholders who have no influence on the construction project, therefore should be ignored or not be listed in the template.

9.9.2 Step 2: Profile the stakeholders

Having listed all the stakeholders, the next column shows the level of education required with reference to the construction project, where one of the levels should be selected among elementary, secondary/matric or tertiary. Then, the level of experience and competency required with reference to the construction project is profiled, of which in this column, more than one 'experience and competency' item may be selected, depending on the needs of the construction project. The number of successful projects would be indicated by percentage, which is in comparison to the failed projects. Therefore, the client or construction project manager can predetermine the percentage required for stakeholders to satisfy or to be profiled against, based on their project portfolio success rate. Thereafter, the stakeholder's roles and interests in the project are investigated and/or deduced. Subsequently, the engagement criterion on whether to consult or involve the stakeholder in the development of the construction project budget is chosen.

9.9.3 Step 3: Impact on the budget

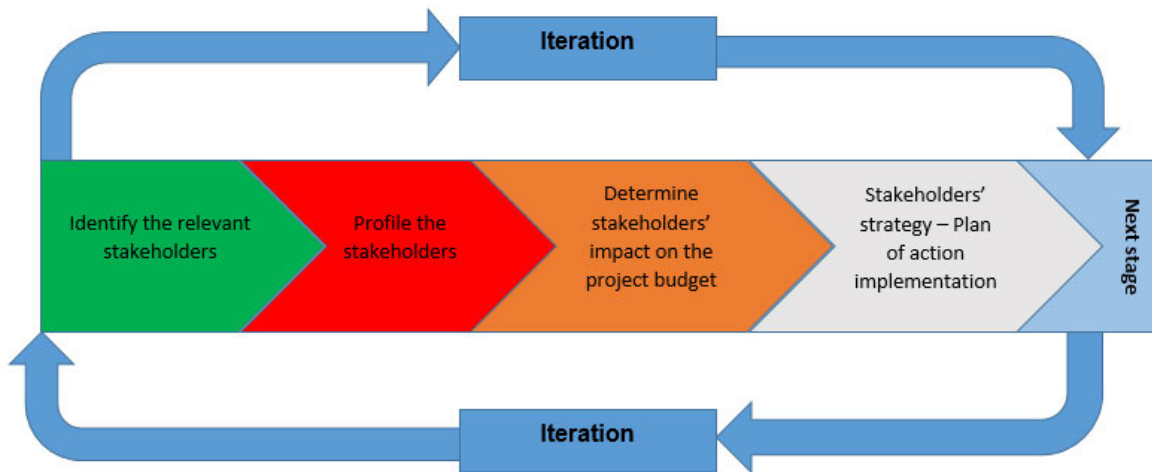
Having profiled all the stakeholders, in terms of level of education, experience, competency and the criterion of engagement. Next, each stakeholder's impact on the project budget is colour-code determined, where green reflects no impact on the project budget, yellow reflects low impact on the project budget, orange reflects moderate impact on the project budget and red reflects high impact on the project budget. In developing strategic measures to curb project budget overruns,

the red-coded stakeholders carry the highest priority, followed by the orange coded and lastly yellow-coded. The green coded stakeholders should be monitored in case their influence on the construction project budget changes. Also, the type of impact would be indicated with an addition of “other”, that is where it is not among the selection, or it is in addition to the selection. On ‘other’ the impact should be stated, for clarity.

9.9.4 Step 4: Stakeholders’ strategy-plan of action implementation

Drawing from each stakeholder’s information, the last step of the mitigation model is to indicate potential solutions to curb cost overruns on each stakeholder. The recommendation for this mitigation model is to complete all the stages of the construction project life cycle, thereafter, iterate the model during the execution of each stage to accommodate stakeholders who may emerge along the project life-cycle or whose influence may change, inevitably resulting in stakeholder strategy update. Drawing on the findings, it is recommended that project leaders should be adaptable and promptly make decisions about emerging stakeholders to prevent ripple effects.

Figure 9.1: Construction project-stakeholders’ budget overrun mitigation model



Constructed by the researcher

Table 9.2: Construction project-stakeholder budget overrun alleviation model template

Project initiation -Construction inception (Business case/End-user's benefit, Feasibility studies, Project Charter)																			
List of identified stakeholders		Level of education required			Level of experience and competency required				Stakeholder's role /Interest	Engagement criterion		Impact on the budget and/or scope				Impact type			Stakeholder strategy action
Yes / √	No / X	Elementary	Secondary/ Matric	Tertiary	General skills	Soft skills	Technical and soft skills	Successful projects completed (%)	State / indicate	Involve	Consult	None	Low	Moderate	High	Policy	Technical	Policy and technical	Other
Project managers												Green	Yellow	Orange	Red				
Client/s												Green	Yellow	Orange	Red				
Quantity surveyors												Green	Yellow	Orange	Red				
Architects												Green	Yellow	Orange	Red				
Civil Engineers												Green	Yellow	Orange	Red				
Mechanical Engineers												Green	Yellow	Orange	Red				
Project Administrators												Green	Yellow	Orange	Red				
Contractors												Green	Yellow	Orange	Red				
End-users												Green	Yellow	Orange	Red				
Health and Safety												Green	Yellow	Orange	Red				
												Green	Yellow	Orange	Red				
												Green	Yellow	Orange	Red				



Project planning - Construction design development (Schematic drawings, design development, construction documents, construction bidding process)																			
List of identified stakeholders		Level of education required			Level of experience and competency required				Stakeholder's role /Interest	Engagement criterion		Impact on the budget and/or scope				Impact type			Stakeholder strategy action
Yes / √	No / X	Elementary	Secondary/ Matric	Tertiary	General skills	Soft skills	Technical and soft skills	Successful projects completed (%)	State / indicate	Involve	Consult	None	Low	Moderate	High	Policy	Technical	Policy and technical	Other
Project managers												Green	Yellow	Orange	Red				
Client/s												Green	Yellow	Orange	Red				
Quantity surveyors												Green	Yellow	Orange	Red				
Architects												Green	Yellow	Orange	Red				
Civil Engineers												Green	Yellow	Orange	Red				
Mechanical Engineers												Green	Yellow	Orange	Red				
Project Administrators												Green	Yellow	Orange	Red				
Contractors												Green	Yellow	Orange	Red				
End-users												Green	Yellow	Orange	Red				
Health and Safety												Green	Yellow	Orange	Red				
												Green	Yellow	Orange	Red				
												Green	Yellow	Orange	Red				



Project implementation -Construction project execution (Site known-unknowns and unknown-unknowns)																				
List of identified stakeholders		Level of education required			Level of experience and competency required				Stakeholder's role /Interest	Engagement criterion		Impact on the budget and/or scope				Impact type				Stakeholder strategy action
Yes / ✓	No / X	Elementary	Secondary/ Matric	Tertiary	General skills	Soft skills	Technical and soft skills	Successful projects completed (%)	State / indicate	Involve	Consult	None	Low	Moderate	High	Policy	Technical	Policy and technical	Other	
Project managers																				
Client/s																				
Quantity surveyors																				
Architects																				
Civil Engineers																				
Mechanical Engineers																				
Project Administrators																				
Contractors																				
End-users																				
Health and Safety																				



Project closure - Construction commissioning																			
List of identified stakeholders		Level of education required			Level of experience and competency required				Stakeholder's role /Interest	Engagement criterion		Impact on the budget and/or scope				Impact type			Stakeholder strategy action
Yes / ✓	No / X	Elementary	Secondary/ Matric	Tertiary	General skills	Soft skills	Technical and soft skills	Successful projects completed (%)	State / indicate	Involve	Consult	None	Low	Moderate	High	Policy	Technical	Policy and technical	Other
Project managers																			
Client/s																			
Quantity surveyors																			
Architects																			
Civil Engineers																			
Mechanical Engineers																			
Project Administrators																			
Contractors																			
End-users																			
Health and Safety																			

Constructed by the researcher

9.10 Conclusion

The chapter achieved its purpose in discussing the findings of the study, which involved deductions, inductions, and abductions. Concurrently, the findings were compared and contrasted with empirical evidence from global, African, and South African contexts, supported by the conceptual and theoretical framework. The researcher's inferences and views dominated the discussion, based on acquired knowledge. Thus, as the study's findings were discussed in accordance with the research objectives in comparison to the extant literature, more insight was gained. Project stakeholders' complexities contribution to project budget overruns were discussed, and scope changes were established as central to stakeholders-related complexities contributing to budget overruns, hence, the recommendation to ensure all the stakeholders who may influence the scope be involved or consulted during the design development and scoping. Furthermore, an emphasis that the scope is complete and clear when the project goes for tender, was recommended. Stakeholders' technical competency was also established as a project budget overrun contributor. Therefore, the introduction of artisans and technical skills training facilities were recommended. whereby contractors and sub-contractors have personnel training. Technical skills training would alleviate construction costs associated with reworks and low productivity.

Construction project budget stakeholder involvement and communication in developing the budget, construction project manager, clients, quantity surveyor, and architects are key to developing the budget and consultation with other stakeholders. In particular, the construction project manager and quantity surveyor are involved throughout the project life cycle in controlling the budget. and are ultimately accountable for budget outcomes. Therefore, their financial competency, project technical skills, and forecasting capabilities are essential in developing the budget, handling scope changes, and generic management of activities with financial implications. In preparing the budget and action plan to control and monitor cost expenditures, factors such as local community strikes or unrest, market conditions, South African regulatory framework, adequate time allocated to budgeting, and types of contracts, should be prioritised. A construction project-stakeholder budget overrun mitigation model was presented in light of the aforementioned factors, as well as the numerous stakeholders' involvement, and skillsets required at various stages of the construction.

The model comprises the following steps: identify the relevant stakeholder, profile the stakeholders, determine stakeholders' impact on the budget, and stakeholders' strategy-plan of action implementation. The model will be used in collaboration with a template incorporating all the stages of the construction project life cycle, iterated in each phase to accommodate stakeholders who may emerge later. The next chapter concludes the study by providing an overview of the previous chapters, reflecting on the achievement of study objectives, recommendations of the study, limitations of the study and considerations for future studies.

CHAPTER TEN - CONCLUSION AND RECOMMENDATIONS

10.1 Introduction

The previous chapter discussed and triangulated the findings originating from both quantitative and qualitative data. Furthermore, the explanation on the applicability of the 'Construction project-stakeholder budget overrun mitigation model' was provided. This chapter concludes the study by summarising all the study chapters, followed by a discussion on the key research findings in relation to the research objectives' achievement. Next, as part of the study contribution, the recommendations are provided, followed by a summary of the study limitations. Finally, future study suggestions are provided.

10.2 Overview of the study chapters

The following section provides closing remarks regarding the study chapters. The purposes of all the chapters were achieved.

10.2.1 Chapter 1 Introduction

This chapter achieved its purpose by introducing the research study by providing a brief description of the background and problem statement of the study investigated, followed by the rationale behind the study. It then provided the research objectives, questions, ethical considerations, and expected study contribution. The chapter was concluded by providing the thesis chapter mapping overview.

10.2.2 Chapter 2 Project management background and project inception

This chapter provided clarification of concepts underpinning construction project inception. Firstly, the construction project conceptual framework in which a project management profession was defined and discussed was considered. From the onset, the historic project management overview pertaining to the project management profession's origins and progression, was discussed. After that, the 'project' concept was defined, based on extant literature, by providing an understanding of construction project attributes. Subsequent to the 'project' conceptual description, the project initiation stage, which is the first phase of the project life cycle and pertains

to project inception, was detailed. The chapter concluded by providing information about the project charter, which plays a critical role in the approval and realisation of construction projects.

10.2.3 Chapter 3 Project realisation process

This chapter was the continuation of the conceptual framework, focusing on construction project realisation. The chapter commenced with an explanation of the project design planning phase comprising of construction schematic design, design development, construction documents, and construction bidding, followed by an elaboration of the construction project execution and project closure. The chapter was concluded by discussing the construction project manager's roles, competencies, and the integration of project management knowledge areas to the construction project life cycle.

10.2.4 Chapter 4 Theoretical framework

This chapter provided the theoretical framework which underpins this research. Stakeholder, goal setting, systems, and complexity theories were discussed in relation to the study's objectives and the nature of the construction projects. Firstly, the stakeholder theory focusing on construction project stakeholders and their impact on the project's budgetary goals, was discussed. Secondly, the goal-setting theory in relation to the set construction budgetary project goals, was discussed. Thirdly, the systems theory aimed at elaborating on the systematic nature of the construction projects, was outlined. Lastly, the complexity theory elaborating on the complex nature and agility of construction projects, considering the diverse stakeholders and their impact on the project's budgetary goals and ultimate project success, was discussed.

10.2.5 Chapter 5 Construction cost overruns and stakeholders' complexities

This chapter reviewed the literature on construction project cost overruns and stakeholders complexities. On the one hand, the literature on cost overruns was reviewed, based on the global, African, and South African context, focusing on the causes, impact, and possible solutions to curb construction budget overruns. On the other hand, construction stakeholders' complexities literature was reviewed by focusing on the identification of stakeholders within a construction project, and their diverse expectations, which influence the project budget and ultimate project

outcomes. Then, the chapter concluded by providing insights drawn from both the literature on construction cost overruns and stakeholders' complexities.

10.2.6 Chapter 6 Research methodology

This chapter provided an explanation of the study's philosophical worldview, and the research methodology paradigm undertaken in data collection and analysis, in answering the research questions to gain a better understanding of how construction project cost overruns can be resolved in South Africa. Firstly, the research philosophy paradigm was defined and explained in relation to the study and the researcher's worldview. Secondly, the research methodology paradigm and the mixed method research paradigm selected for this study were discussed, followed by the underlying research design, population, sampling technique, data collection, and data analysis descriptions. Furthermore, an explanation and discussion on the reliability, validity, and trustworthiness of data collection and data analysis were detailed. The chapter concluded by explaining the ethical clearance issues which were taken into consideration for this study.

10.2.7 Chapter 7 Quantitative data presentation and analysis

This chapter presented and analysed quantitative data, which was presented in pie charts, graphs, and tables. Firstly, the socio-demographic information was presented and analysed, followed by project stakeholder complexities. that contribute to project budget cost overruns and stakeholders' involvement, in different construction project life cycle phases. Lastly, the project stakeholders' influence on the project budget based on project managers' experiences, was presented and analysed. The chapter concluded by providing a summary drawn from the key quantitative research findings.

10.2.8 Chapter 8 Qualitative data presentation and analysis

This chapter presented and analysed qualitative data; it was narratively presented and analysed with interviewees' quotation extracts, data visualisation figures extracted from NVivo, and tables summarising the key findings. Firstly, a table with a list of themes and sub-themes was presented, and thereafter all the themes listed in the table were presented, analysed, and substantiated with quotations from the participants. The chapter concluded by providing a summary of the qualitative findings.

10.2.9 Chapter 9 Discussion and model

This chapter provided a comprehensive discussion and interpretation of the findings triangulated from chapter seven quantitative analysis, and chapter eight qualitative analysis. The discussion of the findings was as follows: firstly, the socio-demographic information of the construction project managers operating in South Africa was discussed. Secondly, the extent to which project stakeholder complexities contribute to project overruns within the construction industry in South Africa, was outlined. Thirdly, the discussion was followed by the level of project stakeholders' involvement and communication with regard to the project budget development within the construction industry in South Africa. Lastly, the model application in relation to the study objectives, was explained.

10.2.10 Chapter 10 Conclusion and recommendations

This chapter provided a concluding summary of each chapter, recapping research objectives and questions in correlation with the closing findings remarks, and detailed explanation of the model in light of the overall research objective, to establish the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholder complexities and cost overruns. In addition to the model, contributions of the study in the form of recommendations were provided. Lastly, the limitations of the study were presented. Recapping the research objectives is indicated below.

10.3 Addressing the research objectives

This study aimed to establish the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholder complexities and cost overruns with the following underlying objectives.

- To investigate the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa.
- To determine the level of project stakeholders' involvement and communication with regard to the project budget within the construction industry in South Africa.
- To explore project managers' experiences with regard to the factors that influence the project budget, in relation to project stakeholders within the construction industry in South Africa.

- To develop a model which project managers may use to avoid stakeholder-related project cost overruns.

The first objective of the study was aimed at investigating the extent to which project stakeholder complexities contribute to project overruns within the construction industry in South Africa. Here are the key findings: It was established that scope changes attributed from diverse stakeholders were central to stakeholders-related complexities, contributing to budget overruns. Therefore, it is essential to ensure that all the stakeholders who may influence the scope, are identified and involved or consulted during the design development and scoping. Furthermore, a clear, complete scope should be presented at the tender stage to curb scope changes associated with the construction design. It was also revealed that the technical proficiency of stakeholders contributed to project budget overruns. As a result, the establishment of institutions for the purpose of training artisans and technical skills is recommended for construction project practitioners. Construction expenses related to incompetency, reworks and low productivity may be alleviated through technical skill training. Henceforth, the first objective of the study was achieved.

The second objective of the study was to determine the level of project stakeholders' involvement and communication with regard to the project budget, within the construction industry in South Africa. Construction project managers, clients, quantity surveyors, and architects were found to be key in developing the budget in consultation with other relevant stakeholders. Quantity surveyors and construction project managers were found to be active in budget control throughout the project lifecycle. Consequently, their financial competency, project technical skills, and forecasting capabilities are vital in developing the budget. Furthermore, quantity surveyors and construction project managers' capabilities in handling scope changes, and generic project management activities in liaison with diverse stakeholders with financial implications, are of paramount importance in meeting construction budgetary goals. Hence, the second objective of the study was achieved.

The third objective of the study was to explore project managers' experiences with regard to the factors that influence the project budget in relation to project stakeholders within the construction industry in South Africa. Based on construction project managers, it was discovered that factors

such as incompetency, local community strikes or unrest, market conditions, South African regulatory framework, inadequate time allocation for budgeting, construction reworks, construction mafia nuisance, political interference, and contract misunderstanding significantly contribute to project budget overruns. In light of the aforementioned factors and the numerous stakeholders' involvement and skillsets required at various construction project stages; construction managers should adopt a “Jack of all trades” adaptable project leadership style in handling the construction project’s volatile nature. Hence, the third objective of the study was achieved.

The fourth objective of the study was to develop a model which may be used by project managers to avoid stakeholder-related project overruns. Drawing from the literature review and study findings, the ‘Construction project-stakeholder budget overrun mitigation model’ was developed (Figure 9.1), to be applied with the ‘Construction project-stakeholder budget overrun alleviation model template’ (Table 9.2) as a guide. The model comprises the following sequential steps, namely: identify the relevant stakeholder, profile the stakeholders, determine the stakeholders’ impact on the budget, as well as the stakeholders’ strategy-plan of action implementation. The model would be applied iteratively in each phase of a construction project. Therefore, the fourth objective of the study was achieved.

10.4 Recommendations

In addition to the project budget overrun mitigation model, the following recommendations are proposed.

10.4.1 Recommendation 1 - Construction tender process amendment

The current tender system awards tenders to contractors with the highest score based on low bid and Black Economic Empowerment (BEE), based on the Broad-Based Black Economic Empowerment Amendment Act, 2013 (Act No. 46 of 2013). Although the tendering policy “aims to facilitate broader participation in the economy by black people, especially in order to redress inequalities created by apartheid,” it was established that contractors and suppliers take advantage of the policy by either misrepresenting information or underestimating their bids to win the tender. While incorporating the BEE policy, the researcher recommends a tendering system focused on realistic tender bids with high accuracy levels, considering factors such as inflation,

contractor's experience, and competency, historical projects, exchange rates, and most importantly, the Bill of Quantities comprehensiveness of the project scope. Therefore, a comprehensive tender would be selected based on comprehensive realistic cost estimations.

10.4.2 Recommendation 2 - Scope development completion

To curb costs associated with cost overruns emanating from incomplete design at the tender stage and end-user or client materials changes at a later project stage, it is recommended that completed designs should be qualified for tender, thus including a comprehensive scope with precise material specifications indicating the brand and type to prevent price differences.

10.4.3 Recommendation 3 - Health and safety management

In light of contractors overlooking health and safety procedures negatively affecting employees through life-threatening injuries and/or resulting in reworks, poor quality, and non-compliance translating to project failure, it is recommended that 'Health and Safety management' be added as the 11th knowledge area. Health and Safety management directly or indirectly affects most stakeholders invested in the construction project. Also, it is the determinant of the construction project success or failure of the construction project to the primary stakeholders such as the client, the local authorities, consultants, and end-users in terms of acceptance. Furthermore, Health and Safety management extends to the post-closure stage affecting the end-users. Therefore, health and safety management are essential throughout the project life cycle and post-closure, during the life of the construction development.

10.4.4 Recommendation 4 - Technical training facilities/Schools

Technical training facilities or schools for artisans and technical skills training facilities are recommended, in which case contractors and sub-contractors' personnel are trained. Technical skills training will alleviate construction costs associated with inadequate technical skills, reworks, and low productivity.

10.4.5 Recommendation 5 – Promote assistant construction project manager positions

The inferential statistics revealed that the majority of construction project managers experience an increasing rate of cost overruns on their first ten projects, and thereafter a decreasing rate of cost overruns is experienced. Consequently, inferring that experience considering the number of projects completed and therein lessons learned drawn from previous cost overruns, play a critical role in curbing cost overruns. Also based on the interviewees' feedback, lack of mentorship and assistant project manager positions at tender were identified as a major challenge that contribute to cost overruns. It is therefore recommended that assistant construction project manager positions be promoted in South Africa, so that entry level project managers will be trained and receive mentorship from experienced project managers, during their assistant project management.

10.4.6 Recommendation 6 – “Jack of all trades” adaptable project leadership style

In light of the diverse stakeholder-related cost overruns such as, but not limited to, scope alterations resulting from diverse stakeholders, miscommunication, political interference, competence gaps, contract misunderstanding, and failure to meet legal obligations, in addition to the project manager's trade or specialisation, it is recommended that construction managers adopt a “Jack of all trades” adaptable project leadership style, where they engage in continuous learning on improving individual construction project management skillsets and leadership inadequacies.

10.4.7 Recommendation 7 - Law enforcement stakeholder involvement

In light of the construction mafias who illegally enforce their recruitment to the project, which ultimately exacerbates the construction budget overruns challenges, it is recommended that construction project managers should involve law enforcement in South African provinces prone to construction mafia disturbances, to prevent or alleviate their impact on the budget and project success.

10.5 Limitations of the study

In terms of limited data access for quantitative data, the online questionnaire was distributed through the professional board gatekeeper, in which construction project managers could be reminded to complete the questionnaire restricted to four times, to prevent harassment to the professional board members. In addition, online questionnaires have a low response rate, which was experienced in this study. The second limitation was that data collection was completed at the beginning of 2020, therefore, the effects of COVID-19 were not considered in either quantitative data collection, and qualitative interviews. Therefore, the model and recommendations of this study may not be effective in curbing project budget overruns associated with the COVID-19 pandemic. Construction project managers were the sole participants for this study. Therefore, the third limitation of the study was the exclusion of non-construction project managers practitioners, who may have significantly contributed on the study inquiry on stakeholders' complexities and cost overrun. The participants of the study were geographically dispersed, therefore, additional qualitative data collections methods such as focus group discussions, were not utilized.

10.6 Future studies' considerations

The following are suggested future studies that can be conducted in relation to this study.

- To conduct a research study focused on the impact of construction mafia interference on construction projects in South Africa, particularly in Gauteng, KwaZulu Natal, and the Eastern Cape province.
- To conduct research on construction project tender corruption and possibilities of amending the current tender process, with a particular focus on bidding price and implementation of the black broad-based economic empowerment at the expense of competency.
- To conduct a research study focused on the impact of political bearers' interference on construction projects in South Africa, particularly in Gauteng

10.7 Conclusion

This last chapter summarised the study by providing an overview of the study, discussing the study's main contributions, study limitations, and future study considerations. Firstly, an overview of the study provided a holistic view of this study by succinctly summarising the main contents of each chapter. Secondly, the discussion of the main contribution entailed proving how the study's research objectives were achieved as well the provision of recommendations. The main contribution of this study is the 'Construction project-stakeholder budget overrun mitigation model' that can be applied to the 'Construction project-stakeholder budget overrun alleviation model template' guide, in alleviating cost overruns associated with stakeholders. The study recommendations provided should be considered in the application of the model. Thirdly, the limitations of the study were summarised, followed by the last section, which provided future study suggestions.

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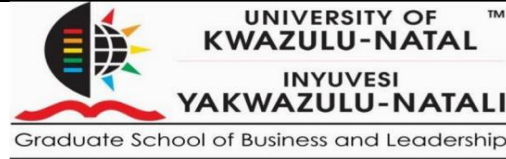
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APPENDICES

Appendix A: Consent forms for the questionnaire and interview

Informed Consent Letter 3C



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

Dear Respondent,

I, Moses Nyathi am a Doctor of Business Administration student, at the Graduate School of Business and Leadership, of the University of KwaZulu-Natal. You are invited to participate in a research project entitled: "Managing stakeholder complexities: A model to curb project cost overruns in the construction industry in South Africa".

The aim of this study is to develop a model to curb or eradicate project cost overruns as a result of project stakeholder complexities in the construction industry in South Africa. As an expert in project management and in liaison with a diverse project stakeholders in the project life cycle, I therefore would like to request your permission in completing the below questionnaire on the aforementioned subject.

Through your participation I hope to establish the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholder complexities and cost overruns.

Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

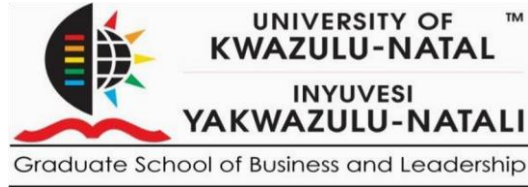
If you have any questions or concerns about participating in the questionnaire or about participating in this study, you may contact me or my supervisor at the numbers listed above.

The questionnaire should take about 15 minutes of your valuable time. I hope you will take the time to participate.

Sincerely

Investigator's signature _____ Date _____

This page is to be retained by the participant



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

CONSENT

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I hereby consent/do not consent to complete the questionnaire.

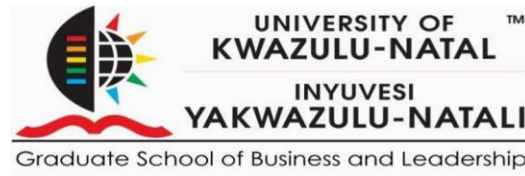
SIGNATURE OF PARTICIPANT

DATE

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This page is to be retained by the researcher

Informed Consent Letter 3C



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

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Through your participation I hope to establish the extent to which construction project managers can effectively and efficiently liaise with all project stakeholders to curb stakeholder complexities and cost overruns.

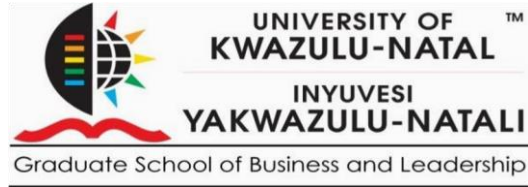
Your participation in this project is voluntary. You may refuse to participate or withdraw from the project at any time with no negative consequence. There will be no monetary gain from participating in this survey or interview. Confidentiality and anonymity of records identifying you as a participant will be maintained by the Graduate School of Business and Leadership, UKZN.

If you have any questions or concerns about participating in the survey or interview or about participating in this study, you may contact me or my supervisors at the numbers listed above. The interview should take about 45-60 minutes and the survey about 10-15 minutes to complete. I hope you will take the time to participate.

Sincerely

Investigator's signature _____ Date _____

This page is to be retained by the participant



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

CONSENT

I.....(full names of participant) hereby confirm that I understand the contents of this document and the nature of the research project, and I consent to participating in the research project.

I understand that I am at liberty to withdraw from the project at any time, should I so desire.

I hereby consent/do not consent to record the interview.

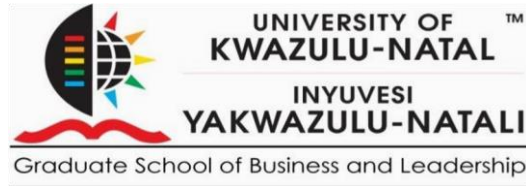
SIGNATURE OF PARTICIPANT

DATE

.....

This page is to be retained by the researcher

Appendix B: Research instruments – Questionnaire and interview schedule



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

Managing stakeholder complexities: A model to curb project cost overruns in the construction industry in South Africa

QUESTIONNAIRE

Section A: Demographic profile

In this section information about you is sought. *Please place a cross (X) in the appropriate box applicable to you.*

Q 1. Gender

Male		Female	
------	--	--------	--

Q 2. Which Age category do you belong to?

< 20 years		20-30 years	
31-40 years		41-50 years	
51 -60 years		61 years and above	

Q 3. What is your highest level of education?

No formal education		Primary education	
Secondary education		Certificate/Metric	
Diploma		BTech/Bachelor's Degree	
Master's Degree		PhD/Doctoral Degree	

Q 4. What is your educational background?

No formal education		Construction Management	
Civil Engineering		Business Management	
Mechanical Engineering		Finance	
Architect		Law	

Quantity Surveyor		Other (indicate the name of educational background)	
-------------------	--	---	--

Q 5. How many construction projects have you completed to date?

1-5 projects		6-10 projects	
11-15 projects		16-20 projects	
20-25 projects		Over 25 projects	

Q 6. How many years of work experience do you have in the construction industry?

0-11 months		1-5 years	
6-10 years		11-15 years	
16-20 years		Over 20 years	

Q 7. Which province are you currently working on a project or recently completed a project?

Gauteng		Western Cape	
Eastern Cape		Northern Cape	
North West		Free State	
KwaZulu Natal		Limpopo	
Mpumalanga		Outside South Africa, indicate the name of the Country	

Section B: Project stakeholder complexities contribution to project cost overruns

In this section, questions are asked to seek information and answers about the extent to which project stakeholder complexities contribute to project cost overruns within the construction industry in South Africa. **Please read each of the questions carefully and place a cross (X) in the appropriate box.**

Q 8. Which of the following project stakeholders do you think that are necessary in the budget project meetings.

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	
Other:			

Q 9. When the project is over the budget, there are people who should take responsibility and be held accountable for the project overruns. Which of the following project stakeholders are held accountable for project overruns?

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	

Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	
Other:			

Q 10. Project stakeholders have different level of impact on the project budget. The table below listed different project stakeholders. Based on your experience rate the level of impact on the project budget by project stakeholders based on the following 5 point likert scale.

1 = None (No impact), 2= Unsure (Do not know the impact), 3 = Low (minimum impact), 4 = Moderate (medium impact), 5 = High (very high impact).

Ratings	None	Low	Moderate	High	Unsure
Project Managers	1	2	3	4	5
Project Administrators	1	2	3	4	5
Local authorities	1	2	3	4	5
Financiers	1	2	3	4	5
Civil Engineers	1	2	3	4	5
Contractors	1	2	3	4	5
Suppliers	1	2	3	4	5
Health and Safety personnel	1	2	3	4	5
Quantity Surveyor	1	2	3	4	5
Architects /Designers	1	2	3	4	5
Client/s	1	2	3	4	5
Electrical engineers/ Electricians	1	2	3	4	5
Plumbers	1	2	3	4	5
Mechanical engineers	1	2	3	4	5
Community where the construction is executed	1	2	3	4	5
Lawyers	1	2	3	4	5

Q 11. Project tasks are supposed to be executed in a cost effective manner. Based on your experience, rank your level of satisfaction with regards to the following tasks/Works. Please place a cross (X) in the appropriate box based on the following 5 – point likert scale

1 =very dissatisfied, 2 = dissatisfied, 3 = Neutral, 4 = satisfied, 5 = very satisfied

Ratings	very dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Civil works are done in a cost effective manner	1	2	3	4	5
Mechanical works are done in a cost effective manner	1	2	3	4	5
Electrical works are done in a cost effective manner	1	2	3	4	5

Special works are done in a cost effective manner	1	2	3	4	5
Administrative tasks are done in a cost effective manner	1	2	3	4	5
Project reworks are done in a cost effective manner	1	2	3	4	5
The development of the project charter in relation to the budget	1	2	3	4	5
The development of the project management plan in relation to the budget	1	2	3	4	5
Execution of the project management plan in relation to the budget	1	2	3	4	5
Directing and managing project execution in relation to the budget	1	2	3	4	5
Controlling the project deliverables in relation to the budget	1	2	3	4	5
The implementation of project changes in relation to the budget	1	2	3	4	5
The project closure in relation to the budget	1	2	3	4	5
Performance reporting on project budget	1	2	3	4	5
Project cost performance management	1	2	3	4	5
Design changes by Architects	1	2	3	4	5

Q 12. For a project to be over the budget there are several factors which would have affected the project negatively. With regards to the following in relation to construction project stakeholders, indicate the level of impact to the project budget and rate/grade the following based on the 5 point likert scale

1 = None (No impact), 2= Unsure (Do not know the impact), 3 = Low (minimum impact), 4 = Moderate (medium impact), 5 = High (very high impact).

Ratings	None	Low	Moderate	High	Unsure
Cost estimating	1	2	3	4	5
Skills issues	1	2	3	4	5
Cost control	1	2	3	4	5
Procurement issues	1	2	3	4	5
Communication issues	1	2	3	4	5
Legal compliance issues	1	2	3	4	5
Health and safety issues	1	2	3	4	5
Process issues	1	2	3	4	5
Client's agent	1	2	3	4	5
Design issues	1	2	3	4	5
Procurement transparency issues	1	2	3	4	5
Lack of co-operative relationships among stakeholders	1	2	3	4	5
Cost budgeting	1	2	3	4	5
Mismatch of contractor/s	1	2	3	4	5
Quality compliance issues	1	2	3	4	5
Competence issues	1	2	3	4	5
Procurement methods	1	2	3	4	5
Design services	1	2	3	4	5
Soft skills	1	2	3	4	5
Community where the construction is executed	1	2	3	4	5
Health and Safety fatalities	1	2	3	4	5
Political interference	1	2	3	4	5
Corruption	1	2	3	4	5
Fraud	1	2	3	4	5

Q 13. There many factors which can affect the project outcome and ultimately affect the project costs. Based on your experience, rank your level of satisfaction with regards to the following project stakeholder related factors. Please place a cross (X) in the appropriate box based on the following 5 – point likert scale

1 =very dissatisfied, 2 = dissatisfied, 3 = Neutral, 4 = satisfied, 5 = very satisfied

Ratings	very dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
Determination of communication needs	1	2	3	4	5
Management of stakeholder relationships	1	2	3	4	5
Communication management with the stakeholders	1	2	3	4	5
Information distribution on the project status reports	1	2	3	4	5
Information distribution with regards to project progress	1	2	3	4	5
Information distribution on project forecasting	1	2	3	4	5
Information management with the stakeholders	1	2	3	4	5
Management of relationships with the suppliers	1	2	3	4	5
Creating scope statement working with the stakeholders	1	2	3	4	5
Creating scope statement working with the users	1	2	3	4	5
Communicating the work breakdown structure to the stakeholders	1	2	3	4	5
Human resource planning	1	2	3	4	5
Acquiring of the project team	1	2	3	4	5
Communication between team and customers.	1	2	3	4	5
Communication between project team members.	1	2	3	4	5
Clarity of requirement of the project contractor.	1	2	3	4	5
Understanding of the user's needs	1	2	3	4	5
End user's involvement	1	2	3	4	5
Architectural design services	1	2	3	4	5

Q 14. Project budget management involves cost estimating, cost budgeting and cost control. Indicate **Yes** or **No** by placing an (X) in the appropriate box on which of the following project stakeholders are involved in project budget management activities.

Q 14.1 Project cost estimating

Project cost estimating					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is		

			executed		
Health and Safety personnel			Lawyers		

Q 14.2 Project cost budget

Project cost budget					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Q 14.3 Project cost control

Project cost control					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Section C: Project stakeholders' involvement and communication regarding the project budget

In this section, questions are asked to seek information and answers about project stakeholders' involvement and communication with regards to the project budget within the construction industry in South Africa. **Please read each of the questions carefully and place a cross (X) in the appropriate box.**

Q 15. Which of the following project stakeholders are informed about the project budget?

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	

Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	

Q 16. Which of the following project stakeholders are involved in drafting the project budget?

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	

Q 17. Which of the following project stakeholders are involved in the project budget reviews?

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	

Q 18. Having worked within the construction project management industry, which of the following project stakeholders receive the project budget?

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	

Q 19. The processes in the PMBoK® Guide are subdivided into the following project management process groups; project initiation process, project planning process, project executing process, project controlling process and project closing process. Based on the above mentioned process, Indicate **Yes** or **No** by placing an **(X)** in the appropriate box on which of the following project stakeholders are involved in project budget management processes

Q 19.1 Project initiation process

Project initiation process					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		

Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Q 19.2 Project planning process

Project planning process					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Q 19.3 Project execution process

Project execution process					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Q 19.4 Project controlling process

Project controlling process					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Q 19.5 Project closing process

Project closing process					
Project Stakeholder/s involvement	Yes	No	Project Stakeholder/s involvement	Yes	No
Project Managers			Quantity Surveyor		
Project Administrators			Architects /Designers		
Local authorities			Client/s		
Financiers			Electrical engineers/ Electricians		
Civil engineers			Plumbers		
Contractors			Mechanical engineers		
Suppliers			Community where the construction is executed		
Health and Safety personnel			Lawyers		

Section D: Project stakeholders influence on the project budget: Project managers' experiences.

In this section, questions are asked to seek information and answers on your experience/s with regards to project stakeholders' and project budget within the construction industry in South Africa. **Please read each of the questions carefully and place a cross (X) in the appropriate box.**

Q 20. How many projects have you managed which ended in project overruns?

Zero/None		6-10 projects	
1-5 projects		16-20 projects	
11-15 projects		Over 25 projects	
20-25 projects			

Q 21. Please indicate **Yes** or **No** by placing an **(X)** in the appropriate box on which of the following statements in relation to you and your experience

Ratings	Yes	No
Do you have any financial background	1	2
Have you ever done Financial Management Course	1	2
Have you ever done Costs Management Course	1	2
Have you ever been involved in project stakeholder identification?	1	2
Have you ever been involved in project budgeting	1	2
Project involved budget forecasting	1	2
Have ever been involved in cost estimation	1	2
Would you say the use of innovative technology may be helpful in reducing stakeholder complexities?	1	2
Would you say prior involve of project stakeholders is necessary before project execution	1	2
Is there enough involvement and engagement of the academic institutions providing the built environment academic institution as a stakeholder with regards to industry activity and academic activity alignment?	1	2

Q 22. Which of the following project stakeholders would you say have given you challenges in achieving the project budget? Please place a cross (X) in the appropriate box.

Project Stakeholder/s involvement	(X)	Project Stakeholder/s involvement	(X)
-----------------------------------	-----	-----------------------------------	-----

Project Managers		Quantity Surveyor	
Project Administrators		Architects /Designers	
Local authorities		Client/s	
Financiers		Electrical engineers/ Electricians	
Civil engineers		Plumbers	
Contractors		Mechanical engineers	
Suppliers		Community where the construction is executed	
Health and Safety personnel		Lawyers	

Q 23. During the project life cycle, budgets are reviewed. Please place a cross (X) in the appropriate box the frequency in which budget are reviewed within the construction project.

1 =Daily, 2 = Weekly, 3 = Monthly, 4 = Quarterly, 5 = Yearly, 6 = Never

Ratings	Daily	Weekly	Monthly	Quarterly	Yearly	Never
How often large project budgets are reviewed						
How often small project budgets are reviewed						

Q 24. The following statements are in relation to project management activities and have a direct or indirect. Based on your experience, rank your level of agreement with regards to the following statements. Please place a cross (X) in the appropriate box based on the following 5 – point Likert scale

1 = Strongly disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly agree

Ratings	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I have dealt with reworks on my previous projects	1	2	3	4	5
The project scope should be very clear to avoid project overruns	1	2	3	4	5
Lengthy internal approval processes affects the project costs	1	2	3	4	5
Lengthy internal approval processes does not affects the project costs	1	2	3	4	5
Arranging the project leadership team before project execution is important to avoid project overruns	1	2	3	4	5
Arranging the project leadership team during project execution does not affect project budget	1	2	3	4	5
Numerous changes by Architects to scope affects the project costs	1	2	3	4	5
Late design changes affects the project costs	1	2	3	4	5
No consideration of benchmarks in estimates affects the project costs	1	2	3	4	5
People are the major contributing factors to exceeding the project budget	1	2	3	4	5
Handling of project changes affects the project budget.	1	2	3	4	5
Lack of understanding of the project management software usage (e.g MS Project, Agile, etc) affects the project budget	1	2	3	4	5
Support from executive have effect on costs	1	2	3	4	5

Q 25. Project activities in relation to cost are sought. Based on your experience, rank the level of frequency with regards to the following activities. Please place a cross (X) in the appropriate box based on the following 5 – point likert scale

1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Very frequently, 5 = Always

Ratings	Never	Rarely	Sometimes	Very Frequently	Always
When I am doing cost estimation I include both materials prices and delivery costs	1	2	3	4	5
When I am doing cost estimation I only include the price of materials and do not include extra costs such delivery costs, storage costs, etc	1	2	3	4	5
The projects I have dealt with, inflation is considered when doing cost estimations	1	2	3	4	5
Taking steps to reduce threats to meeting project cost objectives	1	2	3	4	5
Evaluation of risks related to cost throughout project life-cycle	1	2	3	4	5
Possible project changes are taken into consideration when doing cost estimation	1	2	3	4	5
Tasks with high probability of exceeding costs prioritized	1	2	3	4	5
Cost control measures are utilised.	1	2	3	4	5
Project cost audits are done during project execution	1	2	3	4	5
Contracts with contractors are closed based on prior agreed costs	1	2	3	4	5
Take into account unforeseen cost related risks	1	2	3	4	5
Hidden costs are taken into account	1	2	3	4	5

If there are any other comments and contributions with regards to the causes of projects finishing over the budget, you are welcome to comment below:

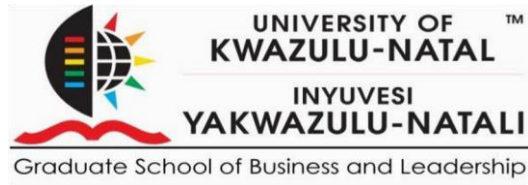
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Thank you for participating in this study
Your contribution is valuable



DBA Research Project

Researcher: Mr Moses Nyathi (073 486 6455)

Supervisors: Prof Cecile Gerwel Proches (031 260 8318) &

Dr Matshediso Joy Ndlovu (031 260 7680)

Managing stakeholder complexities: A model to curb project cost overruns in the construction industry in South Africa

INTERVIEW SCHEDULE

- What are the major challenges that you face with project stakeholders in relation to the project budget?
- In your own opinion, do project stakeholders have an impact on the project budget and do you think they should be included in project budget meetings? Please elaborate.
- Which project stakeholders should be included in the project budget meetings (Cost estimation, cost budgeting, cost control, cost reporting) and Why?
- What suggestions do you have to reduce construction project stakeholders' complexities/difficulties which affect the project budget?
- What factors do you take into consideration when doing the Project budget forecasting and why?
- On the successful projects in terms of the project budget, what would say were the success factors and what was done correctly to achieve that success? What were the positives?
- In your own opinion, how has been the communication with project stakeholders with regards to project budget has been? Would you say there have been effective communication?
- In your past and present experience, which project stakeholders have given you challenges in achieving the project budget and why?
- Is there a mutual interest and understanding between the project construction manager and key project stakeholders with regards to the project budget? Please elaborate.
- Is there project-stakeholder structure formed prior project execution for accountability purposes? Please elaborate.

- How many projects have you managed which ended in project cost overruns?
- Based on your experience, during project life cycle which stage and where would you say there are high project cost escalations?
- What are the other factors that contributes to project cost overruns?
- Scope of work is usually done on paper and the site situation is dynamic ever-changing environment. In relation to costs, what measure would you say are essential to be put in place to ensure that scope of work is followed in accordance to the outlined costs?
- Do you think a project manager should have financial management and cost management degree? Motivate your answer.
- What are the other major challenges do you face with project stakeholders?
- Would you say the use of innovative technology may be helpful in reducing stakeholder complexities? Explain which innovative technology and how?
- Comment on the difficulties you have encountered with regards to procurement issues and stakeholder contractual agreements in relation to the project budget.
- Comment on the Project budget Progress status procedures (variances/deviations, trend analysis, monthly reports) and escalations (inflation, rand value, sourcing materials outside the country)
- Comment on contractors competences
- Any other information that contributes to project cost overruns

**Thank you for participating in this study
Your contribution is valuable**

Appendix C: Gatekeeper consent letter



UNIVERSITY OF
KWAZULU-NATAL
INYUVESI
YAKWAZULU-NATALI

November 15, 2018

To Whom It May Concern:

PERMISSION TO CONDUCT RESEARCH AS PART OF THE DBA QUALIFICATION

Name: Moses Nyathi

Student No: 218035350

Disertation Topic: **Managing stakeholder complexities: A model to curb project costs overruns in the construction industry in South Africa**

We confirm that the above student is registered at the University of KwaZulu-Natal for the DBA Programme. It is a requirement of the DBA that the student undertakes a practical research project in his final year of study.

Typically this project will be a "practical problem solving" exercise, and necessitates data gathering through questionnaires and personal interviews.

Your assistance in permitting access to your organization for purposes of conducting the research is most appreciated. Please be assured that all information gained from the research will be treated with the utmost confidentiality. Furthermore, should you wish any results or findings from the research "to be restricted" for an agreed period of time, this can be arranged. The confidentiality of information and anonymity of personnel will be strictly adhered to by the student.

If permission is granted, kindly confirm this by signing off on the following:

"I am aware of the nature and extent of the document and I am satisfied with all the obligations imposed therein."

Please note that additional information or conditions can be supplied by you.


Name in Full: Jimmy Modise

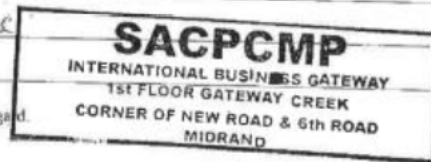
Designation: HR Executive

Company Name & Stamp:

Thank you for your assistance in this regard.

Yours sincerely







Prof Cecilie Gerweij Proches (Supervisor) Graduate
School of Business and Leadership
University of KwaZulu-Natal



University of KwaZulu-Natal
Postal Address: Private Bag X54001,
Durban, 4000, South Africa
Website: www.ukzn.ac.za



Graduate School of Business and Leadership
Physical Address: Room 6B, GSB&L Building,
Ground Floor, UKZN Westville Campus, Westville,
Durban, 6030
Telephone: +27 (0) 31 260 8318
Email: gsb@ukzn.ac.za
Website: www.gsb.ukzn.ac.za

Founding Campuses:  Edgewood  Howard College  Medical School  Pietermaritzburg  Westville

Appendix D: Language editor proofreading certificate

Editing confirmation

Creative Communication
Carol C Ashley BA (Hons) MPhil PhD
74 Queen Victoria Street
Cape Town 8001
27 662857507

creativecommunication@mail.com
<https://www.linkedin.com/in/carol-charmaine-edson->

06 January 2023

To Whom it May concern

RE: EDITING OF DISSERTATION

Managing stakeholder complexities: A model to curb project cost overruns in the construction industry in South Africa

Author: MOSES NYATHI

For: Doctor of Business Administration degree

This serves to confirm that the above-named document has gone through the process of copy-editing, proof reading and coherence of language. No factual content or authorial intention have been disrupted during editing.

The editor is suitably qualified, experienced and holds a Masters Degree in Linguistics.

Dr Carol Ashley

Academic Author/Developer/ Editor/ Linguist: On Editorial Board: Science Publishing Group

Appendix E: Ethical clearance certificate



16 January 2019

Mr Moses Nyathi (218035350)
Graduate School of Business & Leadership
Westville Campus

Dear Mr Nyathi,

Protocol reference number: HSS/2182/018D

Project title: Managing stakeholder complexities: A model to curb project costs overruns in the construction industry in South Africa

Approval Notification – Expedited Application

In response to your application received on 05 December 2018, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

Dr Rosemary Sibanda (Chair)

/ms

Cc Supervisor: Professor Cecile Gerwel Proches and Dr Matshediso Joy Ndlovu
cc Academic Leader Research: Professor Muhammad Hoque
cc School Administrator: Ms Zarina Bullyra

Humanities & Social Sciences Research Ethics Committee

Dr Rosemary Sibanda (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X054001, Durban 4003

Telephone: +27 (0) 31 260 3587/03500/4057 Facsimile: +27 (0) 31 260 4609 Email: sibanda@ukzn.ac.za / zowwam@ukzn.ac.za / mohunp@ukzn.ac.za

Website: www.ukzn.ac.za



100 YEARS OF ACADEMIC EXCELLENCE

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville