Cape Peninsula
University of Technology

MODALITIES TO ACHIEVE SUSTAINABLE SUCCESS RATE OF SMEs CONSTRUCTION PROJECT DELIVERY IN SOUTH AFRICA

By

Athenkosi Sogaxa (212062662)

Thesis submitted in fulfilment of the requirements for the award of the degree of Master of Construction: Construction Management

at the

Department of Construction Management and Quantity Surveying, Faculty of Engineering and the Built Environment, Cape Peninsula University of Technology, Bellville, South Africa

Supervisor: Dr. J.A Fapohunda

Co-Supervisor: Dr. E Simpeh

Bellville

2020

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DECLARATION

I, Athenkosi Sogaxa, student number: 212062662, declare that the thesis entitled: **'Modalities to achieve sustainable success rate of SMEs construction project delivery in South Africa'** is my own work and has not been submitted before for any degree or examination in any other university other than Cape Peninsula University of Technology. It is submitted in fulfilment of the requirement for the degree MASTER OF CONSTRUCTION: CONSTRUCTION MANAGEMENT at the Cape Peninsula University of Technology.

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ABSTRACT

Construction SMEs play a crucial a role in the economy of the country and are significant in terms of employment in South Africa, but construction SMEs face numerous challenges when carrying out construction projects. Although some SMEs are able to deliver projects, the sustainability rate in terms of delivery is still lacking in most SMEs.

The purpose of this research is to establish modalities to enable construction SMEs to achieve consistent construction project success in South Africa. This study focuses on specific modalities that are adopted by SMEs to successfully deliver construction projects: through exploring the existing modalities adopted by SMEs, such as identifying effective cost management modalities, identifying effective time management modalities, evaluating effective quality management modalities, ascertaining effective resource management modalities and effective strategic management modalities in order to achieve construction project success. This study adopted a mixed method approach, comprising both quantitative and qualitative methods. This study targeted construction SMEs in South Africa. Quantitative data collection was adopted at the initial stage with regard to ascertaining the success rate of construction SMEs in South Africa. To analyse the data, descriptive and inferential statistics were adopted in this study, using SPSS software. To validate the quantitative survey, semi-structured interviews were conducted with members of SME management teams such as directors, project managers, surveyors, and quantity surveyors.

The findings from the study reveal that SMEs in South Africa need to adopt the following modalities related to cost management practice: appointment of experienced estimators, effective procurement strategies, effective circulation of drawings and specifications, work production and avoiding waste during construction projects. Concerning time management techniques, the most significant practices include progress meetings, planning and effective communication. In addition, the findings reveal that clear working drawings, periodic requests for inspection and adoption of total quality management are the most significant quality management practices that can be adopted by SMEs. Resource management was categorised as effective materials management, manpower management and machinery management. The results reveal that SMEs need to adopt the following modalities concerning effective material management practices: effective use of specified material for construction, effective utilisation of construction material and effective material recording strategy. Nonetheless, with respect to manpower management, the findings reveal the following management practices that could be adopted by construction SMEs: SMEs manage all workers equally to avoid any conflict on construction sites, project leaders are involved in

the allocation of building personnel and SMEs support values and beliefs of construction workers. Also, the findings reveal that SMEs need to adopt the following modalities regarding effective machinery management practices: effective recruitment of skilled plant operators, effective maintenance plans for regular maintenance of plant and equipment and continuous use of hired plant until booked off site. The findings reveal that SMEs need to adopt in relation to strategic management, as well as integrated project management planning and health and safety protocols.

In conclusion, sustainable project success in South Africa can be achieved through the adoption of effective circulation of drawings and specifications, effective and accurate cost estimate, progress meetings with consultants to ensure regular monitoring of work progress, Clear working drawings supplied by the architect, the use of specified material for construction project, managing construction workers equal, hiring skilled plant operator and adoption of integrated management system. This study recommends that SMEs should adopt the following modalities to achieve sustainable success: clear procurement strategy, endeavour appointing qualified estimator to manage tendering process, employment of experienced personnel to run the project, adopting effective circulation of information, SMEs need to have meeting from time to time, on the construction project SMEs need to request for periodic quality inspection, effective utilization of available material, effective utilization of hired plant, recruiting skilled workers and introducing integrated management system.

Keywords: SMEs, sustainability, construction industry, project delivery and success rate.

DEDICATION

This thesis is dedicated to my mother, Mrs. N. Sogaxa, and my late father, Mr. Z. Sogaxa, who always believed in me and pushed me to take the right decisions in life. Without my mother's love and support it could not be possible. To my daughter, Aqhame Magatyana, thank you for allowing me to fulfil my dream. Keep on motivating me to achieve more.

ACKNOWLEDGEMENTS

Firstly, I thank God for protecting me, empowering me, and providing guidance and direction through this journey in my studies.

I also wish to thank the following people:

My supervisor and co-supervisors, Dr. Julius Ayodeji Fapohunda and Dr. Eric Kwame Simpeh, for your guidance, tireless effort, support, motivation, and encouragement to complete this thesis. Without you, it wouldn't be possible.

I also appreciate the support from the Head of the Department of Construction Management and Quantity Surveying, Mrs. Toni Stringer, and the lecturers, for providing a conducive learning environment and allowing me to use their offices when necessary.

My appreciation is extended to the Head of Department of Built Environment at Walter Sisulu University, Mr. Archie Madumane, and my colleagues, especially Dr. Craig Goldswain, Mr. Ian Moss, Mr. Colin Eliott, Mrs. Sandisa Fata and Ms. Vuyokazi Luthuli. I appreciate the support.

I appreciate the support of Mr. Teboho Kelele from Eastern Cape Department of Public Works, Mr. Mbulelo Jokazi from COAGA Development Corporation, and Mr Jeremy Dobbin, Head of Research, Nelson Mandela Bay Business Chamber, for assisting me with the data collection.

I appreciate the support and encouragement received from family and friends. Thank you to my friend Mr. Xabiso Hila, for providing some much-needed academic competition.

I acknowledge the financial support provided by CPUT with regard to tuition fees under the NRF funding. I also appreciate the financial support provided by Walter Sisulu University.

Table of Contents

DECLARATION **II**

ABSTRACT **III**

DEDICATION **V**

ACKNOWLEDGEMENTS **VI**

LIST OF FIGURES **X**

LIST OF TABLES **XI**

LIST OF ABBREVIATIONS **XII**

GLOSSARY TERMS **XIII**

CHAPTER ONE **1**

INTRODUCTION **1**

1.1 BACKGROUND OF THE STUDY 1
1.2 OVERVIEW OF SMES MODALITIES 2
1.3 PROBLEM STATEMENT 3
1.4 RESEARCH QUESTION 4
1.4.1 As presented in Table 1.1, this research sub-questions are: *4*
1.5 AIM AND OBJECTIVES 4
1.5.1 Aim of the research *4*
1.5.2 Objectives *4*
1.6 CONTEXT OF THE RESEARCH 5
1.7 KEY ASSUMPTIONS 5
1.8 SIGNIFICANCE OF THE STUDY 5
1.9 ETHICAL CONSIDERATIONS 6
1.10 LIMITATIONS 6
1.11 RESEARCH METHODOLOGY 6
1.11.1 Sampling *6*
1.11.2 Data collection *6*
1.11.3 Data analysis *7*
1.12 DIVISION OF CHAPTERS 7
1.15 CHAPTER SUMMARY 7

CHAPTER TWO **9**

LITERATURE REVIEW **9**

2.1. INTRODUCTION 9
2.2 OVERVIEW OF SMES IN SOUTH AFRICA 10
2.2.1 Construction SMEs in South Africa *10*
2.2.2 SMEs construction project delivery in South Africa *11*
2.2.3. Overview of construction project success *11*
2.2.4 SMEs project success in South Africa *13*
2.2.5 Sustainable business performance *14*
2.3 CHALLENGES ENCOUNTERED BY SMES IN CONSTRUCTION PROJECT DELIVERY 17
2.3.1 SMEs project delays *18*
2.3.2 SME political involvement *19*
2.3.3 South African government intervention in the construction industry *19*

2.3 MODALITIES FOR SMES TO ACHIEVE SUSTAINABLE SUCCESS RATE 21
2.3.1 SME cost management practices *21*
2.3.2 SMEs time management practices *23*
2.3.3 SMEs quality management practices *26*
2.3.4 SMEs resource management practices *29*
2.3.5 SMEs approaches to strategic management practices or management techniques *36*
2.4 CHAPTER SUMMARY 46

CHAPTER THREE **48**

METHODOLOGY AND DESIGN **48**

3.1. INTRODUCTION 48
3.2 RESEARCH METHODOLOGIES 48
3.2.1 Quantitative Research approach *49*
3.2.2 Qualitative research approach *49*
3.2.3 Mixed research method *50*
3.2.4 Research philosophies *51*
3.2.5 Positivism *51*
3.2.6 Interpretivism *52*
3.2.7 Types of research design *52*
3.2.8 Research strategies *53*
3.2.9 Research design for this study *53*
3.2.10 Targeted population *54*
3.2.11 Sampling techniques *55*
3.2.12 Data collection *56*
3.2.14 Data analysis *60*
3.2.16 Reliability test *62*
3.3 CHAPTER SUMMARY 62

CHAPTER FOUR **64**

DATA ANALYSIS AND DISCUSSION OF FINDINGS **64**

4.1 INTRODUCTION 64
4.2 RESPONSE RATE, QUESTIONNAIRE SURVEY 64
4.3. PROFILE OF RESPONDENTS 64
4.3.1 Age group of respondents *64*
4.3.2 Experience of the respondents *65*
4.3.3 Educational qualification of the respondents *65*
4.3.4 Role of respondents in the organisation *66*
4.3.5 Gender *66*
4.3.6 CIDB grade of the company *67*
4.4 RELIABILITY TESTING 67
4.5. MANAGEMENT PRACTICES IN SMES 68
4.5.1 Effective cost management practices in SMEs *68*
4.5.2 Effective cost management practices through budgeting in SMEs *69*
4.5.3 Effective time management practices in SMEs *70*
4.5.4 Effective time management through leadership, project work schedule and control *72*
4.5.6 Effective quality management practices in SMEs *73*
4.5.7 Effective material management practices in SMEs *74*
4.5.8 Effective manpower management practices in SMEs *75*

4.5.9 Effective machinery management practices in SMEs *77*
4.5.10 Effective strategic management practices in SMEs *78*
4.6 FACTOR ANALYSIS 79
4.6.1 Identifying the most significant cost management modalities adopted by construction SMEs to achieve sustainable construction project success *79*
4.6.2 Identifying the most significant time management modalities adopted by construction SMEs to achieve sustainable construction project success *83*
4.6.3 Identifying the most significant quality management modalities adopted by construction SMEs to achieve sustainable construction project success *86*
4.7 QUALITATIVE INTERVIEW 88
4.7.1 Interview with Respondent A *89*
4.7.2 Interview with Respondent B *91*
4.7.3 Interview with Respondent C *94*
4.7.4 Interview with Respondent D *96*
4.8 DISCUSSION OF FINDINGS 99
4.8.1 Effective cost management practices *99*
4.8.2 SMEs effective cost budgeting *101*
4.8.3 SMEs effective time management practice *102*
4.8.4 Effective leadership in SMEs *103*
4.8.5 Effective quality management practices in SMEs *105*
4.8.6 Effective resource management practices on SMEs *106*
4.8.7 Effective strategic management practices in SMEs *109*
4.9 CHAPTER SUMMARY 110

CHAPTER FIVE **112**

CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH **112**

5.1 INTRODUCTION 112
5.2 CONCLUSIONS RELATIVE TO SMES MODALITIES TO ACHIEVE A SUSTAINABLE SUCCESS RATE IN CONSTRUCTION PROJECTS 114
5.2.1 Effective cost management practices in SMEs *114*
5.2.2 Time management practices in SMEs *115*
5.2.4 Quality management practices in SMEs *115*
5.2.5 Resource management practices in SMEs *116*
5.2.6 Strategic management practices in SMEs *118*
5.3 OPERATIONAL FRAMEWORK FOR SMES TO ACHIEVE SUSTAINABLE CONSTRUCTION PROJECT SUCCESS 119
5.4 LIMITATIONS 121
5.5 RECOMMENDATIONS 121
5.6 FURTHER RESEARCH AREAS 123

LIST OF REFERENCES **124**

ANNEXURES **142**

ANNEXURE A: QUESTIONNAIRE FOR THE STUDY **142**

ANNEXURE B: SEMI-STRUCTURED QUESTIONNAIRE **151**

ANNEXURE C: DATA COLLECTION PERMISSION **153**

ANNEXURE D: LIST OF PUBLICATIONS **154**

LIST OF FIGURES

FIGURE 2.1: PROJECT SUCCESS IN THE CONSTRUCTION INDUSTRY 13

FIGURE 2.2: SUSTAINABLE PROCESSES 16

FIGURE 2.3 SMES RESPONSE STRATEGY 18

FIGURE 2.4 SUSTAINABLE PROCESSES 19

FIGURE 2.5 SMES QUALITY MANAGEMENT MODALITIES 29

FIGURE 2.6: SMES BUSINESS ENVIRONMENT 41

FIGURE 2.8: THEORETICAL FRAMEWORK 46

FIGURE 3.1: RESEARCH METHODOLOGY FRAMEWORK 62

FIGURE 4.1 CATELL'S SCREE PLOT ON COST MANAGEMENT VARIABLES ADOPTED BY CONSTRUCTION SMES TO ACHIEVE SUSTAINABLE PROJECT SUCCESS 82

FIGURE 4.2 CATELL'S SCREE PLOT ON TIME MANAGEMENT VARIABLES ADOPTED BY CONSTRUCTION SMES TO ACHIEVE SUSTAINABLE PROJECT SUCCESS 85

FIGURE 4.3 CATELL'S SCREE PLOT ON EFFECTIVE QUALITY MANAGEMENT VARIABLES ADOPTED BY CONSTRUCTION SMES TO ACHIEVE SUSTAINABLE PROJECT SUCCESS 87

FIGURE 5.1: OPERATIONAL FRAMEWORK TO ACHIEVE CONSTRUCTION PROJECT SUCCESS 120

LIST OF TABLES

TABLE 1.1 THE RELATIONSHIP BETWEEN RESEARCH QUESTIONS, OBJECTIVES AND METHODS 4

TABLE 3.1. EASTERN CAPE METROPOLES CIDB GRADING 54

TABLE 4.1 AGE GROUP OF THE RESPONDENTS 65

TABLE 4.2 RELEVANT EXPERIENCE 65

TABLE 4.3 EDUCATIONAL QUALIFICATION 66

TABLE 4.4 ROLE IN THE ORGANISATION 66

TABLE 4.5 GENDER 66

TABLE 4.6 CIDB GRADE 67

TABLE 4.7 RELIABILITY TEST 67

TABLE 4.8 EFFECTIVE COST MANAGEMENT PRACTICES 69

TABLE 4.9 COST MANAGEMENT THROUGH BUDGETING 70

TABLE 4.10 EFFECTIVE TIME MANAGEMENT PRACTICES 71

TABLE 4.11 TIME MANAGEMENT THROUGH LEADERSHIP, WORK SCHEDULE AND CONTROL 72

TABLE 4.12 EFFECTIVE QUALITY MANAGEMENT PRACTICES 73

TABLE 4.13 MATERIAL MANAGEMENT PRACTICE 75

TABLE 4.14 EFFECTIVE MANPOWER MANAGEMENT PRACTICES 76

TABLE 4.15 EFFECTIVE MACHINERY MANAGEMENT PRACTICES 77

TABLE 4.16 EFFECTIVE STRATEGIC MANAGEMENT PRACTICE 79

TABLE 4.17 KMO AND BARTLETT'S TEST OF SMES COST MANAGEMENT PRACTICES 80

TABLE 4.18 TOTAL VARIANCE EXPLAINED BY COMPONENTS 81

TABLE 4.19 COMPONENT MATRIX[A] 83

TABLE 4.20 KMO AND BARTLETT'S TEST 84

TABLE 4.22 COMPONENT MATRIX[A] 85

TABLE 4.23 KMO AND BARTLETT'S TEST 86

TABLE 4.24 TOTAL VARIANCE EXPLAINED BY THE COMPONENTS 87

TABLE 4.25 COMPONENT MATRIX[A] 88

TABLE 5.1: SME MODALITIES TO ACHIEVE A SUSTAINABLE SUCCESS RATE IN CONSTRUCTION PROJECT DELIVERY 113

LIST OF ABBREVIATIONS

ASGISA: Accelerated and Shared Initiative for South Africa

CIDB: Construction Industry Development Board

DTI: Department of Trade and Industry

ECDPW: Eastern Cape Department of Public Works

ERP: Enterprise Resource planning

FOI: Free of Information

GB: General Building

GDP: Gross Domestic Product

ICT: Information Communication Technology

KM: Knowledge Management

NGOs: Non-Governmental Organisation

PMBOK: Project Management Body of Knowledge

SME: Small to Medium Enterprise

SPI: Schedule Performance Index

TQM: Total Quality Management

GLOSSARY TERMS

Sustainability: Sustainability is the mean for an organization to maintain its current and future competitiveness (Asif, Bruijn, Fisscher and Steenhuis 2008:423).

Construction industry: Construction industry is referred to a collection of industries and sectors that add much value regarding creation and maintenance of assets within the built environment (CIDB, 2015:4).

SMEs: According to Ngek and Smit, (2013:3043) SMEs is defined as a separate business and non-government organisation that is managed and directed by one or more.

Project delivery: Project delivery is a complete process which include planning, design and construction in order complete the building as required by the user of the building (Design-build done right primer: 2015:2).

Success rate: Is referred as the concept and the project abstract that determine whether a project meet its objectives or not (Kumara, 2016:698).

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Small and Medium Enterprises (SMEs) are regarded as key to the economic growth of the country (Adendorff, Appels & Botha, 2011). However, the success rate of SMEs in South Africa with regard to sustainable project delivery is low (CIDB, 2015:46). The formation and longevity of SMEs are most significant for South African economy (Olawale & Garwe, 2010:729) in respect of success. Olawale and Garwe (2010:729) emphasise that SMEs create more job opportunities in South Africa and that they are of great importance for the Gross Domestic Product (GDP). Landzani and Van Vuuren (2002:154) and Lampadarios (2017:3), describe the success rate of SMEs as one element that conveys social solidity and creates economic benefits globally. However, SMEs are faced with difficulties in competing with well-established companies in the industry, despite being the first preference in government projects and government business development structures (Love *et al.,* 2001:33).

According to Love *et al.* (2001:38) SMEs struggle in using the techniques that could lead the organisation to success. The analysis of management techniques is a significant strategy that needs to be developed by SMEs in the construction industry (Lee, Lim & Tan, 1999:301). Zarook, Rahman and Khanam (2013:106) argue that lack of appropriate skills from business managers lead to SME failure. The management approaches employed by owners of SMEs largely rely on personal objectives and interest of the owners (Zarook *et al.,* 2013:107).

Among other issues, Kongolo (2010:2293) identifies typical challenges of SME contractors that include; lack of management skills, lack of finance, lack of access to bank credit, lack of access to markets, lack of recognition by big construction companies, lack of interest and inadequate support for the roles that SMEs play with regard to national economic development. Ncwadi and Dangalazana (2005:370) state that SMEs are faced with lack of sufficient funds to run a business, which often causes project failure due to a combination of limited availably of viable construction projects and a lack of external support from government. However, Ayandibu (2010:2) notes that the construction industry produces different products and each project is unique and requires different levels of quality that contractors have to meet. Nevertheless, Ayandibu (2010:2) warns that the team involved on each project has to consider that the aim and SME development is not only job creation but also high standards of the developed project. Thus, effective use of resources in construction projects is very important, as the resources are the

productivity factors. Ncwadi and Dangalazana (2005:28) contend that labour outputs and quality performance in construction industry are diminishing daily as a result of ineffective quality management. However, although significant studies conducted to ascertain SMEs sustainable construction project success, researchers have not identified the effective modalities to achieve sustainable success rates of SMEs. Thus, based on the involvement of SMEs with regard to the development of the economy of the country, there is a need to develop effective modalities (as a framework) for sustainable success rates of SMEs with regard to construction project delivery in South Africa.

1.2 Overview of SMEs modalities

A study by Hussain (2000:4) reveals modalities and mechanisms that SMEs links with large companies on success rate. SMEs contribute significantly to the growth of the country through job creation. Thus, SMEs need to possess adequate knowledge regarding ways to manage and control assets to ensure profitability or return on the company's investment at large (Lee *et al.,* 2005:3).

Huang (2011:1) reveals that the use of lowest-bidder contracts has resulted in construction projects being delayed and costs being overrun, thus contributing to both conflict and unpredictability in the industry. The client stipulates timeframes on contracts and the contractors have to successfully deliver a construction project in a timely fashion. Failure by SME contractors to complete the project eventually puts the contractor at risk of having to pay penalties to the client (Bajari & Lewis 2009:6). Gabula (2012:2) notes that SMEs are confronted with several project management issues related to lack of management experience. A study by Smit and Watkins (2012:6326) concludes that SMEs need to employ competent teams order to ensure a sustainable and successful delivery of construction projects. Olawale and Garwe (2010:731) opine that managerial competencies are the key elements to the sustainability of the emerging contractor. The competency of management is often related to management personnel and the quality and quantity of financial information regarding the staff employed by the company (Brink, Cant & Lightelm, 2003). Smit and Watkins (2012:6326) reveal that not only the lack of ownership skill, but also lack of management skills, leads to failure of emerging contractors. Berry, Blottnitz, Cassim, Kesper, Rajaratnam and Seventer (2002:8) argue that emerging contractors are confronted with a shortage of skills and subsequently fail to deliver the project. Furthermore, Barry *et al.* (2002:8) point out that, despite the fact that a number of South African black people are employed as semi-skilled labour, the impact of Apartheid-era labour practices can still be seen in the relative shortage of management skills found in emerging contractors from this demographic. Mensah (2004:14) agrees, indicating that not only management skills, but training of employees is critical for the growth of the average SME. Nevertheless, Agumba (2006:30) reveals

that organisational techniques allow the companies to order their resources on time in order to avoid delays on construction projects.

Thus, the principal factors considered; cost, time, quality, health and safety and resource management in respect to SME success rates are: cost of construction, delivery time and quality of a project. However, Fapohunda (2009) indicates that a project could be completed timeously, within the estimated cost, within expected quality parameters and in alignment with shareholder expectation, and still turn out to be financially costly to the SME due to inefficient use of resources during construction project delivery. Hence, the author finds it necessary to evaluate emerging contractor's resource (material, manpower and machinery) usage. In addition, the SMEs managerial capabilities in respect to intrinsic management knowledge with respect to construction projects and management practices will be critically evaluated with the goal of identifying modalities to be used as a tool to achieve sustainable management of cost, time, quality and construction resources.

1.3 Problem statement

There are high numbers of construction companies entering the industry, due to low barriers to entry in the industry, especially in the lower sector (grade 1-4), which causes significant competition among emerging contractors (Tezel, Koskela & Aziz, 2018). Although a number of SMEs enter the construction market, Chadhliwa (2015:4) reveals that 90% of registered SMEs often fail within the first five years of registration. SMEs are confronted with challenges with respect to time management, finance management and resources (Smit & Watkins 2012:6325). As a project progresses, SMEs require external finance from the banks to ameliorate the cash-flow problems which occur during the life of the construction project (Fatoki & Asah 2011:170), which is seldom forthcoming. On the other hand, Mkheimer (2018) opine that there are many strategic organisational assets such physical infrastructure, capital and human resource which plays a significant role in construction project success.

Ankomah, Ayarkwa and Agyekum (2017) is concerned about challenges linked to the fact that SMEs lack the capacity to implement management ideas. The South African government facilitated the development and empowerment of SMEs in the country by creating job opportunities for SMEs (CIDB, 2004:49). However, this effort did nothing to solve the challenges faced by SMEs in respect to project success and project sustainability. From the above discussion, it is evident that many attempts have been made to resolve the challenges faced by SMEs in their quest to sustain the business during the delivery of a construction project. Therefore, the problem to be investigated may be stated as: the success rate of SMEs in sustainable construction project delivery is compromised by the different modalities employed by SMEs at project level. Hence,

there is a need to develop modalities to achieve sustainable success rates of SMEs in South Africa.

1.4 Research question

What are the modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa?

1.4.1 As presented in Table 1.1, this research sub-questions are:

- How could SMEs effectively manage cost with regard to sustainable construction project (SCP) delivery?
- How could SMEs successfully complete construction projects on time?
- How could SMEs effectively manage quality with regard to sustainable construction project delivery?
- How can management techniques be employed effectively with regard to usage of construction resources by the SMEs, in order to deliver projects successfully?
- What are the modalities to achieve sustainable success rates of SME construction project delivery?

1.5 Aim and objectives

1.5.1 Aim of the research

The aim of this study is to establish the appropriate modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa with a view to enhance continuous project performance.

1.5.2 Objectives

- To identify effective cost management techniques to achieve sustainable construction project delivery by the SMEs.
- To identify modalities to avoid time overrun on SME projects.
- To evaluate appropriate quality assurance techniques during project delivery.
- To ascertain management techniques that would be employed to enhance success rates of SME contractors.
- To establish and recommend effective modalities to achieve sustainable success rate of SME construction project delivery.

Table 1.1 The relationship between research questions, objectives and methods

Research questions	Research Objectives	Research Method

How could SMEs effectively manage cost with regard to sustainable construction project (SCP) delivery?	To identify effective cost management techniques to achieve sustainable construction project delivery by the SMEs.	Review of relevant literature, questionnaire administration and interviews.
How could SMEs successfully complete construction projects on time?	To identify modalities to avoid time overrun on SME projects.	Review of relevant literature, questionnaire administration and interviews.
How could SMEs effectively manage quality with regard to sustainable construction project delivery?	To evaluate appropriate quality assurance techniques during project delivery.	Review of relevant literature, questionnaire administration and interviews.
How can management techniques be employed effectively with regard to usage of construction resources by the SMEs, in order to deliver projects successfully?	To ascertain the management techniques that would be employed to enhance resource management.	Review of relevant literature, questionnaire administration and interviews.
What are the modalities to achieve sustainable success rates of SME construction project delivery?	To establish and recommend effective modalities to achieve sustainable success rate of SME construction project delivery.	Analysis of retrieved questionnaires and interviews.

1.6 Context of the research

This study is based in South Africa, and focuses on the Eastern Cape SMEs in construction industry registered under general building category 1-4. The investigation will be conducted on SME's that are on project, and concentrate on the managerial staff of firms, such as construction managers, site agents and quantity surveyors, to determine modalities to achieve higher success rates of SMEs with regard to sustainable construction project delivery.

1.7 Key assumptions

The assumptions of the research are:

- The selected SMEs or emerging contractors will participate;
- Selected companies will allow access to and provide experiences about previous construction projects in respect of success rate; and
- The staff employed by SMEs will provide relevant information on survey questionnaires, in order to achieve the aim and objectives of the study.

1.8 Significance of the study

The outcome of the study will benefit construction companies with regard to the project delivery process in the following ways:

- Present the mechanisms to reduce financial risks faced by contractors in the delivery of projects;
- Assist construction companies to reflect on the SME technical and managerial capabilities and identify treats in the market prior to tendering; and

- Provide contractors with advantage in terms of project deliver within the industry. The study will improve project performance with regard to the success of the project**.**

1.9 Ethical considerations

In this research, the following ethical issues have been considered; the names of emerging contractors and the names of the participants in the interviews will not be disclosed.

There is no bribery or payment to any participants of this research, nor political contribution in the selection of the participants. The quality of this research will be based on the quality of the data collected from competent participants and the correctness of the calculation in quantitative research method.

1.10 Limitations

This research focuses on SMEs in the Eastern Cape Province of South Africa with CIDB general building category (GB) grade 1 and 4. Respondents are only SMEs that have previous project experience or currently busy on project. This research is based on the success factors of construction SMEs during construction project delivery.

1.11 Research methodology

This study adopts a mixed method approach, utilising both qualitative and quantitative research methods. According to Redmond, Walker and Wang (2008:279), one applies qualitative methodology to provide explanation and quantitative methodology to obtain numerical data. The literature is reviewed to investigate the existing modalities employed by emerging contractors with regard to project delivery. This literature informs the formulation of questionnaires and interview questions.

1.11.1 Sampling

Non-probability sampling method was adopted, using purposive sampling technique, which was selected because of time constraints. The study population is drawn from SME contractors within South Africa. Emerging contractors are selected in the CIDB grade range 1 to 4.

1.11.2 Data collection

Shaban (2008:32) highlights the importance of the structured interviews in the research study. Both semi-structured interviews and questionnaire surveys were adopted to obtain reliable and valid data. The purpose of the study was emphasised in detail on the questionnaires. The data collection is based on the aim of the research. These interviews provide a broad understanding of the modalities employed by SMEs in South Africa: open-

ended questions developed to allow the interviewee to discuss their experiences regarding the success rate and challenges of emerging contractors. Closed-ended questionnaires were distributed among the management team of the company, and included such positions as directors, project managers, quantity surveyors, contract managers, commercial managers, site agents, site engineers and/or any other company representative.

1.11.3 Data analysis

This research project adopts descriptive and content analysis. This was achieved by using Statistical Package for the Social Sciences (SPSS) to analyse the questionnaire data and present the findings of the study. In addition, content analysis was adopted to analyse the qualitative data.

1.12 Division of chapters

Chapter One: This chapter consists of the introduction to the problem and its settings, as well as the sub-problem, research questions, objectives, aim of the study, preliminary literature, conceptual framework, research methods and significance of the study.

Chapter Two: Reviews the relevant literature on modalities to enhance the success rate of SMEs with regard to sustainable construction project in South Africa. This will be achieved by focusing on the following success modalities; SMEs time management, SMEs cost management, SMEs quality management, SMEs resource management, SMEs management techniques and communication among participants and within the organisation.

Chapter Three: This chapter provides the research tools and methodologies used in this study for data collection and analysing data. It provides the research approach and methods adopted by the researcher, indicating the population and sampling technique adopted in the study, questionnaire design and data analysis.

Chapter Four: This chapter provides the analysis of the findings and the discussion of the findings.

Chapter Five: Deals with the conclusion and recommendations, will propose the possible implications, suggestions and limitations associated with the modalities to enhance the success rate of SMEs, and ends with recommendations for further research.

1.15 Chapter summary

This introductory chapter (**Chapter One**) provides a background to the research study and a statement of the research problem and objectives of the study. Further, the scope of the research, key assumptions adopted in the research is underpinned over and methods adopted are presented Finally, the chapter indicate the grounds of the chapters to follow and laid the underpinning for this dissertation.

On this basis, the next chapter provides an overview of modalities needed to achieve a sustainable success rate of SMEs construction project delivery in South Africa.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter presents the information with respect to sustainable success rates of SMEs within construction sector in South Africa. The success rate of emerging contractors in South African depends on managerial techniques applied by SMEs in construction project delivery. South Africa has failed to sustain economic growth (Maladzhi, 2012:5).

Historically, construction projects were awarded almost entirely to well-established construction companies. The South African government policies and measures regarding turning the procurement method adopted before 1994 and with that South African construction industry has become a highly competitive environment. Sebone and Barry (2009:186) point out that in the year 2000, the South African government established the Construction Industry Development Board (CIDB) in order to regulate and promote growth of construction companies. Despite government policies encouraging the growth of emerging contractors, SMEs are still challenged by numeric barriers (Lose & Tengeh, 2015). SMEs in South Africa need to establish effective modalities as a tool to successfully deliver construction projects.

In South Africa, the success rate of SMEs is related to the ability to reliably and successfully deliver the outcomes of construction projects. Nguen, Ogunlana and Lan (2004:405), as well as Nwachukwu and Emoh (2011:59) argue that in the construction industry, each stakeholder has different objectives in a project and the achievement of these objectives depends heavily on management knowledge. In addition, Nwachukwu and Emoh (2011:59) emphasise that the success rate often depends on management techniques applied in construction planning. This chapter therefore discusses different barriers and success factors for SMEs to develop modalities to achieve sustainable success rates of SMEs in construction project delivery.

A rigorous review of the basic factors affecting SME modalities, and possible solutions to any problems, will be discussed later in this chapter. The chapter concludes with an overview of significant information with respect to SME management strategies that can be adopted by construction SMEs, covering effective management of cost, time, quality and resources throughout project delivery.

2.2 Overview of SMEs in South Africa

2.2.1 Construction SMEs in South Africa

The definition of SMEs differs with the industry of operation. For instance, in the construction industry Agumba, (2006:6), as well as Smit and Watkins, (2012:6325) define a business as an SMEs based on yearly turnover and number of workers or employees. However, Ngek and Smit, (2013:3043) defines emerging contractors as a separate entity, including cooperative businesses and non-government organisations, managed by one owner or more. Rogerson (2000:689) further points out that these SMEs enter the market by means of push factors rather than pull factors.

In 1948 racial discrimination was enacted to further exclude coloureds, Asians and blacks from participation in South African life (Ferreira, 2007:20). Among other effects, this exclusion limited the opportunities and mechanisms by which entrepreneurial skills could be developed among non-whites in South Africa. A lack of opportunity to develop entrepreneurial skills was exacerbated by Apartheid education and training, which intentionally produced graduates with poor skills, suited primarily to unskilled or semi-skilled labour (Rasool & Botha, 2011:2). Political issues also added to the failure rate of small businesses, particularly among the non-white population. As Kunene (2008:32) argues, in developing countries, political and legal issues are the biggest threat in the business environment to the development of entrepreneurs. This has been a major cause of poor delivery of projects in South Africa. Othman and Mia (2008:239) added that South Africa still bears the scars of the decisions made by the pre-1994 government, which can be seen in artificially severe social and economic divisions. In the early 1990s, the construction business environment, which was fairly competitive, was impacted by relatively easy access to the construction industry (Barnes *et al.,* 2000:297). Further, (Barnes *et al*., 2000) point out that South Africa was allowed to return to the international fold of World Trade Organisation.

The industry's procurement system was formulated in 1995 in order to implement programmes that will promote emerging contractors in the building environment. As Visagie (1997:661) points out, the application of equity in principles of employment was developed to correct the racial inequality in personnel income and set regulations. Although South Africa has become a democratic country, the level of inequality is still extremely high, and it will take some time to balance the inequality caused by colonialism and exacerbated by Apartheid, especially in the construction industry. Income levels, in South Africa as a whole there is still inequalities regarding racial lines, though some slow improvement has occurred (Bowen, Pearl & Akintoye, 2007:191). Small business in South Africa is a major contributor to economic growth, and the easy entry system at lower levels

addresses the imbalances in the industry and increases the number of black owned companies (Luiz, 2014:55).

2.2.2 SMEs construction project delivery in South Africa

Emerging contractors are regarded as leading source of the development and growth of the economy in South Africa, by creating jobs for people (Agumba, 2006; Donyavi & Flanagan, 2009:12). In light of that, Agumba (2006) argue that SMEs downsizes the use of outsourcing in construction project which is applied by large companies through the use of subcontracting some of work trades. According to Nowotarski and Paslawski (2015), the advantage of SMEs in construction projects is the possibility of systematically learning during project delivery through gathering knowledge on the ongoing project. Although SMEs create more job opportunities, SME project management techniques differ from large companies in terms of managerial style, staff capacity, organisational structure and financial resources (Donyavi & Flanagan, 2009).

Dlungwana, Nxumalo, Huysteen, Rwelamila and Noyana (2002) argue that SME contractor's performance can be affected by client decisions, particularly where there is no concern regarding environment during the project briefing. Furthermore, Dlungwana *et al.* (2002) point out that late or new information by the designers such as drawings, poor management of the design and immature level of skills creates a major challenge for SMEs, who have smaller pools of talent and resources, and are thus less able to accommodate changes in staff or resources required.

2.2.3. Overview of construction project success

Construction project success is regarded as successful when it is within client's budget, the project goals are achieved with no delays and the project is complete in accordance with the client's specification (Nguyen, Ogunlana & Lan, 2008:404; Diallo & Thuillier, 2004:21). Project success is the investment of financial resources expected to turn into assets that generate profit over a period of time (Ika, Diallo & Thuillier, 2010:66). Atkinson (1999:337) views project success as a project management process of collective modality or managerial techniques to direct effective use of available resources to deliver a project that is unique, complex, completed within project timeframe, cost effective and adhering to quality requirements. Belassi and Tukel (1996:142) agree, and emphasize that construction project success is measured based on technical performance. On the other hand, Nguyen, Ogunlana and Lan, (2004:405) and Gray, (2001:105) regard project success as meeting the requirements and improving output in terms of cost, schedule, quality, safety and participant satisfaction. Further, project success is measured across four dimensions; meeting design and planning requirements, accruing benefit to the client, benefiting companies in the industry and developing national infrastructure (Mir & Pinnington, 2014:203)

Construction project success depends on the management team, because should the project be wrongly managed, it is unlikely to be successful. According to Munns and Bjeirmi, (1996:82) construction project success is based on the following: setting clear and realistic project goals, being competitive, meeting client requirements, profitability, the third parties involved, market availability, the project's operational structure and the perceived value of the project. In addition, Nwachukwa and Emoh (2011:64), identify the following factors that may assist in terms of ensuring project success:

- *Communication:* The need for effective communication processes is extremely significant in generating a good working environment for successful and sustainable implementation of a construction project at project level;
- *Project mission:* definition of company goals and objectives of a project;
- *Top management support:* The relationship between the top management team and the operating team of the construction project;
- *Project scheduled plan:* The importance of developing a detailed plan of the required stages of the project process;
- *Client consultation:* The need for effective links between the client and the designing team client is significant in attempting to successfully execute a construction project;
- *Personnel issues:* Personnel issues related to recruitment, selection of staff based on their skills and staff development for the construction project;
- *Technical tasks:* The most significant strategy which management personnel need to understand for the project and management of the implementation process;
- *Monitoring and feedback:* In respect to monitoring or processes by which, at each stage of execution, key personnel receive feedback on project performance by comparing or conforming to plans with regard to time, cost, quality and materials; and
- *Client acceptance:* The end of the construction project, by which the success of the project is determined.

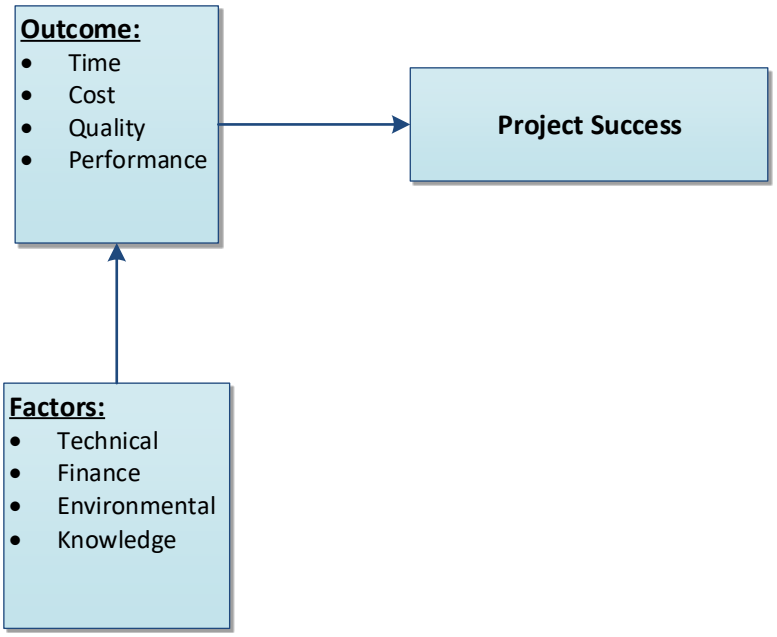

Figure 2.1: Project success in the construction industry

(Adapted from Lim & Mohamed, 1999:246)

Chan, Scott and Chan (2004; 153-155) reveal that using management tools effectively allows managers to plan and implement the project to its maximum, and enhance the chances of project success. Furthermore, project manager competence is another critical factor that influences the project's success (Chan, Scott & Chan, 2004:153-155). Fotwe and McCaffer (2000:13) point out that general skills from project management gives more strength with regard to the development of effective project management skills and the enhancement project success. However, Swarup, Korkmaz and Riley (2011:1043) argue that project success is not only limited to skill, interaction and management planning, but incorporates the process of delivery, including challenges that can potentially affect the delivery of a project. A study by Labuschagne (2005:15) reveals that successful companies are the ones which use well-organised management frameworks which incorporate all the stages and modalities in all projects in order to succeed in any circumstance. Although the above studies identify project success factors, Toor and Ogunlana (2008:150) argue that every project has specific success factors, which at times might not be transferrable to another project. These success factors include the makeup of the project team; resources; availability of local technical and managerial expertise; competence of the building contractors, management of subcontractors and suppliers; physical attributes of the project; project environmental conditions; and project location (Toor & Ogunlana, 2008:150).

2.2.4 SMEs project success in South Africa

Regarding SMEs project success, a construction project is considered successful when it meets technical performance criteria and meets the client's requirements (Meister,

2006). According to Turner, Ledwith and Kelly (2009) SMEs have high potential contribution to the economy of the country. Otar, Tim and Hendrik (2011) note that some SME contractors are able to undertake larger projects and divide them into small subsections, allowing SMEs to complete projects in a short space of time. Kappelman, McKeeman and Zhang (2006) recommend that when SME contractors prepare estimates, attention should be paid to details from the first step in order to successfully complete the project. Bougrain and Haudeville (2002) recommend that SMEs co-operate with other SMEs in the same industry in order to share project responsibilities. In addition, Meister (2006) recommends the use of a Gantt chart to display project times and achieve better project results. Also, Geoghegan and Dulewicz (2008) highlight leadership as a determinant of effectiveness, and the capacity to drive construction projects to success. Yang, Huang and Wu (2011) concluded that the leadership behaviour on project performance should give a firm an advantage regarding project delivery when a certain leadership style is adopted on project. Among SMEs project success, Ofori-Kuragu, Baiden and Badu (2016) and Chan and Chan (2004) argue that SMEs project success is measured based on project performance and adoption of profitable and competitive business. However, the interaction between the building owner and the contractor plays a key role with regard to construction project success, SME contractors need to be customer-focused in terms of understanding the client's expectations of the project (Bryde & Robinson, 2005). Hence, the purpose of this study is to determine the most important project success modalities adopted by construction SMEs.

2.2.5 Sustainable business performance

Labuschagne (2005:17), postulates that in every project undertaken, sustainability should be the priority of the project development. In addition, Labuschagne (2005) recommends that sustainability must be combined in planning, managing and implementation stages of a project lifecycle. Sustainability is defined in many ways, according to Pit, Tucker, Riley and Longden (2009; 201) *sustainability* is defined as meeting all the needs of the current business environment without adversely affecting the future generation's opportunities to meet their needs. Nevertheless, Labuschagne and Brent (2005; 159) indicate that SME businesses constitute one of the pillars of the economy of the country and that SMEs have the responsibility to prioritise the significance of sustainability in the construction industry. Although sustainability is interpreted in many ways, this study focuses on sustainable construction project performance in relation to economic, social and including environmental transformation.

Presley and Meade (2010; 436) opine that a company intending to start a sustainable business needs to note of stakeholders that influence or will be influenced by sustainability, including but not limited to environmental and social sustainability, while

ensuring a reasonable ongoing return on investment. Tan, Shan, and Yao (2010:229) believe that SMEs need to develop a sustainable strategy in the construction industry, complying not only with business regulations, but also with legislation in order to achieve a balance in construction regulations, design, and sustainable procurement to achieve required supply. However, Moore and Manring (2008; 277) argue that SME project processes and strategic frameworks need to have a sustainability lens in order to balance the resilience and construction growth of SMEs that align with creation of abundance: economically, environmentally, and socially.

Strategic planning leads SMEs to project quality improvement and increased project sustainability, while also exerting a positive influence on turnover and employment (Bos-Brouwers, 2010; 418). Furthermore, Bos-Brouwers (2010:419) states that sustainability includes environmental performance and organisational improvement. Although project sustainability is the core aim in the construction industry, there is a growing recognition of the need to assess business environment regarding business polices plan and business programs (Alshuwaikhat, 2005:309).

The South African Government intervenes in sustainable construction and other emerging areas in the construction industry by introducing some policy changes to favour sustainable development (Goebel, 2007; 292). Construction growth mostly relies on home-based sustainable growth, which is brought through effective performance by the company in the industry (Wong, Thomas & Chan, 2009:260). Some SME's are more dynamic and innovative and derive an advantage with respect to core competences by focusing on entrepreneurial sustainability (Moore & Monring, 2009:280). South African companies direct their business with regard to sustainability partially through innovation (Klewitz & Hansen, 2014:58). This shows the power of innovation within an organisation. Labuschagne and Brent (2005) present different levels of organisation in the figure below. The figure depicts the reliance of sustainable process on business processes or methodologies which leads to project sustainability. The process and strategies adopted result in enhancement of sustainable project delivery.

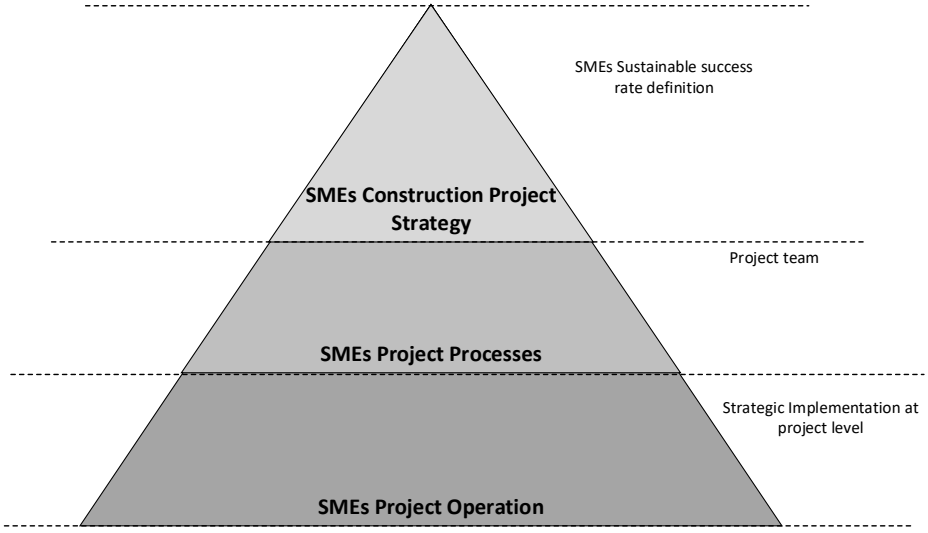

Figure 2.2: Sustainable processes

(Adapted from Labuschagne & Brent, 2005:161)

Moore & Monring (2009:278) argue that sustainability goes beyond the innovation, legislation and regulations set by government, requiring life-cycle-based standards in achieving sustainable environmental and social performance of the product. Although government infrastructure increases job opportunities in the general African economy, it also has an impact on the sustainable construction environment (Ugwu & Haupt, 2007:666). According to Olawale and Smit (2010:1781) the South African government is spending significant amounts of money on reducing high crime rates, and the rate of corruption is very high compared to other developed countries.

The South African Skills Development Act, No 97 0f 1998, identifies the requirements for the increase of individuals. Although this is an initiation in sustainable construction, South Africa is still faced with quite a number of challenges when it comes to service delivery. These challenges include the problem of poverty, inequality, corruption, insecurity and shortage of skills in human resources (Mutula & Mostert, 2010:44). According to Aigbavboa and Thwala (2014:772), the SME sector is the one that is actively promoted in the South African economy by a number of initiatives, such as the establishment of the National Business Council and Ntsika Enterprise Promotion Agency. Rhamukumba, (2014:21) points out that the Department of Trade and Industry (DTI) of South Africa suggests that South Africa boasts more than 800 000 SMEs, which increase economic growth by about 50% of GDP and employ up to 60% of the labour force.

The South African government still lags in acknowledging the importance of solid and sustainable SMEs. The government is trying all means to meet the requirements for a business environment which supports, SMEs, and these requirements can only be achieved through the National Small Business Act of 1996 (Chimucheka, 2013:783). The

previous studies point out that the South African Government have been actively supporting SMEs with the goal of addressing problems caused during the Apartheid era by implementing processes and creating more opportunities for small business. This study explores a wide range of sustainability options for continuous growth of SMEs in South Africa.

2.3 Challenges encountered by SMEs in construction project delivery

Adeniran and Johnston (2012:4089) point out that SME's are confronted with many challenges in the business environment, such as technology adopted, time management practices, project cost management modalities, project quality management modalities, project resource management modalities, innovation and flexibility with regard to changes or variance in market conditions. SMEs need to ensure that customers are always satisfied and that should be a priority of any businessman. They should also be flexible enough to respond when there is a market change (Fatoki, 2011:199).

Nevertheless, the external environment in any business, including SMEs, is regarded as an independent variable that affects the business success (Olawale & Smith, 2010:1780). According to Cant and Wiid (2013:708), factors that impact South African SMEs include, but are not limited to, interest and exchange rate, inflation, unemployment rate, crime, HIV/AIDS, technology and government legislation. However, Olawale and Smith (2010:1780) also highlight the following external environment factors: macro environment, legal environment, ethics, crime and corruption. Another factor is the interest and exchange rates: for any business, a lower interest rate increases the access of SMEs to finance and this is an important resource to business owners, as they will have more capital and can more easily increase inventory and hire more labou. It is key for business owners to keep up with the market in order for SMEs to effectively utilise the available resources. Marketing implementation at times can be very useful and lead to success of the company, even more so than planning and strategy (Sheers, 2011:5049). However, Ndihokubwayo and Haupt (2009:3) argue that in the construction industry there is no project that can be completed without variations. This is supported by Wadawatta, Ingirige, Jones and Proverbs (2011:108) who state that construction companies tend to ignore the impact of weather conditions, a tendency especially true of SMEs. Therefore, they should put risk assessments and strategies in place and develop adaptive capacities to handle more extreme events and climate changes that might occur during project delivery.

Islam, Keawchana and Yusuf (2011) note factors that can be adopted by SMEs with regard to sustainable business, namely management and know-how. Bouazza, Ardjouman and Abada (2015) note that SMEs are confronted with challenges in respect

to business operations, such as legal requirements, lack of trust from financial institutions, low manpower capacities, lack of managerial skills and training and lack of technological skills. The figure below presents the response strategies that can be implemented by SMEs faced with the factors that affect the success rates of SMEs in South Africa.

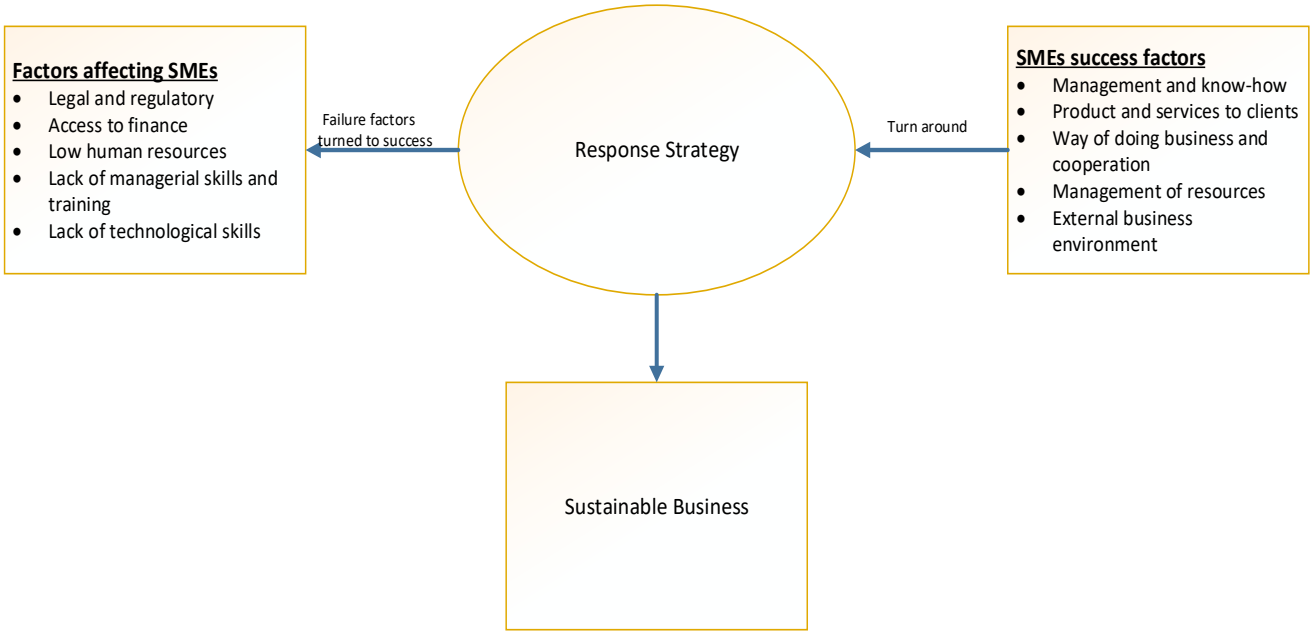

Figure 2.3 SMEs response strategy

(Adapted from Indarti & Langenberg, 2004)

2.3.1 SMEs project delays

Project delay is referred to as time overrun beyond the agreed completion date between two parties (Aziz & Abdal-Hakam, 2016:1516). Likewise, Hamzah, Khoiry, Arshad, Tawil and Che-Ani (2011:490) define *project delays* as a project confronted with construction delays, were the actual progress on construction site is compared to planned work.

Delays to the project schedule result in high costs of project, which in turn increases the contract value of a project. According to Kaming *et al.* (1997:84), a project can be delayed by a high number of variables, which are mostly caused by poor estimates during the tendering process. Kaming *et al.* (1997:84) further state that the list of variations that occurs in the construction industry result in project delays. Delays can be classified into three groups: delay with compensation, which is outside of the contractors' control and within employers' control; excusable and non-compensation delay, for which neither party is at fault, such as acts of God, labour strikes and weather conditions and for which the contractor can only claim for the time extension or contract duration; and non-excusable delay, which is caused by contractors fault, such as lack of planning, for which the contractor is generally penalised (Arditi, Nayak & Damci, 2017:137). Assaf and Hejji (2006:350) indicate that lack of experience, inadequate estimate practices, poor managerial competence in respect to regulating company polices and national slumps in

the industry are some of the factors that cause delays. The figure below illustrates the types of delay that occur during the construction stage of a project.

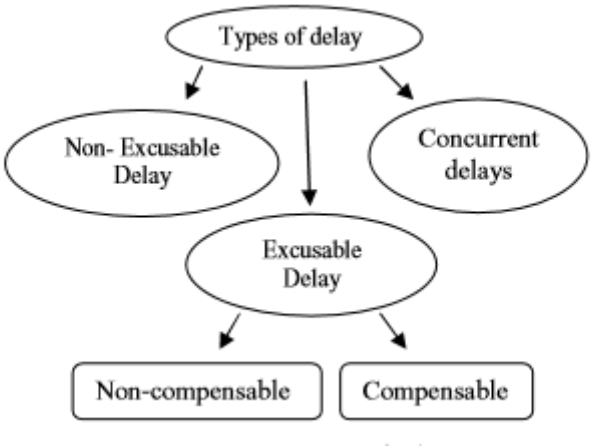

Figure 2.4 Sustainable processes

(Source: Hamzah *et al.* 2011:491)

The purpose of this study is to identify factors leading to SME-related construction project delays in South Africa. The causes of delays are collected from different previous international journal papers. There is, therefore, the need to investigate time management modalities that can be adopted by construction SMEs to address challenges faced by SMEs through exploring techniques and tools of time management practices with regard to enhancement of sustainable success rates of SMEs in South Africa.

2.3.2 SME political involvement

Political factors are often linked with project sustainability. Enshassi, Mohamed and Abushaban (2009:269) point out that political challenges have often been the cause of poor project performance. Operating in an industry that is overpopulated, there are always political issues, (Pare, Sicotte, Jaan & Girouard, 2008:254), which arise from conflicting individual and organisational interests and objectives, and which delay the project implementation process. The influence of political factors diminishes the confidence of stakeholders, who require clear business operations and predictable business environment (Van Wyk & Dahmer, 2004:260). In any industry the impact of politics plays a crucial role, and this study seeks to improve political awareness of SMEs in construction project.

2.3.3 South African government intervention in the construction industry

In South Africa, SMEs existed way before democracy and government intervention has been mainly either at national level or through small business development associations. The South African government has shown a great improvement with regard to construction industry development and become one of the few governments worldwide

that has shown full commitment with respect to development of the construction industry (Edigheji, 2010:2). Wong, Thomas and Chan (2009:260) as well as Ngek and Smit (2013:345), believe that government policies and strategies are very important when looking at the amount of empowerment given to private sectors, and also the extent of necessary intervention. The South African government has taken a position which seeks to alleviate unemployment and poverty, and requires the empowerment of currently disadvantaged individuals by acquiring all necessary knowledge and skills needed in the industry (Bowen, Pearl & Akintoye, 2007:191).

The increasing number of people in South Africa has caused an increasing housing demand in the country, which necessitates government intervention to create job opportunities in the construction industry. However, this demand decreases the available resources that could be used for maintenance on existing public properties (McCutcheon, 1995:333). Government has developed many policies which aim at empowering SMEs, and it is important to identify policies related to each sector in order to benefit from those policies. Among these policies and regulations, are the Freedom of Information Act (FOIA), Infrastructure Policy, Universal Access Policy, Development Policy, Universal Services and Access Policy (Mutula & Mostert, 2010:40). Visagie (1997:661) points out that government support is key in SMEs development, and to develop these SMEs, the government, private sector and NGOs are the key stakeholders in the construction sector with a role to play. These include the following:

- SMEs ability to access the advice from government;
- South African policy favours SMEs;
- SMEs ability to access construction marketing and procurement;
- SMEs ability to access finance from financial institutions;
- SMEs ability to access infrastructure and premises;
- Availability of training and development to SMEs;
- SMEs access to appropriate technology used in the construction industry; and
- Encouragement of interfirm linkages.

The big issue for SMEs is typically capital or financial assistance, lack of which frequently results in SME failure. Although the South African government attempted to address this issue through institutions such as Khula Enterprise Finance, the problem of SME access to finance remains. This is caused by relatively easy entry of SMEs into the market (Luiz, 2014:53).

2.3 Modalities for SMEs to achieve sustainable success rate

2.3.1 SME cost management practices

Cost in construction projects is impacted by challenges encountered by SME contractors when delivering a construction project. Abanis (2013:30) defines cost management as the way of raising company's capital to finance organisational assets and activities and these funds have to be used effectively to achieve the objectives of the comapy. Similarly, Vasista (2017:44) describes effective financial management as the method of controlling expenditures throughout the project and within the approved budget. Innovative ideas have created a gap or niche for small businesses to enter into construction market and increase the efficacy of cost management through innovative ideas (Jones, Davies & Muir, 2003:5).

SMEs find themselves at financial risk in construction projects due to lack of planning within the organisation. Further, lack of planning results in financial risk and is often linked to organisational performance or variance of returns. These risks include stock returns, financial ratios and an uncertain income stream, all of which subsequently determine the success of the SME in the construction sector (Van Wyk, Dahmer & Custy, 2004:260). Moreover, Olawale and Garwe (2010:731) identify a lack of financial support and education as the most significant factors contributing to the hasty creation and subsequent failure of SMEs in South Africa. However, Khan and Khan (2015:3) point out that some SME contractors manage to reduce the bidding cost of projects through innovation and new construction techniques to secure projects and still maintain their profit margin. A question on how SMEs could successfully establish cost management practices to enhance sustainable construction project success in construction project delivery can be resolved by identifying the most effective cost management strategies used by existing SMEs.

Thwala and Phaladi (2009:536) argue that, although the promotion of SME access to finance has taken place, the access to those financial institutions is limited, and all SMEs have access to the financial institutions, however, the success of application depends on assessment criteria used by financial institution. Start-up operating capital is very high in the construction sector, especially for newly-registered SMEs (Thwala & Phaladi, 2009). The authors further emphasise that many SMEs have suffered due to financial problems associated with delays in payment by the client, and these delays occur most often in government construction projects. Though research has been conducted on the shortage among construction SMEs of financial management expertise, these researchers differ in objectives regarding SMEs project success. SMEs are most often rejected by banks when applying for loans or credit (Ferrando, Popov & Udell, 2017). According to Ramukumba (2014:25), 75% of applications for credits or loan by SMEs are rejected and only a very few SMEs can obtain loans, depending on the owner's credit record. SMEs need to monitor the cost of production very closely, as this is necessary to reduce the amount of

wastage and determines the most effective means of production in construction processes (Olawale & Garwe, 2010:731). Haddara and Elragal (2013:9) note that SMEs often suffer from a lack planning to identify project financial risks, and therefore make inadequate cost estimates.

Although SMEs most often suffer from financial problems during construction project delivery, the impact of government policy is often felt in SMEs' cashflow, which results in SMEs' failure or inability to sustainably deliver projects. Lack of financial access from banks or insurance companies affects a company's sustainability. Government policies which affect financial aspects of SMEs include the following:

- Interest rate ceilings in South Africa;
- State owned companies not paying on time;
- Public sector borrowing; and
- Legal and regulatory frameworks (Ganbold, 2008:10).

2.3.1.1 SME cost escalation on project delivery

Kaliba, Muya and Mumber (2009:523) describe cost escalation as construction project growth in terms of the amount of capital required for the project above the original project budget. Furthermore, the authors referred to cost escalation as the cost that occurs when actual cost exceeds the previously estimated cost. Niazi and Painting (2017:511) reveal that most construction projects experience project cost escalation during the construction period and this escalation is estimated at about 28% of budgeted cost. For SMEs to deliver construction project within their budget, there is a need to do an accurate project budget allocation. Moreover, cost overrun during the construction phase may seriously overextend the client's financial budget, up to the point where the construction project may not be completed to the client's requirements and standards, and the project may eventually be abandoned.

2.3.1.2 SME budget allocation for construction projects

According to Sui and Wang (2013:85) SMEs tend to ignore budgets for construction because of the complexity involved, and this will often include factors such as the production cost, labourers, materials, machineries, wages, bonuses and others. Vasista (2017:45) refers to *budget allocation* as a cost management tool adopted by construction SMEs to ensure that construction project is completed within the targeted budget. The cost is measured using earned value technique; the technique that compares the budgeted cost of work with the actual cost schedule performance index (SPI) (Vasista, 2017:46).

However, Afetornu and Edum-Fotwa (2005:259) reveal that, to some extent, SME cost overruns can be deemed as an indicator of inadequate scheduling and budgeting of the construction project, which is the result of accuracy of costing and estimating a project

budget. Hence, Afetornu and Edum-Fotwa (2005:262) note that budget overrun causes includes lowest-bidder practices, incorrect planning and scheduling of activities, project management team failure, lack of material procurement, unskilled labourers, inadequate equipment resources, high defects on projects and SME failure to inspect the site before tendering.

For construction projects to be successful and sustainable, SMEs need to consider budgeting at the planning or initiation stage of a project. According to Sui and Wang, (2013:85), budgets can be derived in three ways, either prior budgeting, concurrent budget and/or post budgeting. Also, SMEs can manage cost through effective enterprise resource budget planning (Haddara, 2011). Nonetheless, Enterprise resource planning could be adopted by construction SMEs to achieve sustainable success rate. Moreover, enterprise budget cost planning is the most cost-effective tool, and SMEs adopt ERP as the way to survive in the industry and be competitive (Haddara, 2011). Notwithstanding, the cost budget helps SMEs understand the budget problems and corrective measures attendant on the problems which arise during the construction stage of the project. However, budget allocation can only be successfully implemented if the project is executed on time and according to client specifications.

2.3.2 SMEs time management practices

In each contract, there is a timeframe which is stipulated by the employer in the contract documentation, based on the employer's future plan (Hatush & Skitmore, 1997:130). According to Chan and Kumaraswamy (1997:55), the majority of project delays on a project occur during project delivery stage, where there are many unforeseen factors. Thus, for SMEs to manage construction time effectively, all construction project participants need to have all the relevant qualities, such as good leadership skills, good project understanding, and common objectives with regard to achieving construction project delivery (Fapohunda, 2014:27). In addition, Hoai, Dai Lee and Yong Lee (2008:368) are of the opinion that in order to to minimise construction time delays and financial overruns, stakeholders should ensure that there are adequate funds available during the execution of the project. Furthermore, recommendations are effective project planning and funds during project design, including the selection of competent bodies to develop the work plan for the SMEs, and a reliable contractor to undertake the required work.

The client's decisions influence the SME contractor's performance significantly in construction project delivery. Clients may, in some cases, include incentives in their contract in order to influence the SME contractor in meeting the client's requirements. In other contracts, a project bonus is adopted in order to encourage SMEs to achieve project goals and avoid project penalties (Hatush & Skitmore, 1997:130). Hence, this study

analyses SME time management in construction. It is believed that during effective planning, SMEs need to consider the following: work scheduling, project monitoring and controlling, leadership, progress meetings, subcontracting work and corrective actions concerning project delays.

2.3.2.1 SME work schedule on project delivery

Wu, Borrmann, Beibert, Konig, and Rank (2010:379) define *work schedule* as coordinating resources of works, machines and materials timeously in order to complete a construction project within budget. Similarly, Chua, Nguyen and Yeoh (2013:79) define work scheduling as the relationship among schedule elements which are governed by various factors, such as project constraints, construction methods, code of conduct and regulations. Hence, there is a need to develop an adequate work schedule for SMEs to successfully deliver the project on time and within the client's budget. However, Siglov and Konig (2017:456) contend that SMEs are faced with challenges in developing an adequate work and material schedule for construction projects. This is corroborated by Han, Cline and Fard (2015:890), who maintain that there is a lack of detailed planning by SMEs in terms of the schedule of work, and subsequently and consequently a failure to capture all operational levels of activities, such as reinforcement, formwork and waterproofing on concrete.

The traditional method of scheduling is mostly common adopted tool by construction SMEs, where dependences are only supported by the precedence's, network diagram which include the critical path method (Siglov & Konig, 2017:457). However, there is a need to develop an effective sequencing of work schedules in order to enhance effective time management on construction projects. Agumba and Fester (2011) regard scheduling and sequencing as the framework and principal driving factors with regard to SME project success. Yang, Park, Vela and Fard (2015:211) emphasise that scheduling does not only end at drawing up a timetable, but there is also a need to continuously monitor the project in order to assess and react to the immediate project issues arising. This observation is supported by Srewil and Scherer (2017:173), who state that SMEs need efficient scheduling planning in construction projects to enhance sufficient information flow in the current project process.

2.3.2.2 SMEs project monitoring and controlling

Yang *et al.* (2015:211) characterise *project monitoring* as the involvement of the extent of project plan being followed. In addition, Screwil and Scherer (2017:178) explain that, in monitoring of SME construction projects, it is essential to anticipate potential schedule delays and exceptions at the early stages of the project. In most cases, SMEs do not have adequate skills with respect to monitoring the project at the operational level, which causes project delays and affects the cost of the project (Yang *et al.* 2015:212). There is thus a need for SMEs to take prompt action on construction project delivery systems in

order to manage project timeframes and be operative and productive at project level (Omar & Nehdi, 2016:144). The authors also emphasise that SMEs are challenged by construction progress tracking, or as-built project sensing. Hence, the study develops strategies to implement effective project monitoring during construction project delivery.

2.3.2.3 SMEs leadership on construction project delivery

SMEs leadership has been defined in many ways, often inconsistent but somewhat complementary to each other. Archer, Verster and Zulch (2010:431) describe leadership as a quality possessed by a person who understands the need for SMEs to develop, direct and control and motivate, including communicating the vision to the followers with regard to sharing, mentoring and coaching subordinates and integrated construction decisions. Ghafoor, Munir and Yousaf (2016:3) suggest that there is a need for SMEs to acquire a leader who can manage uncertainty and competition in an increasingly diverse workforce to achieve desired sustainable project success.

However, Nubuor, Hongyi and Frimpong (2014:85) note that SME leadership on a construction project can be affected by many work-related factors, such as employee's attitude, motivation among team members, and performance of manpower, all of which affects the outcome of the project. Jowah (2016:11) believes that poor leadership and unsuitable leadership competencies are the principal causes of SME business failures, particularly at project delivery stage. This research would identify and suggest effective modalities that can be implemented by SMEs in order to enjoy continuous success at project stage.

2.3.2.4 Progress meeting during construction project delivery

The SME progress meeting is regarded as the most important tool used to ensure that the project is successfully delivered in respect to time, cost and quality (Ayodeji, Bhekisia & Clinton, 2016:84). Ayodeji, Bhekisia and Clinton (2016:84) further state that all issues arising on a project, including disputes and claims pertaining to the project, are discussed and resolved at the progress meeting. In a similar vein, Gorse and Emmitt (2009:984) explain that SMEs need to have project progress meetings on a regular basis throughout the project delivery for all the parties involved, to review the construction project timeframes. Nonetheless, Emmitt and Otter (2007:1073) view the progress meeting as a shared dialogue, and that meeting should be the best way of exchanging the meanings and understandings with the involved team. In addition, Emmitt and Otter (2007:1073) state that meetings help SMEs and the design team to have clear interpersonal communication.

It can be seen that SMEs need to continuously conduct progress meetings during the course of a project in order to effectively communicate among project team involved and obtain all the outstanding information from the design team to get clear project direction.

2.3.2.5 SMEs time management through subcontracting

Manu, Ankrah, Proverbs and Suresh (2013:1018) define *subcontracting* as a method of transferring project performance of the work which subsequently negatively affects manpower recruitment status in the project and also the manner in which the activities are performed, in terms of the degree of control and patterns of regulations within the project. Chiang (2009:81) regards subcontracting as a response to improbability that mainly arises from construction project complexity, given bounded rationality of the company. In construction projects, most of the work is subcontracted to specialist contractors. This is confirmed by Chiang (2003:82) who states that about 60% of all construction work is subcontracted to specialist contractors. Manu *et al.* (2013:1018) confirm that about 80% of construction work that is tendered by the main contractor is subcontracted to SME's. Furthermore, Manu *et al.* (2013:1018) note some of the factors influencing subcontracting the work to SME contractors:

- The ability to motivate labour flexibility;
- The ability to undertake construction project within stipulated time;
- The ability to reduce labour cost;
- The transfer of financial responsibility; and
- The avoidance of work compensation costs.

2.3.3 SMEs quality management practices

In any building project, the primary interest of the client lies in a high quality project (Xiao & Proverbs 2002:673). Dlungwana and Rwelamila (2015:411) define *quality management practices* as a management philosophy that evolved from the quality management movement during the late 1940's. According to Munting and Gruywagen (2008:445) SMEs mostly possess a basic Total Quality Management (TQM) core by virtue of their natural characteristics. Furthermore, to achieve TQM in construction without proper quality management during the designing stage will cause most challenges during project delivery and eventually result in construction project failure (Munting & Gruywagen, 2008:446). According to Arditi and Gunaydin (1997:237), during the design stage of a project there is a need for a balance regarding clients project objectives in terms of cost and time, and desired operation components in a project. A report compiled by CIDB (2011:8) identifies the following setbacks in terms of implementing quality management principles in the South African construction industry:

- *Design-related factors:* poor detailing of drawings and specification;
- *Procurement-related factors*: time budget, project periods, tenders awarded based solely on prices (such as lowest bidding); and
- *Construction-related factors*: unskilled labour, lack of training, lack of management commitment within the team and poor quality control measures.

TQM is one of the quality management approaches which improves production in construction projects. Fening, Pesakovic and Amaria (2008:696) point out that construction management has become a strategic tool in improving organisational performance during project delivery in both large enterprises and SMEs.

Barnes, Bessant, Dunne and Morris (2000:296) agree, arguing that TQM, teamwork and continuous improvement are some of the core production techniques designed to mitigate waste and increase knowledge within a business. However, there are various professional personnel involved in a construction project to ensure that the quality is met. CIDB, (2011:8) point out that the existing study on quality has been conducted among design team and general contractors, and thus there is a need to evaluate the quality measures employed by SMEs. Furthermore, Zou, Zhang and Wang (2007:603) outline project quality risks, which include inexperienced manpower, inadequate material, ignoring project specification and lack of work schedule. Further, ensuring the quality from the first step in a project is very important, and that does not only affect the operational cost, but also reduces the cost of maintenance when the project is delivered at the level of quality expected (Ayanibu 2010:10-11). An added benefit is a much higher chance of a long term relationship developing between SME and client. Effective implementation of TQM is a company asset, and also makes for a good organisational resource portfolio that increases the company's competitive capabilities, while also constituting a source of competitive advantage over the competitors (Singh, Garge & Deshmukh, 2008:530). Singh *et al.* (2008) further point out that quality culture is the key element within the organisation to enable the development of innovative management systems. It can be seen from the above discussions that there is a need for SMEs to develop quality management structures to achieve continuous quality improvement, which will allow SMEs to get references and long term relationship with clients.

2.3.3.1 Benchmarking for quality management practices

Benchmarking has been regarded as the SMEs management practices associated with quality management (Parast & Adams, 2012:449). Anand and Kodali (2008:258) define *benchmarking* as the SMEs search for best construction practices which lead to good construction performance through adoption of these construction project best practices.

Parast and Adams (2012:450) believe that the most important element in terms of the success or failure regarding quality management is the extent of the quality management planning. According to Anand and Kodali (2008:258) many SMEs need to strive to improve quality both faster and cheaper than their competitors, and therefore benchmarking needs to be recognised as the way to implement continuous improvement and innovation. Benchmarking is therefore ideal for SMEs desiring a clear project direction and improvement in the quality of ongoing projects. Luu, Kim and Huynh (2008:759) add that benchmarking could be used to improve and evaluate construction

quality management. However, Patel and Vyas (2011:2) believe that SMEs need to consider the benchmarking processes and techniques that could be developed to avoid waste and poor quality on construction projects.

2.3.3.2 SMEs construction project quality control

Dlungwana and Rwelamila (2014:411) note that appropriate assessment of a contractor's performance should be applied as a strategic implementation of any quality management system. Nonetheless, quality control does not only require the involvement of the contractor alone, but everyone in a team is required to have a common goal to achieve quality. Ardit and Gunaydin (1997:237) also stress the importance of common goals and point out that the ultimate goal of a team approach is getting everyone involved, which includes the contractor, the designers, the subcontractors, and the owner, in the process of achieving TQM. ISO 9000 is used as a quality measure within the industry and to maintain the high standard of quality management in order to achieve continuous improvement. ISO 9000 was established in 1987 as a quality standard by government, and in most areas ISO 9000 has become mandatory (McAdam & Canning, 2001:80). There are many political issues that revolve around ISO 9000. McAdam and Canning (2001:81) added that many organisations see the registration to ISO 9000 as company's commitment to quality. CIDB (2011:32) confirmed that the benefits of quality management plan and system as a result of ISO 9000 certification is often seen an only relevant to large construction companies. The author also states that this is confirmed by limited numbers of contractors accredited by ISO 9000 in both General Building (GB) and Civil Engineering (CE). However, there is still a dilemma concerning whether the development and certification of quality assurance systems in respect to ISO 9000's series of standards and guarantee continuous quality improvement in companies (Gotzamani & Tsiotras, 2001:1327).

2.3.3.3 SMEs construction project quality inspection

Quality inspection is significant in the construction industry with regard to achieving quality requirements and it should be integrated with daily works on site (Wang, 2008:467). Hence, knowing the requirements from project scope, it is important for SMEs to incorporate the planning for inspection and also understand the quality tolerance from the beginning (Boukamp & Akinci, 2007:90). Therefore, quality inspection could be regarded as the process of checking that what is produced is what is required by the client (Harris & McCaffer, 2013:9). In conclusion, SMEs need to continuously conduct inspections on construction sites to ensure that the required quality standards are being met, and retain a sustainable success rate of project delivery to the client.

Figure 2.5 below illustrates the typical process of SMEs quality management strategies and how quality should be managed in construction project delivery. Shobana and Ambika (2016:3527) outline factors affecting SME quality management as consisting of:

design code and standard, financial issues, customer satisfaction, planning and scheduling, resources, coordination, inspection, risk, method of execution and type of organisation.

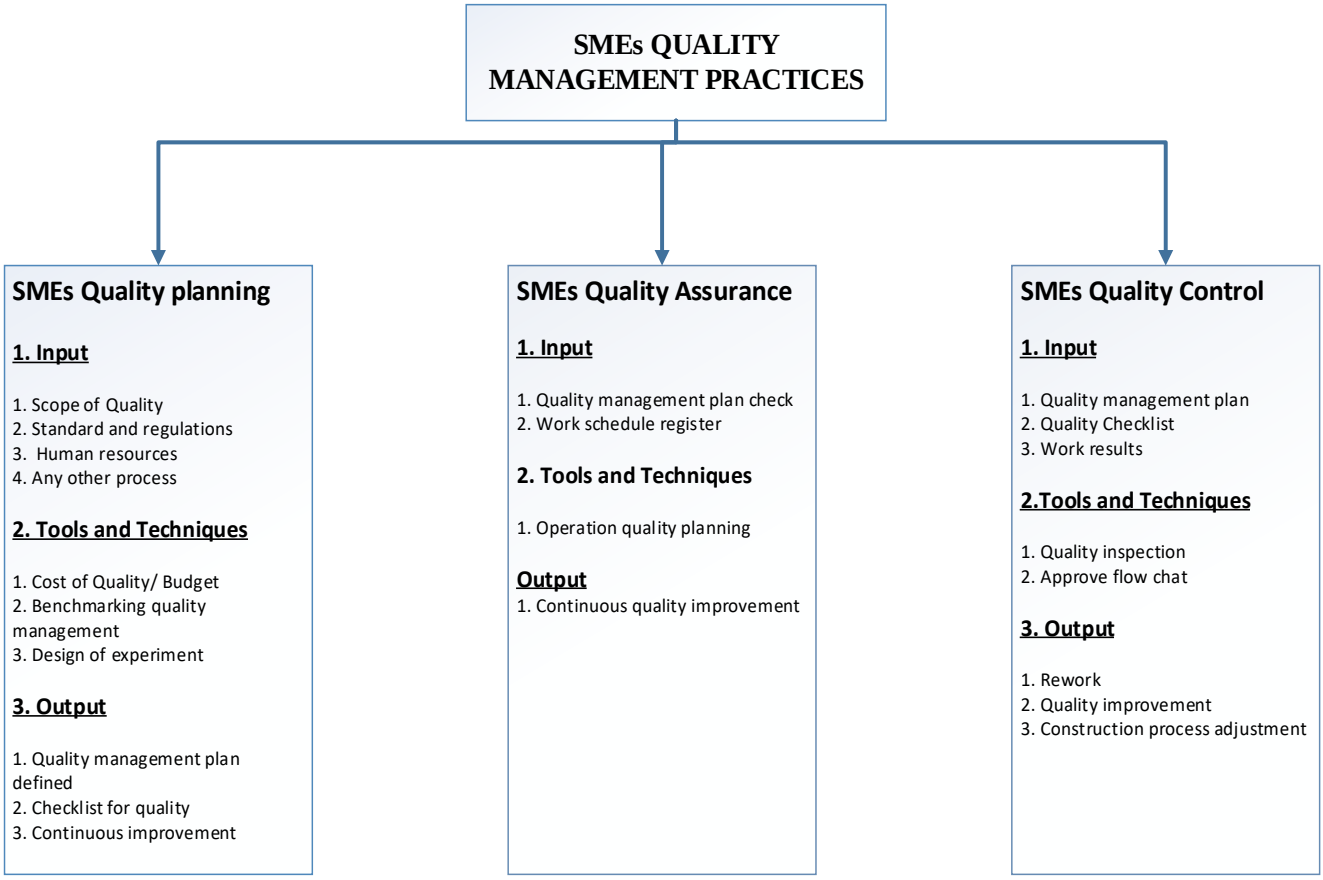

Figure 2.5 SMEs quality management modalities

(Adapted from PMBOK, 2000:96)

2.3.4 SMEs resource management practices

This section describes the management strategies that SMEs are lacking, which results in project failure and subsequently fails to sustain project delivery. SMEs often fail to implement strategic plans for resources and effectively manage available resources. There is a need for SMEs to adopt effective strategic management practices in order to remain sustainable in construction.

2.3.4.1 SMEs material management techniques

Management of material in construction is the main element, as it is the one applied in order to construct the structure of the building. When material is not effectively managed, it adds to the cost of the project on contractor's perspective (Gulghane & Khandve, 2015:60). Kasim, Anumba and Dainty (2005:794) point out that materials management is the process which includes planning and quantifying construction material, supplier evaluation and selection, effective purchasing of construction material, expenditure,

transporting material, material receiving, storing and material recording, and material distribution.

In addition, Kasim (2008:48) points out that when the material is not properly managed during a construction project, this will have a negative impact on the project performance. Furthermore, Kasim (2008:48) points out that materials make up the bulk of the costs on a construction project (30-80%). During construction project delivery, poor materials management leads to large unavoidable variation costs that the contractor has to take (Fapohunda, 2014:25). Thus, improper materials management will result in construction project failure. There is a need for emerging contractors to development effective material procurement system. The impacts of procurement include planning, ordering and scheduling (Gulghane & Khandve, 2015:60). Similarly, Donyavi and Flanagan (2009:13) emphasise that the following factors can cause failure of SME to deliver on a construction project:

- SME's failure to timeously order material, consequently cause project delay;
- Delivery hours to construction site being set in such a manner as to interrupt the work schedule;
- Management personnel over-ordering material;
- Noncompliant of substandard material requiring re-work;
- Site security inadequacies from delivery into production; and
- Inadequate material storage, resulting in double handling.
- Kasim (2011) identifies the following challenges:
- Inadequate site storage facilities;
- Inadequate site material handling on delivery;
- Poor movement of material on site;
- Poor site access when in confined space;
- Operation limitations due to security considerations;
- Poor acquisition of construction material; and
- Improper material deliveries to construction site.

Stoilkovska, Hanak and Pancovska (2015:723) reveal that the lack of materials management is the leading factor in increase in cost and time overruns. Donyiva and Flanagam (2009:12) argue that for a contractor to achieve cost reduction, special attention is required on management of materials, which include the following: effective procurement strategy, shop fabrication, effective material logistics, effective resource management, production on site, and effective field servicing, which promotes cost reduction.

To properly manage production times in construction projects, SME contractors have to ensure that there is a proper scheduling of material delivery (Fapohunda, 2014:25). The sustainable management of project material is the key factor with regard to achieving sustainable construction project delivery. Solanke and Fapohunda (2016:497) opine that sustainable materials management requires integrated approach with regard to reduction of material wastage during construction projects, and thus increases the company's profit and environmental protection. Hence, extra costs on construction sites are caused by delays which may be unavoidable where there is an inadequate material ordering system within the company. It is necessary for growth and sustainable use of available material, that project managers ensure a proper flow of material on a project.

2.3.4.1.1 SMEs material procurement

Kasim, Anumba and Dainty (2005:795) define *procurement* as the term that includes a wide range of activities such as procurement and management of materials, manpower and services required for construction project delivery. According to Patel and Vyas (2011), materials procurement is the primary objective of materials management in any project management system used in a construction project. Similarly, according to Kasim (2011:32), material procurement is the process of purchasing materials from external suppliers to support the operations of the project. In addition, Briscoe, Dainty and Millett (2001:245) conclude that the present interest of construction companies is mostly focused on the resource acquisition relationship, with respect to SME contractor sand material suppliers and construction subcontractors.

From the definitions and explanations above, materials procurement could be categorised as a management objective which involves the process of purchasing materials in correct quality, at the right time, in the right quantity, from the right sources (external or internal) and at an affordable price. Kong, Li and Love (2001:44) reveal that the main concerns of SME contractors in respect to materials procurement are the provision of material delivery at the right time, in the right place and within the project budget. Nonetheless, strategic procurement of material is regarded as the most significant time toward sustainable construction project in order to reduces numerous challenges encountered by SMEs. Hence, as a result of the rapid change encountered by construction SMEs in the industry with respect to the nature of construction project. Furthermore, Lindén and Josephson (2013) opined that due to uniqueness of construction projects, the procurement, delivery and handling of construction materials over the years has been a challenge for SMEs. Hence, the aim of this study is to identify the effect of material procurement adopted by SMEs with regard to achieving sustainable construction project delivery.

2.3.4.1.2 SMEs material Scheduling

SME construction management decisions are mainly based on programmes and schedules that are developed during the planning stage of a project, but there is still a

lack of material scheduling that needs to be done, among many scenarios that could be considered at project level (Asce *et al.,* 2009:1096). Although most SMEs uses CPM (Critical Path Method) to do scheduling of materials, this technique has been used since 1950's and benefited most SMEs in many areas of construction projects, such as the planning and controlling of materials, communicating plans, and training management (Asce *et al.* 2009:1096). Hence Risku and Karkkainen (2004:4) conclude that material can be managed effectively by focusing on two factors, namely; the planner needs to have access to effective comprehensive information regarding materials required on project and the material should be reliable, without excessive record build-up at project site. Consequently, SME material routing is still heavily dependent on the level of experience of the construction site manager. Hence there is a need for SMEs to develop sustainable material scheduling for construction projects. Cost, quality, time, client, supply chain and project size are drivers of strategic materials procurement selection, which is usually also influenced by the legislations of any country (developed or developing) (Baloi, 2002).

2.3.4.2 SME manpower (human resource or labour) management during construction project delivery

SMEs create job opportunities, as they primarily use human labour for construction. SMEs employ more people than the large contractors (Temtime & Pansiri, 2008:18). Lill (2008:866) points out that labour is affected by the working conditions and the control of the project in terms of management. For an SME to be successful in the industry, it should employ skilled, trained and experienced labour to lead the company to success. However, according to Olawale and Garwa (2010:732), these labourers can only be available when hired and the labour wage is within building regulations, which stipulate the minimum wage requirements which any company has to obey to. Nwachukwa and Emoh (2011:72), conclude that without sufficient manpower, a construction project cannot stand the test of time and must fail or suffer abandonment. According to Oluseyi and Fapohunda (2015:1117) during construction processes, the contractor has to plan and direct the available workforce and ensure the utilisation of available resources at all times.

The sustainability of a construction project relies on sustainable building technologies and construction materials, but more emphasis has to be placed on management of the labour (Lill, 2008:865). Poor quality project delivery is caused by a shortage of labour skills required to perform each construction activity in South Africa. According to Wndapo (2016:3) jobs in the construction industry are typically seen as being of low social standing, as the industry is notorious for severe physical demands and long working hours. The author further states that the industry does not attract the youth and certainly fails to replace any labour that has left the industry. However, Ghoddousi, Poorafshar, Chileshe and Hosseini (2015:813) note that SME workers lack motivation, and motivation

is one of the aspects regarded as a key element to increase productivity when managing people.

2.3.4.2.1 Motivation of SMEs employees

Motivation is defined as a characteristic of a particular person, a willingness to expend energy with regard to achieving a particular set of individual behaviour (Tabassi & Bakar, 2009:474). Thwala and Monese (2006: 141) define employee's *motivation* as the ability to lead workers with common understanding and maintaining a continuing, good relationship among all employees. Dwivedula and Bredillet (2009:159) argue that incentives are used to promote creativity, a practise which has been adopted by many organisations to motivate their employees. Kazaz *et al.* (2008:96) opine that monetary motivation or incentives have proven to have influence on the productivity of workers. Furthermore, the authors point out that the quality of human performance is significantly reliant on motivation, where an increase in motivation brings a corresponding increase in worker productivity. Tabassi and Bakar (2009:474) suggest that effective employee motivation requires a leader to identify employee needs and to develop strategies that will meet those needs. This study seeks to understand motivational influences employed by SMEs with regard to achieving continuous project productivity on available resources or workers.

2.3.4.2.2 Experience of SMEs regarding construction project delivery

Regarding SMEs experience, Turner, Ledwith and Kelly (2012) argue that SME contractors are less likely to employ an experienced management team, while large companies employ professional project managers who are have rich experience and use formal project management practices. There is a concern regarding shortage of skilled labour in the construction industry due to construction site conditions, and the fact that construction jobs typically have low social standing and are lacking in attractiveness as the result of their physical demands, long hours, remote work sites and nomadic lifestyle (Windapo, 2016:3). Furthermore, the author points out that the changes in technological advancements within the construction industry have led to numerous changes with regard to the demand for different skilled labour. However, Assaf and All-Hejji (2006) point out that construction SMEs fall behind schedule due to their inexperience in utilising the resources available to perform the project successfully within the stipulated time. Love and Edwards (2004) note that construction SMEs that suffer from a lack of project experience are always likely to experience a cost of rework. There is a need to develop effective project techniques in order to successfully complete construction projects in South Africa.

2.3.4.2.3 Education and training of SMEs relative to construction project delivery

According to Urban and Naidoo (2012:150), employee's skills development and experience regarding education general form part of human investment. Human

investment is the asset that can improve SMEs productivity significantly during the project delivery stage. Training and skills development is defined as a process of developing and improving work-related skills and knowledge with regard to the investment in employees for the benefits of the project and improvement of productivity (Tabassi & Bakar, 2009:473). Similarly, according to Tabassi, Ramli and Bakar (2012:215) training and development is defined as the strategy of ascertaining and assuring and helping to develop significant competent skills that enable employees to perform in current or future projects.

Furthermore, Rogerson (2008:62) stresses the national significance of skills development and training, which is further highlighted by Accelerated and Shared Growth Initiative for South Africa (ASGISA). However, Crawford (2005:9) states that labour competence can be inferred from different attributes, which includes knowledge, skills and experience, personality traits, attitude and the behaviour of employees. According to Briscoe, Dainty and Millett (2001:245), "Labour skills are often divided into two main categories: hard skills are mainly vocational in nature and are used primarily in manual work, whereas soft skills are generic and are applied most commonly in non-manual work". It has been identified that there is a shortage of skilled labourers in the construction industry. Windapo (2016:2) defines a skills shortage as an unavailability of qualified and suitable employees who are prepared to work under existing market conditions, particularly at prevailing wages. It has been proven that there is a connection between human resource development and business performance (Ormar, Arokiasamy & Ismail, 2009:98).

Danials (2007:2) argues that unavailability of labour can arise either due to an absolute scarcity of the required skills or a relative scarcity, where absolute scarcity refers to suitably skilled people that are not available, a lack of sufficient or insufficient numbers to satisfy replacement demand, and relative scarcity refers to a case where appropriately skilled workers exist, but do not meet the employment criteria of the contractor. Many studies have been carried out in education and training and mainly focused on entrepreneurial training and development. The objective of this study is to ascertain labour skills and levels of educational training found in SME contractors.

2.3.4.2.4 Communication strategy adopted by SMEs with regard to project delivery

Cheng, Li, Love and Irani, (2001:63) define *communication* as the transmission of resources from one individual to another by the use of sharing symbols and media. Nwachukwa and Emoh (2011:64), describe communication as the live wire for any project implementation success. Similarly, Hartmann (2006:163) outlines the communication mechanism and impact of information exchange between people based on an individual's beliefs. Furthermore, Hartmann (2006:163) also states that in SME construction projects, the behaviour and managerial actions of employees need to focus on nurturing

communication that promotes reliable understanding of what is required and that minimises uncertainties within the company.

According to Egbu, Ellis and Gorse (2004) communication in the SME sector is very challenging, as there are different teams from different backgrounds which need to be brought together to achieve common goals.

Project management requires collaboration and coordination between all stakeholders; effective communication systems between all members within the project are crucial in ensuring the success of SME project delivery (Yang, Ahuja & Shankar, 2007:2344). Garbharran, Govender and Msani (2012:94) noted that a detailed communication plan is necessary for the effective distribution of information in a construction project delivery.

Ahuja, Yang and Shankar (2009:415) identify that, at all levels of SME construction projects; information should be gathered, stored and communicated by all project members, and the construction management team should follow an agreed-upon method of communication to disseminate such information. SME contractors generally lag behind larger businesses in adoption of Information Communication Technology (ICT), which, if used correctly, naturally enhances the communication processes. In any construction project the project goal and vision must be shared, so that in the event that construction managers note interest from relevant clients, the manager must ensure that the stakeholders buy into the project (Garbharran *et al.,* 2012:94). Fotwe and McCaffer (2000:114) add that project managers mostly require skills of writing, oral and listening in order to perform effective communication.

For any contractor in the industry, effective communication is essential, which is why strategic ICT adoption is required at the industry level as a tool to manage the project, as well as organisational strategies to align with the current construction industry graduate (Ahuja, Yang & Schankar, 2010:160).

2.3.4.3 SMEs approach to machinery (plant and equipment management practices)

Many studies have been carried out regarding plant and equipment management in the construction industry. Aadal, Fard, Rad, Sabet and Morshedi (2014:2372) report that there are different problems with regard to the management of plant and equipment which have negative effects on working activity and the quality of the work done. Aadal *et al.* (2014) emphasise that it is important to identify the plant and equipment management in order to optimise the work activities effectively. Likewise, Nwachukwa and Emoh (2011:72), state that machineries and equipment which are required in a construction project depend on the suitable types and the method adopted by the project management team which ensure safekeeping of construction equipment and plant.

The management of the plant and equipment is the purview of the management team, because the management team is the entity making decisions with regard to the project's success. Randunupura and Hadiwattege (2013:334) argue that the management team needs to make decision on methods of operations in the working environment. There are two ways of plant and equipment acquisition: hiring or owning (Randunupura & Hadiwattege, 2013:335). Many emerging contractors prefer to hire the plant and equipment based on the number of available projects. Thus there is a need for modalities to ensure the effectiveness of plant and equipment management. Chinchore and Khare (2014:29) recommend that SMEs adopt planning of construction project and undertake the appointment of equipment managers in order to minimise the cost of a project.

2.3.5 SMEs approaches to strategic management practices or management techniques

Buys and Van Rooyen (2014:5) define *strategic management practices* as a strategy of coordinating groups of decisions and commitments made by stakeholders in an organisation, where SMEs can exploit their key competencies to gain a competitive advantage over the market. Also, Bakar, Said, Razak and Yusof, (2008:1278) note that SMEs, without the effective implementation of strategy, are unable to gain the benefits of performing an organisation analysis, establishing organisational direction, and formulating organisational strategies.

2.3.5.1. Knowledge adopted by SMEs in the construction industry

The SMEs knowledge management is the most important survival weapon of SMEs in the construction industry (Aspinwall, 2004:47). Knowledge management (KM) is described as the strategic asset that gives the company a sustainable competitive advantage (Aspinwall, 2004). Wiig (1997:8) identifies the objective of knowledge management as the company acting as wisely as possible to ensure continuous success of the business. Furthermore, KM relies on the SME's sharing of knowledge, trust, employee's attitudes and degree of employees' acceptance (Mohamed 2008:64). The SME's KM is based on the SMEs organisational culture to stimulate the employees in changes of internal structure of a company recognised as the success factor of a company (Mohamed 2008:64). This is supported by Olawale and Garwe (2010:733) who note that the competence of available management is essential to the existence and growth of newly-established SME's in the construction industry. Brink, Cant and Ligthelm (2002:3) point out that lack development, and the inability to control or transform the business, weaken the growth of the company and eventually lead to business failure. Thus, the time taken by the management to respond to challenges and market circumstances will pay dividends for the business in the long run (Brink, Cant & Ligthelm, 2002:2).

Wiig (1997: 9) argues that SME companies with effective knowledge management are able to realise a large number of tangible and intangible benefits. Pare, Sicotte, Jaan and Girouard (2008:254) note the significance of SME executive involvement in projects is critical for all improvements, as well as maintaining high project visibility throughout and across the entire execution stage of construction project. For a construction company to be competitive in the market, it is becoming a norm for construction companies, especially SMEs, to provide an accurate and cost-effective tender to the client (Wong, Thomas & Chan, 2009:260). Knowledge management comes from an individual who is making decisions within the company, and thus their capacity determines the success of the company. According to Bowen, Akintoye, Pearl and Edwards (2007:632) decision-making is the core component of most businesses, especially SME's. The management team needs to have an ability to correctly distribute and utilise available resources. Ramukumba (2014:24) identifies the lack of ability of the manager to successfully allocate scarce resources effectively as a major barrier to success. Lee, Egbu, Boyd, Xiao and Chinyo (2005) point out that SMEs have the following advantages in the industry:

- Effective sharing of knowledge with speedy decision-making, less formal strategies and the ability to improve networking informally;
- Informal network improves employee commitment and their receptiveness to knowledge management regimes; and
- They are also able to react faster to changing market requirements and obtain the requisite knowledge to satisfy market needs.

Construction companies require staff with the correct mind-set. The company can be staffed with knowledgeable and skilled people, but if their mind-set is not correct, it will result in project failure (Gurteen, 199:6). Furthermore, the willingness of the staff to deliver the construction project is very key in the industry. When the staff is not forthcoming and is reluctant to provide all required information within the project, the project is likely to fail (Jang & Lee, 1998:70). Hence this study will develop and propose a knowledge management system to improve SME sustainable success rate.

2.3.5.2 SMEs approaches to integrated management during project delivery

The status of construction project delivery on construction sites changes continuously as the project progresses, requiring a project management team to correlate as the project progresses (Akinci *et al.,* 2006:124). Some researchers have focused on the reconciliation between the initial scope of work and the actual scope of work, as many changes are likely to happened during the construction stage of construction project, which requires interfacing between the SME and the design team (Motawa *et al.,* 2007:369)

2.3.5.3 Project scope management adopted by SMEs during project delivery

In the construction industry, projects are often implemented by means of a strategic plan with the aim of realising organisational goals. Construction projects are planned to have a definite start and definite end date (PMBOK, 2000:4). SME scope management is associated with strategic planning that is specific in such a way that it is exactly clear what it is that the business is required to achieve in order to achieve the project objectives (Adendorff, Appels & Botha, 2011:45). It is therefore necessary to examine project scope management during construction project delivery through scope planning, scope definition and scope control.

2.3.5.4 Project management practices adopted by SMEs during project delivery

Since SMEs contribute to the national economy at large, it is important for SMEs to employ sound management practices at project level in order to achieve sustainable success rates. Smit and Watkins (2012:6325) reveal that the upgrade on South African rules with regard to SMEs in the construction industry improved economic growth by increasing competitiveness in the sector and increasing employment opportunities and redistribution of income in South Africa. Provision of support by top management to lower levels of management is necessary for growth of the company and fostering innovation within the company, which can only be achieved through commitment by the top management team (Yan & Makinde, 2011:2221). According to Gale and Brown (2003:415) SME project management competencies are defined as the capability to manage project professionals, which includes applying the best project practices regarding the design and application of effective project management methods. There is a need for sound project management processes in order for a project to run smoothly with no miscommunication within the team. According to Briscoe, Dainty and Millet (2001:245), communication can be very complex, especially in large projects, where communication has to progress through a number of levels. It is thus important that management skills be implemented during project delivery. This has been outlined by Lambert, Cooper and Pagh 91998:7) in a study entitled “Supply Chain Management”, which emphasises the importance of linkage between the company and the suppliers. However, Briscoe *et al.* (2001:254) argue that these management practices can be achieved only when company executives have high level management qualifications, hence it is unlikely that experienced management will be able to attain the formal leadership skills required in a project.

Furthermore, Project Management Body of Knowledge (PMBOK) (2008:38) lists eleven knowledge areas of a project, associated with project management practises as follows:

- *SME project scope management:* Includes the processes required to ensure that the project includes all work required, and only the work required, for SMEs to

successfully complete the project. There is thus a need for SMEs to do project scope planning;

- *Project time management:* Includes the processes required for SMEs to timeously and successfully complete the project and meet all project stakeholders' requirements;
- *Project cost management:* Includes the processes which the SME requires in order to complete the project within the budget;
- *Project quality management:* Includes the processes required for SMEs to ensure that the project will satisfy its intended aims;
- *Project human resource management:* Include the processes which the SMEs require to make the most effective use of the manpower involved on the project;
- *Project communication management:* Includes the processes required by SMEs to ensure timely and appropriate generation, collection, dissemination, storage and ultimately disposition of project information among the project team;
- *Project risk management:* The systematic process of identifying, analysing and responding to SME project risks at project stage; and
- *Project procurement management:* Includes the processes required by SMEs in order to acquire goods and services for SMEs to attain project scope from the outside performing organisations or companies.

PMBOK (2008:38) refers to the above knowledge areas as good construction project practices; meaning there is an element of agreement on these practises that, when applied to the project management process, brings positive results and outcomes on project success. Hence the implementation of knowledge areas in SME project delivery would bring successful and sustainable construction project delivery.

2.3.5.5 Impact of stakeholders on SME approaches to construction project delivery

A construction project is made up of individuals or groups of people who have the singular power/resources, with common goals at their disposal to either facilitate the furtherance of a construction project or to frustrate the success of the project. Takim (2009:168), Wyatt (2001) and Yang (2008) describe *SME construction stakeholders* as a group of individuals that has the power to effect the decision with respect to production process and direct the project in such a way to align with the desired final results.

The variance in the definitions of the construction stakeholder by several researchers, led to the conclusion that proper management of the needs and expectations of SME construction stakeholders with regard to satisfaction is a major factor to be considered for project success. However, Takim (2009) and Azny (2012) state that lapses in the SME's management of stakeholder requirements may result in dissatisfaction, and subsequently, project failure. Hence, it is essential to ascertain the role of the SME's

construction stakeholder in achieving sustainability during construction, as well as the management principles of the SME's project stakeholders and their associated stakes.

2.3.5.6 Relationship between the banks/insurance companies and SMEs with regard to sustainable construction projects

According to Smitt and Watkins (2012:6326), South African banks do not consider SMEs as a good financing prospect. Pretorius and Shaw (2004) admitted that due to high levels of risk in respect to SME finance, as well as low return, banks are unable to grant finance to SMEs. Thus, St-Pierre and Bahri (2006) argue that lack of financial support from external stakeholders hinders the success and sustainability of construction SMEs.

Fatoki and Asah (2011:172) and Berger and Udell (2002) suggest that the geographic proximity between the financial institutions and SME contractors affects the relationship between the SME and financial institution. Further, Fatoki and Asah (2011) reveal that SME contractors that are geographically close to the financial institution are able to check their credit through the use of soft qualitative information. Geographical location could be the critical factor for potential clients or suppliers of the SME contractor. Hence, construction SMEs need to perform environmental scanning that enables them to more easily identify and exploit growth opportunities in the market.

2.3.5.7 Health and Safety adopted by SMEs during construction project delivery

In South Africa, the Occupational Health and Safety Act of 1993, with construction regulations set out in 2003 in accordance with the legal framework for workplaces related to SMEs duties to provide safe working environment. Furthermore, organisational culture which the SME contractor create to ensure the commitment and behaviour of each individual or group value towards the enhancement of safe working environment (Agumba & Haupt, 2009:463). However, the extent to which management involves itself in construction health and safety work practices, as well as the decisions they make regarding health and safety, determines the success of health and safety implementation (Agumba & Haupt, 2009:189). Smallwood and Venter (2015:58) argue that the impact of designing team during the inception stage of a project which starts with the interaction between the client and designing team, which is the most crucial stage in the implementation of construction health and safety. Some researchers are concerned about the impact of Occupational Health and Safety regulations on SME growth. According to Mustapha, Aigbavboa and Thwala, (2016:219) SMEs are mostly run by a single owner and have very limited time to deal with all H&S regulatory requirements. However, Tool and Gambatese (2008:226), argue that every professional working in a construction project should prioritize minimising injuries on each aspect of the construction project. Abudayyeh, Fedricks, Butt and Shaar (2006:168) note that the success of any project relies on the involvement of construction health and safety officers, construction managers and labourers working in concert to improve safety.

2.3.5.8 SMEs business environment adoption

This study focuses on internal and external business environments, which determine the success or failure of SMEs. The external business environment focuses on government intervention in creating the environment that leads to business success or failure (Ahmad *et al.,* 2010:183. The internal environment focuses on managerial behaviour of the company in terms of business understanding in order to achieve company goal (Ahmad *et al.,* 2010:184). In addition, Kunene (2008:32) points out that most business entrepreneurs in South Africa view the construction business environment as unsuitable.

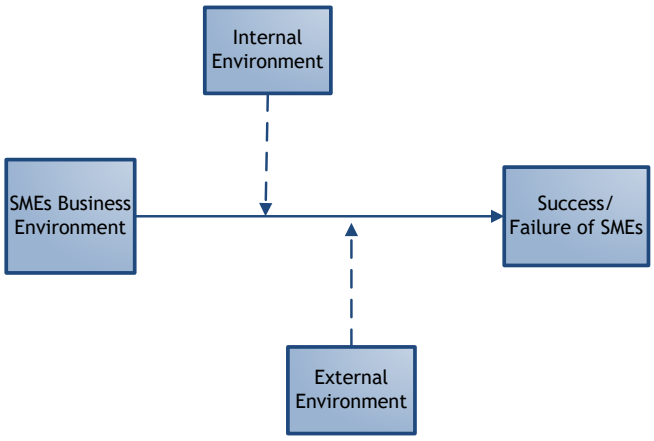

Figure 2.6: SMEs business environment

2.3.5.8.1 Strategies adopted by SMEs with regard to environmental sustainability

Increasing costs in the construction industry help in reducing and minimising waste in construction (Pit *et al.* 2005:203). SMEs have different ideas and requirements when looking at environmental sustainability. Williams and Schaefer (2013:174) note that SMEs' business rendezvous with environmental issues differs from company to company, with some differing by firm, size and competitive values. Although SME environmental sustainability can be overlooked, it affects the quality of the project. However, Howard and Lubbe (2012:307) argue that the environmental impact can negatively affect the capacity of available resources and also can affect the capacity of earth, which has obvious impacts on project quality. Hutchins and Sutherland (2008:1689) maintain that sustainability requires an effort across the lifecycle of material and the impact of that material on the environment, which requires SMEs to do environmental assessment prior to purchasing of material.

ISO 14000 was formed to assist in standardising methods and considering the environmental impact of a product's lifecycle (Hutchins & Sutherland, 2008:1689). These systems are there to assist SMEs in improving sustainability. However, Hillary (2004:562) argues that although this system is an improvement from an environmental standpoint, cost and resources used can be increased, and it is costly in time and expertise to implement the various methods (Hillary, 2004:562). Hence, this research will explore

environmental factors affecting sustainable construction and develop modalities to be employed during the construction stage of a project.

2.3.5.8.2 Internal environment strategy adopted by SMEs with regard to achieving sustainable project delivery

SMEs mostly have a small number of employees that have common values and beliefs that correlate with their behaviour and actions (Aspinwall 2004: 51). SMEs are associated with a lack of track record, which affects the business success (Olawale & Smith, 2010:1780). This affects the business success, because the banks and other institutions look at the information provided by the company (SME) in order to grant financial support to the company (Olawale & Smith, 2010:1780). Moreover, the location and networking of the business could determine the success of SMEs. Olawale and Garwe (2010:731) state that SMEs need to do environmental scanning in the market in order to put the business where potential buyers and suppliers that will give the company competitive advantage exist, and explore growth opportunities in the market. Networking is the key element, as it spreads awareness of the company in the market (Olawale & Garwe, 2010:731), which is used to advertise the product and build relationships within the construction market. According to Tang and Palaneeswaran, (2008:737) the internal business environment that affect SMEs is as follows: subcontractor performance, competence of the team, turnover rate, top management support, track record, and level of services.

2.3.5.9 Strategies adopted by SMEs with regard to economic sustainability aimed at achieving sustainable project delivery

The development of sustainable construction development is a key in the success of SMEs in the construction industry. Moore and Monring, (2009:278) reveal that as the SME's business grows, the processes of the organisation become well defined, and thus the organisational values are better articulated. The increasing competition or potential competition generated by low entry barriers to the market impact the potential and limit opportunities of newly formed SMEs (Olawale & Garwe, 2010:732). According to Olawale and Garwe (2010:732) in a competitive market, it is important for SMEs to do analysis of potential competition to avoid breakdowns in the construction business.

Although the South African economy is a leading African economy, there is still a need to develop techniques to be applied to ensure sustainability. The South African economy has been outpaced by population growth, which causes financial stress on the general populace. In addition, it is not only in South Africa that SMEs are important pillars of the economy, but worldwide. For example, Aigbavboa and Thwala (2014:771) argue that SME's introduce innovative products and services, increase job opportunities to the people and improve national economies. Research conducted on SMEs by Ramukumba (2014:24) confirms that activities of SMEs, not only in South Africa but Africa as a whole, are vital for the promotion of economic growth and mitigation of poverty. Furthermore, this

limits profitability of the stakeholders and investors and results in a drop in private investments (Forum, 2010:2). Sustainable economic growth is achieved through relationships between the company, stakeholders and suppliers, including households. Adeniran and Johnston (2012:4091) argue SMEs need to achieve sustainable competitive advantage by, among others strategies, networking with suppliers to build a solid relationship, which will lead to getting credits and buying material at a discount from suppliers. In addition, Fatoki (2011:197) points out that there are very few SME's in South Africa which are putting sufficient time and energy into strategic networking with other contractors and potential clients.

SMEs need to keep their customers and reassure them by producing quality products and services. By doing so, SME contractors will secure sustainable customers and avoid any potential risks and losses of business (Morris & Dunne, 2004:252). However, SMEs promote, and lead the economic growth and development in South Africa (Chimucheka, 2013:785). A study by Rogerson (2008:66) points out that there has been a reluctance by private banks to extend credit or financing to SMEs, and this negatively impacts the economy the country. This creates a negative impact not only in the SME's supply chain, but on all the parties involved in the development of the country. Sustainable supply chain management is defined as the management of material and information, and requires good networking among companies involved in a supply chain and companies with common goals in all aspects of sustainable development (Editorial, 2008:1545).

2.3.5.9.1 Responsive strategy to social sustainability for the SME

Social sustainability is referred as one of the leading element with regard to the success of SMEs in the construction industry. Labuschagne and Brent (2005:160) define social sustainability as adopting business strategies and activities that meet all the needs of the company and its stakeholders on the project, while protecting, sustaining and enhancing all available resources that will be needed in the future. SMEs often lack with adequate knowledge in the industry which they working in and this can lead to a failure of the company. Thus the knowledge of SMEs is often seen in terms of psychological characteristics of the owner (Jenkins, 2006:242). Fatoki, (2011:195) argues that firms are linked to the environments by one or more of the following: federations, associations, suppliers or customers, competition and social-legal relationships. These control the nature and sustainability of the business.

Furthermore (Jenkins, 2006:243; Lepoutre & Heene, 2006:259) argue that SMEs believe that it is more important for them to pay attention to social responsibilities in order to sustain the business. The community culture has a strong influence in small businesses, as the reaction of the owner or managers of the company is mostly displayed by community values (Lepoutre & Heene, 2006:260). Community or social demands are

regarded as the way in which the community interacts with the business and these demands shall be considered by management in order to achieve social values (Baldo, 2010:4). However social values alone do not make a business sustainable, but it must be correlated with the owner's values in order to ensure a sustainable success (Baldo, 2010:10). Also, SMEs have largely been inactive when it comes to social responsibilities, as SMEs tend to believe that business social responsibility is only to be practiced by large enterprises (Ladzani & Seeletse, 2012:87).

Once the company adopts values of social sustainability, the company will build a relationship with potential clients and subsequently be the first preference in projects around the community; hence social responsibilities should be taken into account in management decision-making (Ciliberti, Pontrandolfo & Scozzi, 2008:1580), which, according to Ciliberti *et al.* (2008:1580) SMEs unlike large companies who are well equipped to stimulate social responsible knowledge within the community. Social sustainability on the part of SMEs is not only a South African problem, but a problem in Africa generally. There is multiple interest and engagement with social entrepreneurship in South Africa to try and address sustainable development problems faced by the country (Littlewood & Holt, 2015:2).

Figure 2.7 illustrate conceptual framework of this research. The conceptual framework indicates modalities that could lead to the achievement of a sustainable success rate. It is believed that the success rate of SME contractors is affected by SME time management practices, SME cost management practices, SME quality management practices, SMEs resource management practices and SME management practices.

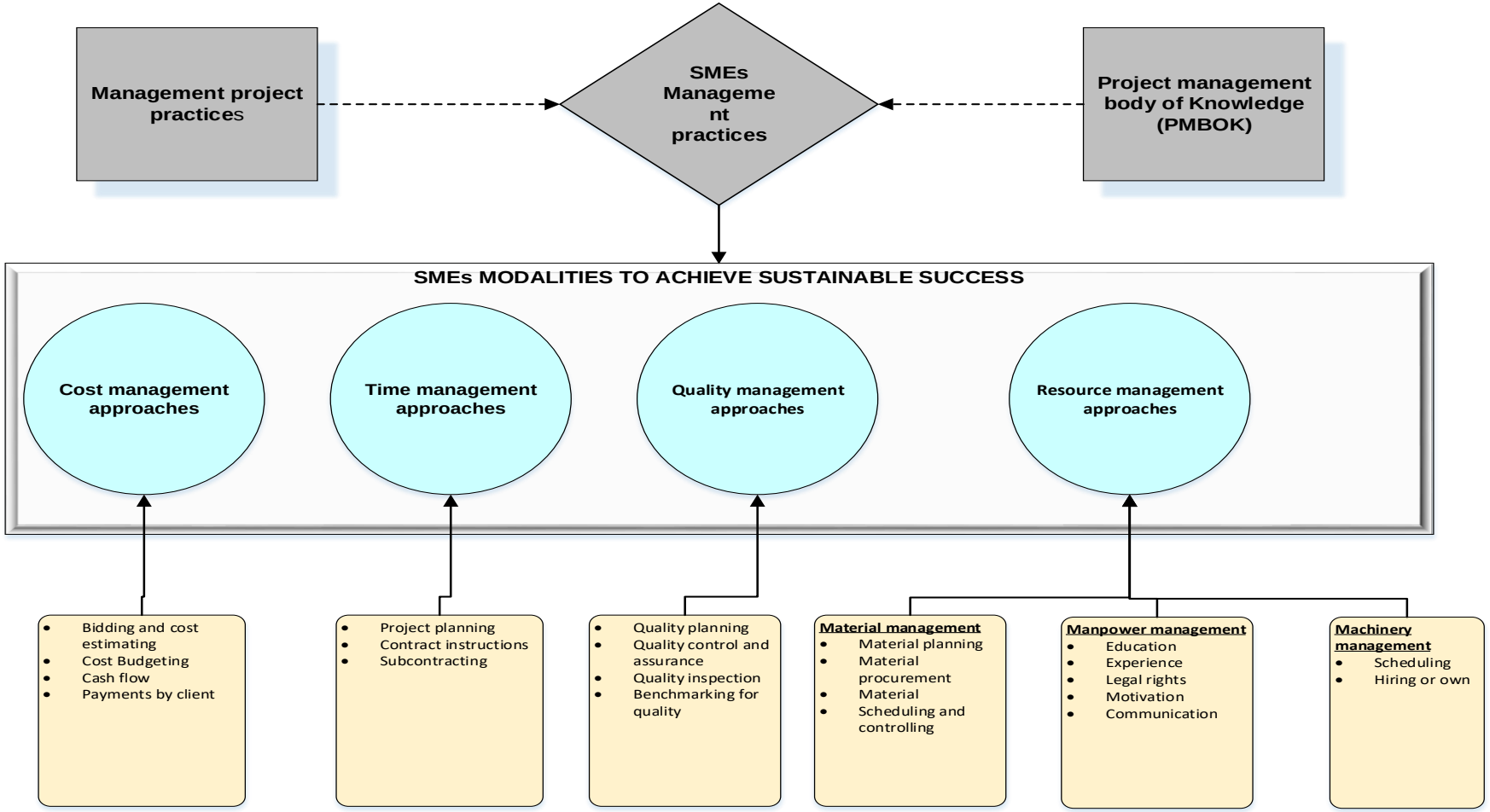

Figure 2.7 Conceptual framework

Figure 2.8 below illustrates the relationship between project management practices, PMBOK and business knowledge of SMEs. The area marked as “7” in the diagram shows SME sustainable construction project success that can be achieved when a combination of the three factors has been successful implemented within the organisation. These are the best construction project management strategies which are adopted by construction SMEs. Hence, the combination of the three project management practices will result in sustainable success rate of SMEs at project level.

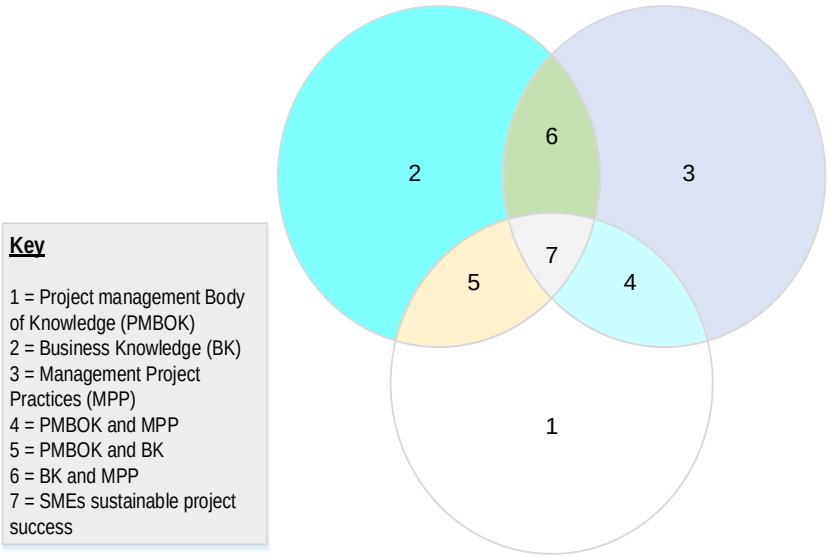

Figure 2.8: Theoretical framework

(Adapted from PMBOK, 2000)

2.4 Chapter summary

This chapter reviewed the literature on various topics related to SME modalities to achieve sustainable success rate in construction project delivery. This research study extracted the cost management practices employed by SMEs during construction project delivery, including the challenges faced by SMEs on cost management. This was covered through: cost escalation, cost budgeting and all SME cost-related challenges. SMEs manage cost through cost budgeting, which is reviewed at the beginning of the project. The literature reveals time management issues faced by SMEs, such as subcontracting project work, monitoring project progress and leadership on construction projects. However, SMEs adopt project bonuses to fast-track the project and ensure that it is completed within stipulated time. Nevertheless, quality-management-related issues were revealed, such as benchmarking for quality and quality inspection. The literature presents various quality measures adopted by SME contractors, such as quality planning to achieve project success. This research also presented an overview of resource management issues encountered by SMEs through the review on material management practices, and

manpower management practices. Further, this study reveals SMEs strategic management practices adopted by construction SMEs. In addition, the external and internal factors associated with best practices for SMEs sustainability were reviewed.

CHAPTER THREE

METHODOLOGY AND DESIGN

3.1. Introduction

The literature review (Chapter Two) describes the existing state of knowledge with regard to factors influencing construction SME success rates. For the researcher to establish modalities to achieve sustainable success rates, both qualitative and quantitative methods were adopted with a targeted group of SME contractors and suppliers. The purpose of this research is to address the research questions and these research questions can only be addressed using a relevant research method.

This chapter begins with an overview of different types of research methodologies available, followed by the specific research design adopted in this research. However, before adopting a research design, the study problem, questions and objectives will be considered to ultimately select an appropriate methodology for the research. Therefore, the research method encompasses the design, sampling techniques, data collection strategy, process of analysis, rationale for the selection of these, and, importantly, the test of validity and reliability of the research tool.

3.2 Research methodologies

Research methodology is a holistic process of gathering, analysing and understanding data with the objective of obtaining results which develop the knowledge obtained by the research (Leedy & Ormrod, 2010). Fapohunda (2014) describes research methodology as the strategy of examining advantages and disadvantages of different research methods available, in order to discover the most suitable method for the research. Furthermore, Leedy and Ormrod (2010) expand on this by suggesting that the most significant functions of research methodology include, but are not limited to:

- Setting data acquisition standards; and
- Collecting the data and providing interpretations.

Research is rotational of the research that involves several research cautious and logical process to achieve detailed solutions to the research questions. Biggam (2011) notes the importance of linkages among research methods, methods of obtaining data and strategies adopted to analyse available data, and notes that the fundamental awareness required by a researcher in order to achieve research objectives are as follows:

- Identify the data to be collected;
- Understanding the importance of the collected data;
- Determining the population’s geographical location for data collection;

- Setting timeframes for data collection; and
- Determining the method of data collection.

3.2.1 Quantitative Research approach

Quantitative research approach is characterised by collecting numerical data adopting deductive reasoning in order to link theory and research (Zou *et al.,* 2014:317). According to Rubin and Babbie (2005:552), a quantitative research methodology is known as the method by which the researcher(s) adapt data into numerical form. Similarly, Creswell (2009) suggests that this research method is the approach adopted by researchers to test objective theories by checking the correlation between the variables. Furthermore, Thomas (2003:2) points out that quantitative research methods presents\ an opportunity to the researcher to obtain generalisable and predictable research results from large populations. Maree and Pieterson (2007) and Flick (2011) argue that this research method is characterised by the following three elements: objectivity; mathematical results; and generalisability of these results.

Hence, the quantitative research method is a goal-oriented procedure of research, which suggest inter-subjective realities as quality assurance tools (Kromre, 2006). In addition, Creswell and Clark (2007) opine that in most cases, the collection of quantitative data adopts closed-ended questionnaires or checklists. However, different methods have been noted for conducting quantitative research, and these methods include: theoretical studies, descriptive research, developmental studies and correlational studies (Leedy & Ormrod, 2005). This project adopts a quantitative research approach to collect data through survey questionnaires, and to ascertain respondents' perceptions regarding effective modalities adopted by construction SMEs.

3.2.2 Qualitative research approach

This research methodology adopts non-quantitative research observations, which are mostly made in the field and analysed in non-statistical ways (Samkange, 2012:608). O'Leary (2010) divulged that the qualitative research approach involves collecting detailed descriptive data concerning a particular research aim, with the intention of advancing the existing knowledge. Samkange (2012:609) points out that there are other factors that differentiate qualitative methodology from other research methodologies, and these include its settings, sampling (which is non-random and theoretical), and also the researcher(s) constituting the initial research instrument for collecting data.

Silverman (1993, cited in Olsen, 2004:7) states that the importance of qualitative research is to recognise the inherently subjective nature of social relationships. The qualitative research method is the most significant research method that shows the correlation between a range of research models (Nieuwenhuis, 2007). Moreover, these research

methods include epistemology, ontology, nomothetic, positivism, and ethnography (Nieuwenhuis, 2007:76). To validate the results from quantitative research data qualitative method was adopted. The qualitative approach adopted in this research examines the perception of respondents regarding modalities adopted by construction SMEs to achieve a sustainable success rate.

3.2.3 Mixed research method

Collins, Onwuegbuzie and Sutton (2006:69) defined the *mixed research method* as a class of study where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches or concepts, or any set of related studies. Redmond, Walker and Wang (2008:279) applied qualitative methodology to provide explanation and quantitative methodology to collect categorical data from small business owners.

The mixed method is a transformation of quantitative and qualitative research method into one research form (Creswell & Clark, 2007:388). Mixed method is also known as triangulation method, because multiple research approaches are explored for data collection. According to Sandelowski (2000:247), combined methods could be used to expand the scope of the research and capture method-linked dimensions of a targeted phenomenon. Sale, Lohfeld and Brazil (2002:44), state that mixed method research is being widely adopted by researchers.

In addition, Zou, Sunindijo and Dainty (2014:317) argue that a mixed method enhances the validity and reliability of the study outcome. Mengshoel (2012:373) argues that triangulation of research design, where qualitative and quantitative research approaches are applied simultaneously, either throughout or at certain levels of the research process, assists in terms of study outcomes improvement. Furthermore, using a mixed method may bring a contraction in data analysis, where the interview can extract different views from those obtained by research questionnaires. Ncwadi and Dangalazana (2005:363) used mixed methods in order to provide information in their research. Multiple research methods will be adopted in this study in order to reduce findings and reduce any possibilities of personal bias by not depending on one research approach (Mambula, 2002:58).

Mengshoel (2012:375) suggests that both qualitative and quantitative approaches should be viewed as complementary rather than competitive. Notably, Sales, Lohfeld and Brazil (2002:49), argue that qualitative and quantitative paradigms do not study the same phenomena; hence the combination of the two methods for cross-examination or triangulation purposes is not a viable option in a research project. According to Creswell and Clark (2007:9) the qualities of mixed methods are as follows:

- Mixed methods approach provide results to questions related qualitative and quantitative approach;
- Provide the researcher with wide and detailed views in the research;
- Motivate researcher to adopt different paradigms related to qualitative and quantitative methods;
- Two methods can be adopted to achieve different purposes in the study.

  In addition, Creswell and Garrent (2008:325) point out the following issues related to the use of mixed methods:
- Unusual mixture of data such as discourse analysis with structural equation modelling, the strategies that could be adopted in selecting qualitative follow-up participants from qualitative data, strategies to avoid contradictions when researchers adopt both methods (quantitative and qualitative);
- Implementing a mixed method, which includes how significant decisions are negotiated and the development of the research team; and
- The tension to co-exist between philosophical and methodological context.

3.2.4 Research philosophies

Bandaranay, (2012) define *research philosophy* as a term used to describe the evolution and nature of specific knowledge. The philosophical stance of a piece of research guides and justifies the researchers' decisions, philosophical or theoretical (Greene, 2006). According to Biggam (2011:136), the pillars of the philosophical stance of research include:

- Positivism; and
- Interpretivism.

3.2.5 Positivism

Positivism describes the nature of a research project with regard to quantitative research (Biggam 2011). This research is characterised by the ability of the researcher to test hypotheses derived from existing theories (Flowers, 2009). In addition, Lawrence (2000) defines positivism as a research method is grounded in scientific, experimental or knowledge testing, without the influence of personnel involvement. However, Biggam (2009) highlights that positivist research in sociology and history is influenced by personal participation and observation, based on the goal of obtaining quantifiable data for research. Therefore, this concept involves the use of quantitative methods – questionnaires, experiments and interviews - and statistical analysis dependent on respondents and experience. Thus, the participation of respondents is inevitable (Kumar, 2011; Eriksson & Kovalainen, 2008).

3.2.6 Interpretivism

Eriksson and Kovalainen (2008) reveal that the Interpretivist paradigm of research is described as a logical position that is aimed to focus on the content of theory through adoption of the principles of the sciences. Furthermore, Eriksson and Kovalainen (2008) opined that the philosophical background of interpretivist research is based on hermeneutics and phenomenology to give research meaning. In addition, the primary focus of the researcher is to understand, interpret and give meaning to social realities from their perspective (Flowers, 2009). Hence, the interpretivist philosophy of research is based on four assumptions, summarised by Burr (2003) as:

- It presents a critical stance and scrutiny on hidden, undiscovered knowledge;
- The knowledge derived is sustained by adopting qualitative methods and social relations with participants to achieve the objectives of the study;
- Subjective knowledge and social processes and actions are relative; and
- The languages used for data interpretation are derived from social interaction with the participants in a particular place and time.

3.2.7 Types of research design

Regarding the deductive and inductive research approach, adopting mixed method with both the qualitative and quantitative to analyses modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa. The inductive/deductive strategy are based on combining the observatory justification of the research. It includes the practices of testing hypotheses to form a fundamental ground for effective, enhanced knowledge (Walliman, 2012). Furthermore, this derived knowledge, after being tested, can yield either positive (accepted) or negative (rejected) results, but this is a judgement based on the aims of the research. The mixed approach is adopted to retrieve valid responses from opposite school of thoughts (Walliman, 2005). Thus, the mixed approach adopts the principles of both quantitative and qualitative methodology for research.

Both structured and closed-ended questionnaires were employed. In addition, structured interviews provide an opportunity for the researcher to observe and verify the procedures in place. Scheers (2011:5050) uses qualitative research approach in order to answer research questions. According to Fatoki (2012:182), the face-to-face interview method is a preferred approach for ensuring high response rates from the selected sample, and it allows the researcher to gather quality data.

3.2.7.1 Deductive research approach

According to Williman (2012) this research approach was first adopted by ancient Greeks, and was then improved by Aristotle, who derived a number of deductive syllogisms. Furthermore, the deductive approach to research comprises of logical arguments which

begins with generic statements aimed at obtaining required conclusions concerning the research (Walliman, 2005). In addition, the deductive strategy includes a method of developing hypotheses from a general statement in order to obtain clear conclusions (Dahlberg & McCaig, 2010). Hence, with regard to the findings obtained in deductive research are checked with hypotheses empirically (Dahlberg & McCaig, 2010).

3.2.7.2 Inductive research approach

This research approach is considered as the most frequently adopted strategy in most scientific research. It begins with either observation or survey and later derives the conclusions from the available results (Walliman, 2012). As compared to the deductive research approach, the inductive approach contributes to a general known truth about a theory. Walliman (2005) points out that results obtained from the inductive approach can only be regarded as valid if they meet the following inductive research conditions:

- A large population or observation size for survey is required;
- A survey or observation is repeated under different conditions; and
- The derived observed experiential data must align with the generalised result.

3.2.8 Research strategies

Literature has revealed numerous research strategies for the usage of qualitative, quantitative and mixed research methods (Walliman, 2012; Leedy & Ormrod, 2010; Walliman, 2005). These research strategies include case studies, structured interviews, phenomenological studies, historical research, action research, experimental studies, quasi-experimental studies and also theoretical research studies (Bryman, 2012; Biggam, 2009; Walliman, 2012; Leedy & Ormrod, 2010).

3.2.9 Research design for this study

Many studies have been conducted in effort to promote organisation performance in the construction project implementations (Yang, Chen & Wang, 2012). For instance, Shaul and Tauber (2012) identified SMEs critical success factors affecting the firms resource planning in construction project delivery. On the other hand, some researchers have explored social and technological impact on SMEs success while others have looked at SMEs tectics and strategies (Shaul & Tauber, 2012). To date there is no research conducted on effective modalities adopted by construction SMEs to enhance sustainable project implementation.

This research adopted a mixed method approach to determine and establish modalities for SMEs to achieve sustainable success rate in construction project delivery, as the mixed method research approach aided the exploration of the perceptions of construction management team on most significant modalities that enhance SMEs construction project delivery. A mixed method research approach, as explained, comprising both quantitative and qualitative research method. This study adopted a mixed method research approach

because it has more complex and complete perception of a phenomenon than adopting one research approach (Leedy & Ormrod, 2010). This research approach was adopted because of the nature of the research study and for the researcher to obtain a valid research finding. Moreover, with consideration of the study aim: to establish the appropriate modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa with a view to achieving continuous performance, SMEs that are currently busy on construction project are largely considered.

Thus, the quantitative method was used to collect data from construction SMEs that currently have project or previously have projects (construction managers, site agents, site engineers, quantity surveyors and etc) to compare the effectiveness of modalities adopted by construction SMEs at project level. The research data were obtained through the adoption of questionnaire survey (quantitative method) that was validated by conducting semi-structured interviews (qualitative method).

3.2.10 Targeted population

According to O'Leary (2004) a *population* is described as the total number of research participants or groups of participant adopted to select a sample. In addition, Burt, Barber and Rigby (2009:259) define *population* as the set of group or individuals that is relevant to a particular study. In relation to this research, the chosen population was active SME contractors registered on CIDB, general building (GB) category, thus, participants from SMEs in grades 1 to 4. The population was defined as construction SMEs registered in the Eastern Cape of South Africa, particularly the following metropoles: Port Elizabeth, East London, Butterworth and Mthatha. The population was purposively selected for the study and to balance the population on each CIDB grade. It must be noted that this study focuses on the quality of the results rather than the quantity of the population. Thus, the population of the study was selected based on SMEs experience and previous construction project success to determine effective modalities for SMEs to achieve sustainable success rate.

Table 3.1. Eastern Cape Metropoles CIDB grading

Grade of the contractor	**No. of SMEs in GB**	**Selected population**
Grade 1	2554	56
Grade 2	71	20
Grade 3	40	20
Grade 4	56	32

In any research design, population is not only regarded as a group of people, but in many ways depends on the field of the study. It is important to highlight that the study population

is comprised of project managers, construction managers, technicians, site agents, quantity surveyors and business owners/directors in the cycle of SMEs.

Flick (2011) explains that the sample of any population in a research study is a minimised depiction of the population. However, for the purpose of result validity and generalisation in research studies, it is considered that to achieve the aim and objectives of the study, a large sample size is recommended, as the larger the sample size, the better the results (O'Leary, 2004). However, this research focusses on the quality of the data collected from the respondents to achieve the objectives of this study.

3.2.11 Sampling techniques

A non-probability sampling techniques was adopted to determine the number of the survey participants. De Vos, Delport, Fouche and Strydom (2006) reveal that non-probability sampling includes the following: purposive sampling, quota sampling, target sampling, spatial sampling and snowball sampling. According to Welman, Kruger and Mitchell (2005: 68) the advantage of adopting non-probability sampling is that they are easy to understand and more cost-effective, with regard to financial expenses and time, unlike probability sampling. This research is based on a purposive research sampling technique. De Vos *et al.* (2006:202) opine that the purposive sample technique is referred to the decision of the scholar, in that a sample is composed of fundamentals that contain the most characteristics representative of the population. One of the main advantages of the purposive sampling technique is that the researcher(s) select the participants based on the purpose of the research.

In consideration of the complexity of the construction industry with regard to operations, project management and project location, construction project management teams have been observed to operate on very busy schedule. As a result, SME construction management team members such as construction project managers, quantity surveyors, site agents, construction managers and company directors in East London, Port Elizabeth, Mthatha and Butterworth, all in the Eastern Cape, were considered as samples for this research population (South Africa).

According to Biggam (2008) and Maree and Pieterson (2007), cluster sampling involves converting the target population into smaller groups, in which a purposive selection of samples is adopted for the data collection and result generalisation. This sampling technique reduces the total number of the target population, in the interests of cost and accuracy of the desired results. The cluster sampling technique is regarded as the most effective data collection technique where clusters are diverse in terms representative of the population. The quantitative questionnaires were delivered to SME building contractor management teams in East London, Port Elizabeth, Mthatha and Butterworth, as mentioned earlier, based on the availability of construction sites or offices, and accessibility of the site construction professionals, as a result of their busy schedules.

Hence, this study adopts cluster sampling technique, questionnaire administration (quantitative data), for easy and fast generalisation of findings. For the quantitative data collection, construction SMEs in East London, Port Elizabeth, Mthatha and Butterworth (Eastern Cape Province), were each grouped into clusters of thirty-two (32), in which respondents were selected using a purposive sampling technique. A total of one hundred and twenty-eight (128) companies were selected with at least two (2) representatives of each companies. Hence, the overall total of sample used was 256 to achieve the objectives of this research. Nonetheless, this research focusses on the quality provided by the participants, based on their experience and qualification. To validate the data obtained from the questionnaires, SME contractors from construction companies earlier selected for the quantitative data collection phase of the survey were interviewed. The interviews were conducted with the aim to establish modalities to achieve a sustainable success rate of SMEs construction project delivery.

3.2.12 Data collection

Sahu, (2013:63) defines research as the process of finding the unknown from different bases of data through constantly searching for a suitable tool of attaining data. Data collection is therefore the process of collecting information to solve the subject of concern in the research and depends on the type of issue (Walliman, 2011:65). Data collection is either primary or secondary data (Walliman, 2011:69). In this research both secondary and primary terminology for data collection will be adopted. For this research triangulation data collection approach was adopted (i.e. not only questionnaire survey was adopted but also semi-structured interviews and literature review form the bases of data collection for the study). According to Thomas (2003), noted that triangulation pin the research problem from different angles through adoption of numerus data collection approach. Thus, this study adopts literature reviews, questionnaires and interviews to collect the data.

3.2.12.1 Primary data collection

According to Leedy and Ormrod (2010), the primary data are the most valid information obtained in a study. The collection of primary data comprises leading information from the survey developed by the researcher, thus, it is significant for the researcher to develop clear and well-structured and easy to follow to obtain the results from the respondents based on their views (Kumar & Phrommathed, 2005). This study adopted primary data collection through administration of survey questionnaires to the selected participants, also, semi-structured interviews. The questionnaires were administered to the participants through emails, hand delivery and the department of public works. On the other hand, the interview was conducted through face-to-face with selected SMEs management team.

3.2.12.2 Secondary data collection

According to Dahlberg and McCaig (2010), in secondary data collection both quantitative and qualitative are adopted as secondary sources of data collection. For this study the secondary data collection approach adopted was literature review of the existing research and the present literature. Moreover, Kumar (2005) revealed that the literature review serves to improve the researcher's knowledge and assist with respect to integrating the findings of the existing literature review. Also, O'Leary (2013) pointed that for the researchers to bring new knowledge it is significant to consult past research study. Hence, the literature reviewed comprises textbooks, journals, articles, conference proceedings, dissertations and theses.

3.2.13.1 Form of questionnaires

Questionnaires are designed or developed with the focus of information gathered from the literature reviewed. According to Adler and Clark (2008:218), questionnaires are the tool that is most used to collect the data containing research questions and statements to gather information from selected respondents. Furthermore, Maree and Pieterson (2007) state that the design of the questionnaire is an important phase of the research process which brings the researcher into realisation of the main aim and objectives of the study. It is very important for the researcher to take into account the type of data to collect and the method(s) of data analysis which will be applied with regard to the research study. Maree and Pieterson (2007) further argue that there are some aspects of the questionnaire to pay particular attention to, and list these as follows:

- The total appearance of the questionnaire;
- The question sequence;
- Response categories; and
- Wording of questions.

These can be achieved by either using closed-ended or open-ended questionnaires.

3.2.13.2 Closed-ended questions

Closed-ended questions are structured survey questions formulated to obtain constant responses from all participants. For this research questionnaires were structured with two Parts, where *Part one* was based on biographic information of the respondents and *Part two* was based on SMEs modalities to achieve sustainable construction project success. Maree and Pieterson (2007) argue that closed-ended questionnaires provide the researcher with sequential research questions, with the instructions to the respondents to select the most appropriate answer for each question. Lewis and Thornhill (2009) contend that in closed-ended questions, the respondents are instructed to select an answer from a number of options provided. Closed-ended questions are often used by researchers due to the fact that they provide uniform responses from the participants, hence this study employs this method because it is effective in terms of time and allows for the ability to construct questions in such a way as to validate or contradict themes

identified in qualitative interviews. Furthermore, Lewis and Thornhill (2009) also highlighted six types of closed-ended questions as follows:

- *List:* in this instance the respondents is required to list items;
- *Category:* in this instance the respondent is required to select categories;
- *Ranking:* in this instance the respondent is required to order items;
- *Rating:* the respondent is required to rate items using recording responses;
- *Quantity:* the respondent is required to give numbers; and
- *Matrix:* where responses to two or more questions can be recorded using the same grid.

Although these research questionnaires are easy to answer and also easy to analyse, Maree and Pieterson (2007) list the following disadvantages of closed-ended research questions:

- The responses are easy to follow and clear with no fundamental background;
- The respondents may be cajoled to give answers they would never have given;
- Answering the questions is too easy;
- The respondent's opinion might not be available as an option to choose from; and
- The survey questionnaire is always too long.

3.2.13.3 Open-ended questions

Open-ended questions differ from closed-ended questions, in that they are administered with the view to obtain the opinions of the participants. In this instance, the respondents are allowed to give their comments based on their experience and opinions (Kumar, 2011). According to Maree and Pieterson (2007), open-ended research questions are designed in such a way to get participants. Maree and Pieterson (2007) summarise the advantages and disadvantages of open-ended questions on the research study as follows:

3.2.13.3.1 Advantages

- The participants respond to questions honestly with the assurance of being anonymous;
- The respondent's opinions are revealed; and
- Complex questions are duly answered with detailed justifications.

3.2.13.3.2 Disadvantages

- Data rating not easy;
- It requires a lot of time for the respondents to participate; and
- The answers are variably different in content as a result of the unstructured nature of the question.

3.2.13.4 Development of the questionnaire

Both semi-structured interviews and questionnaire surveys were used to obtain valid data from respondents. The questionnaires were divided into two parts. Part one consisted of biographic information related to the respondent and the company, with contractors required to answer all questions based on their opinion and experience. Part two was based on modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa. Section two is comprised of five sub-sections, namely: SME Cost management practices, SME time management practices, SME quality management practices, SME resource management practices and SME strategic management practices. Maree and Pietetersen (2007) note that an effective and useful tool in a research survey is the scale. This research adopts a 5-point Likert scale, which establishes SME modalities to achieve a sustainable success rate in construction project delivery. The Likert scale will be organised as follows: SD = Strongly disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly agree. At the end of the survey questionnaires, the respondents were required to give their opinions regarding SME modalities to achieve a sustainable success rate. Structured interviews were designed in two sections, where section A was based on background information of the interviewee and section B was based on SMEs management practices.

The data collection is based on the aim of the research study to achieve the objectives of the research. These interviews provide a broad understanding of modalities employed by SMEs in South Africa. Open-ended questions were design to allow the interviewee to discuss their experience on success rates of emerging contractors. Shaban (2008:32) highlighted the importance of using structured interviews in research studies.

3.2.13.5 Administration of questionnaires

Closed-ended questionnaires were distributed among the professional management team of construction SMEs, such as the owners or directors of the company, the project managers, quantity surveyors, contract managers, commercial managers, site agents, site engineers, and any other management personnel involved in the SME's projects.

The survey questionnaire was sent to participants through email and a hardcopy was submitted to the supervisor for the record. Assistance was received from the Department of Public Works (ECDPW) and the Eastern Cape Business Chamber (NMBC), in terms of contacts in SMEs around the Eastern Cape province. The participants were given at least one week to complete the questionnaire and respond directly to the researcher or through the ECDPW or NMBC.

3.2.13.6 Interview

This method of data collection is qualitative in nature and usually open-ended. According to Leedy and Ormrod (2010) interviews in a survey can either be structured or semi-structured. Similarly, Kumar (2011) states that interviews give the researcher flexibility and power to dialogue and interact with the respondents. Hence, this method was applied

in this study to explore and validate the quantitative data that was gathered during the first stage of the data collection process. It is in the interest of the study to ensure that all the participants are alerted regarding the time required prior to the interview session, in order for them to make enough time for the researcher and also for the researcher to achieve relevant responses from all respondents. For the purpose of this, a total of four small and medium-sized enterprises in the construction industry was selected. The focus was mostly based on owners or any management personnel as a whole, as they were in a position to give relevant information to the researcher. This study seeks modalities to achieve sustainable success of SME contractors during construction project delivery.

The semi-structured interview allows the researcher to lead the discussions that seek to achieve the aim and objectives of the study, with the intention of obtaining the opinions, experience and knowledge in relation to the objectives of the study from participants. However, Tracy (2013) opines that semi-structured interviews are more detailed and most flexible, which tends to stimulate the interview to be more interesting to both interviewer and interviewee. The adoption of the semi-structured interview also ensured that well-defined responses from interviewee were obtained. Semi-structured interviews were organised in order to gather opinions and experiences from the participants and also explore, discover, and determine the validity and reliability of the research questionnaires.

3.2.13.7 Pre-testing questions

Faux (2010:104) notes that whilst pre-testing with well experienced researchers is crucial, it is also recommended that the researcher use potential respondent(s) for pre-testing. For the purpose of this study five (5) respondents were selected from COAGA, Department of Public Works and Eastern Cape Business Chamber. The respondents were instructed to complete the survey questionnaires and give their comments based on the quality and structure of questionnaires. The respondents were given a week to complete the survey questionnaires. In the case where respondents failed to return the questionnaires, in the following week a reminder was sent to respondent(s). Hence, the researcher had enough time to make any changes if necessary.

3.2.14 Data analysis

After collecting both qualitative and quantitative data, the researcher had to do a proper data analysis and interpretation. To analyse quantitative data, Statistical Package for the Social Sciences (SPSS) version 25 was adopted. This is recommended by Dawson (2009), who opines that the adoption of statistical software is the easiest method, and also cost-effective with regard to most data analysis methods. SPSS allows for the development of graphs, pie charts and tables with relative ease. This study used both descriptive methods for the quantitative data and content analysis for the qualitative data.

3.2.14.1 Descriptive statistics

According to McMillan and Schuhmacher (2006), descriptive statistics are adopted to summarise, organise, and reduce large numbers in a research study. Hence, the descriptive statistics could be divided into two main threads, namely; univariate descriptive analysis, which is concerned with summarising of characteristics, and bivariate descriptive analysis, which focuses on describing the strength of relationships between variables and comparing the same variables in different populations. Hence, for the purpose of this research, the descriptive analysis method is adopted to analyse quantitative data which includes closed-ended questions on SME modalities to achieve a sustainable success rate. To achieve the objectives of this study, mean ranking was used to identify the most significant variables.

The results are organised with mean ranking, using the relationship between the variables, and the mean could either be ascending or descending. Fellows and Liu (2008:182) suggest that, after completing the rankings of the variables, these ratings indicate the degree of the most significant statement displayed in hierarchy rankings. The mean was acquired by adopting a Likert scale, and responses were ranked. In the event where the mean value of the respondents was the same, standard deviation was used to determine the most significant variables.

3.2.14.2 Content analysis

Leedy and Ormrod (2010) define *content analysis* as a demonstration of a systematic process, analysing the content of a body of knowledge with the aim of accessing the significance, theme, pattern and flaws. In addition, content analysis involves the coding and transcription of human communication or other means of communication (Leedy & Ormrod, 2010). This is confirmed by Flick (2011), who explains that content analysis enables the researcher to omit any irrelevant information or terms and also give a summary of accounts. Content analysis is mostly not intended to be a standalone method (Leedy & Ormrod, 2010). This study adopts content analysis in order to explore text or given statement(s) for the researcher to support or reject these encountered in the literature.

3.2.15 Validity test

According to Struwig and Stead (2007), validity of a research study refers to the credibility of the survey tool. Likewise, McMillian and Schuhmacher (2006) agree that validity of questions is a judgement based on appropriateness of measurement(s) or decision(s). In addition, Leedy and Ormrod (2010) point out that validity of any research is regarded as the maximum which the instrument is measuring what it supposed to measure, and the standard to which this measurement occurs.

3.2.16 Reliability test

According to Salkind (2006: 106) reliability is often adopted as an instrument to measure the same variables more than once, obtain the same outcomes. It is mostly unusual obtain the most significant reliable results, hence, the process of reliability test is to increase the reliability measure through the increase in number of variables or observation and the use of pre-tests and pilot study. Sekaran and Bougie (2009) state that the reliability of study measures can be established by testing the consistency and stability of the questions. This study adopted the Cronbach's Alpha coefficient to measure the internal consistency of the items associated with the Likert scale questions. Sekaran and Bougie (2009) state that the closer is the measured items are to 1, the higher the consistency and reliability of the scale questions. Similarly, Andrew, Damon, Paul and McEvoy (2011) state that Cronbach's alpha is one of the most popular methods used to measure consistency and reliability of items.

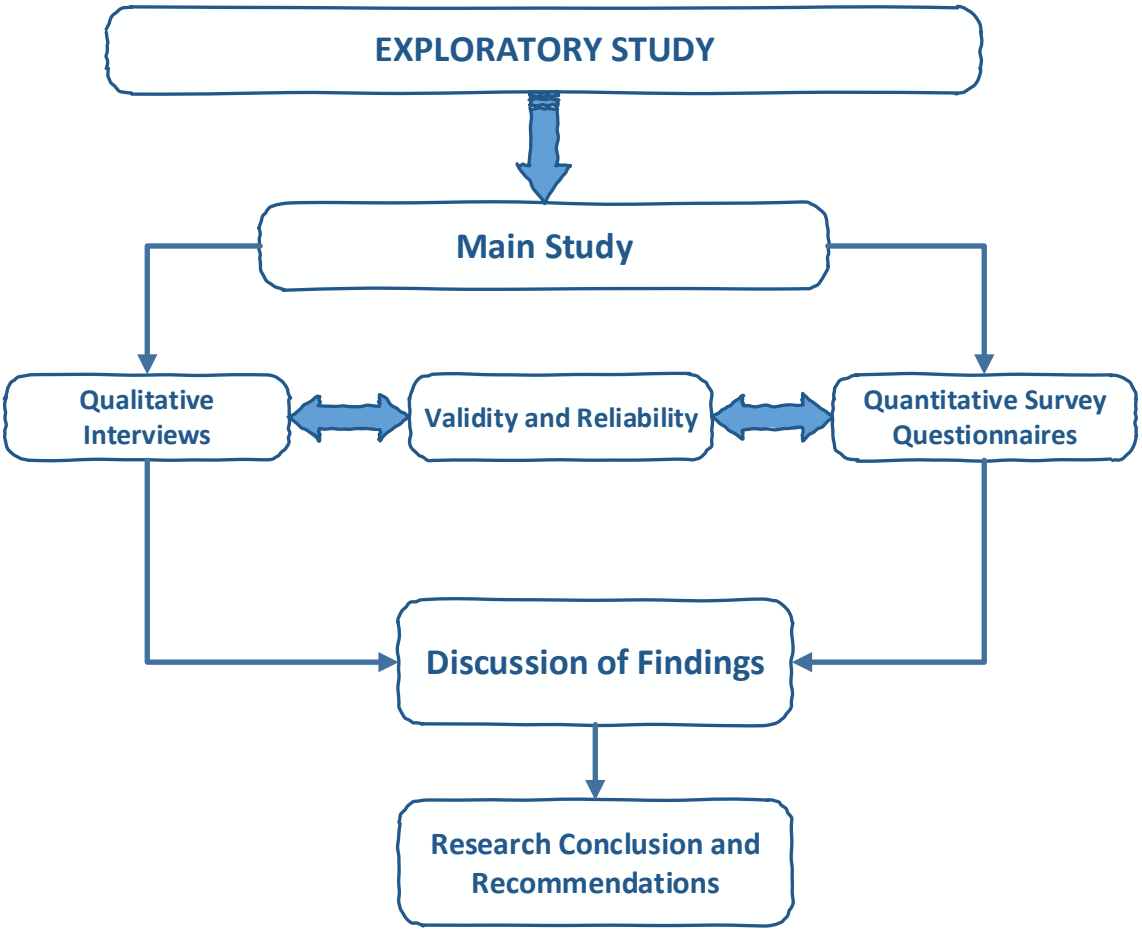

Figure 3.1: Research methodology framework

3.3 Chapter summary

This chapter provided an overview of the research methodology employed in the study. A mixed research method with both qualitative and quantitative research approaches was

adopted to achieve the aim and objectives of the research study. This chapter focuses on the population for the study, data collection methods, the method for designing the questionnaire survey, pre-testing the survey, response rate, as well as the data analysis method. Literature review, interviews and questionnaires were employed to collect and explore the primary and secondary data for the study. The proposed approach for questionnaire administration was the mailing and hand delivery approach. The next chapter focuses on the presentation and interpretation of findings of the questionnaire in a meaningful manner, using descriptive analysis and content analysis of interviews.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter outlines the analysis of the data collected using questionnaire, survey and semi-structured interviews conducted amongst the SME management teams. In this chapter, the results of quantitative data conducted and analysed by using statistical techniques are presented. The significant explanations of participant responses of the qualitative interview conducted for this research are reported and tabulated under appropriate sections. From the results of the data collected, statistical analyses were used to interpret and the implications of the observed the results are comprehensively discussed to bring the research outcomes into focus.

4.2 Response rate, questionnaire survey

The quantitative data collection for this study was conducted through the use of the questionnaire survey. It is important to note that a total of two hundred and fifty-six (256) questionnaires were issued to SME construction firms operating within the Eastern Cape province of South Africa. The respondents included directors, project managers, quantity surveyors, site agents and any other representatives of the firm involved in project delivery. Out of two hundred and fifty-six (256) questionnaires, ninety-six (96) were issued in person to the respondents, of which sixteen (16) questionnaires were adequately completed and retrieved. One hundred and sixty (160) were administered online via electronic mail, forty-three (43) questions were duly completed and sent back electronically. A total of 59 questionnaires were retrieved, representing a 23.05% response rate.

4.3. Profile of respondents

4.3.1 Age group of respondents

Table 4.1 shows the age group distribution of the 59 respondents. It can be seen that about 54.2% of respondents were in the age group between 26 and 39, 23.7% were in the age group between 40 and 49. 11.9% were in the aged group of 50 to 59 years. 10.2% were in the age group between 18 and 25. This shows that there are few participants between 18 and 25 in the management team of SME contractors. The results obtained indicate that the majority of the respondents were less than 40 years of age, with a share of 64.4%.

Table 4.1 Age group of the respondents			
Age	**No**	**Percent**	**Cumulative %**
18 – 25	6	10.2	10.2
26 – 39	32	54.2	64.4
40 – 49	14	23.7	88.1
50 – 59	7	11.9	100.0
Total	**59**	**100.0**	

4.3.2 Experience of the respondents

Table 4.2 shows the relevant experience of the respondents in terms of managing and running construction projects. It can be seen that 37.3% of respondents have relevant experience ranging between 1 to 5 years, 25.4% of respondents have worked in the industry between 6 to 10 and 11 to 15 years, while 6.8% of respondents have worked in the industry between 16 and 20 years, and only 5.1% have worked in the industry for more than 20 years. It is clear that most of the graduates are employed by SMEs, as a significant number of projects are managed by respondents with less experience in the industry, with 37.3% having between 1 and 5 years of experience.

Table 4.2 Relevant experience			
Experience	**No**	**Percent**	**Cumulative %**
1-5 years	22	37.3	37.3
6-10 years	15	25.4	62.7
11-15 years	15	25.4	88.1
16-20 years	4	6.8	94.9
20 & Above	3	5.1	100.0
Total	**59**	**100.0**	

4.3.3 Educational qualification of the respondents

Table 4.3 clearly shows that the largest share of the respondents (47.5%) hold a National Diploma qualification, followed by respondents with degree qualifications and others, at 25.4% out of 59 respondents. Table 4.3 also shows that there were about 1.7% respondents with qualifications lower than Matric. This indicates that most respondents within the SME management team have tertiary or postgraduate qualifications, as indicated by age group and experience, most of SMEs employees are qualified to be in the construction industry.

Table 4.3 Educational qualification			
Qualification	**No**	**Percent**	**Cumulative %**
Below Matric	1	1.7	1.7
Matric Certificate	7	11.9	13.6
National Diploma	28	47.5	61.1
Bachelor's degree	15	25.4	86.5
Other	8	13.6	100.0
Total	**59**	**100.0**	

4.3.4 Role of respondents in the organisation

It is clear from Table 4.4 that about 37.3% of the respondents were site agents, followed by a notable 20.3% of respondents who were project managers. In addition, 32.2% of respondents were other participants, such as site engineers, site representatives, directors, and so on. There were six quantity surveyors participating. This indicates that SME projects are mostly run by site agents or foremen. The results indicated that the majority of the respondents were site agents and other professionals, with a significant 69.5%.

Table 4.4 Role in the organisation			
Role	**No**	**Percent**	**Cumulative %**
Quantity Surveyor	6	10.2	10.2
Project Manager	12	20.3	30.5
Site Agent/ Foreman	22	37.3	67.8
Other	19	32.2	100.0
Total	**59**	**100.0**	

4.3.5 Gender

Table 4.5 reveals that out of 59 respondents, 62.7% were males and 37.3% were females. As indicated, SME projects are dominated by males. However, the table clearly indicates that both genders were represented.

Table 4.5 Gender

Gender	**No**	**Percent**
Male	37	62.7
Female	22	37.3
Total	**59**	**100.0**

4.3.6 CIDB grade of the company

Table 4.6 presents the CIDB grading for firms in which the respondents were employed. It should be noted that 35.6% of the firms were categorised as grade 3, followed by 32.2% of the firms who were classified as grade 4. 22.0% of the firms were in the category of grade 2 and only 10.2% of firms were in grade 1. It is clear that most of the active firms were between grade 2 and grade 4 contractors, with 89.8% of the respondents employed at contractors with CIDB grade 2 to 4.

Table 4.6 CIDB grade

CIDB Grade	No	Percent	Cumulative %
Grade 1	6	10.2	10.2
Grade 2	13	22.0	32.2
Grade 3	21	35.6	67.8
Grade 4	19	32.2	100.0
Total	**59**	**100.0**	

4.4 Reliability testing

The scaled questions used were tested on Cronbach's alpha coefficient to check the reliability of questions. Statistic Package for Social Sciences Software (SPSS) was used to examine the reliability of the Likert scale questions. According to Maree (2007:216), the Cronbach's alpha test is interpreted as follows: values that are lower than 0.6 are considered as unacceptable; values with coefficient of 0.70 are considered as having low reliability; while values with coefficient of 0.80 are considered as moderate, and values hovering around 0.90 are considered as possessing high reliability. The results of the Cronbach's alpha co-efficient tests presented in Table 4.7 were found satisfactory in terms of the reliability test requirements.

Table 4.7 Reliability test

Question No.	Headings	No. of items	Cronbach's alpha coefficient value	Rank
7	Effective cost management practices	18	0.87	Moderate
8	Cost management through budgeting in SMEs	5	0.72	Low
9	Effective time management practices	16	0.84	Moderate
10	Leadership, project work schedule and control in SMEs	7	0.80	Moderate
11	Effective quality management practices	16	0.84	Moderate
12	Effective material management practices	14	0.84	Moderate
13	Effective manpower management practices	14	0.86	Moderate

14	Effective machinery management practices	10	0.81	Moderate
15	Effective strategic management practices	19	0.91	High
Sum	All questions combined	119	0.83	

4.5. Management practices in SMEs

4.5.1 Effective cost management practices in SMEs

The respondents were asked to indicate the level of agreement with regard to cost management practices that can be adopted and implemented by SMEs to achieve sustainable construction project success in South Africa, using a 5-point scale: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA).

It is evident from Table 4.8 that effective circulation of drawings and specifications among management teams to identify abortive works is ranked highest, with a mean value of 4.08. This is supported by the fact that 83% of respondents agreed that effective circulation of drawings among project management teams is the core of SME cost management practice, while a minority of 16.9% were undecided. Table 4.8 also indicates that there were no respondents who. Managing cost through work production is ranked second, with a mean value of 4.07. It is also notable that 83% of the respondents agreed that managing cost through work production is important in terms of managing cost for SME. Nevertheless, there were 69.5% of respondents who agreed on appointment of experienced estimators with relevant experience, shown by a mean value of 4.02 and ranked third. 28.8% of the respondents were neutral regarding cost management through appointment of experienced estimators, while 1.7% of the respondents disagreed. The least ranked factor, according to the respondents, is precise cost estimate during procurement of the project, with MV of 3.66. However, it is important to highlight that all MVs are above 3.00, and average MV for the combined factors is 3.9, which indicates that the factors are significant in terms of influencing construction SMEs to achieve sustainable construction project success.

Table 4.8 Effective cost management practices

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Effective circulation of drawings and specification among management team to identify abortive works	59	0.0	0.0	16.9	57.6	25.4	4.08	.65094	1
Managing cost through work production	59	0.0	1.7	15.3	57.6	25.4	4.07	.69144	2
Appointment of experienced estimators who are conversant with the industry	59	0.0	1.7	28.8	35.6	33.9	4.02	.84060	3
Subcontracting work to transfer financial responsibility	59	0.0	5.1	11.9	61.0	22.0	4.00	.74278	4
Effective system for monitoring cash flow of business/ project	59	1.7	3.4	13.6	57.6	23.7	3.98	.81983	5
Resource allocation on a project is well defined	59	0.0	3.4	18.6	55.9	22.0	3.97	.74199	6
Managing cost through effective allocation of budget to each activity	59	0.0	0.0	32.2	40.7	27.1	3.95	.77512	7
Managing cost through project cost reporting	59	0.0	1.7	30.5	40.7	27.1	3.93	.80653	8
Procurement of materials based on comparative market analysis	59	0.0	3.4	18.6	59.3	18.6	3.93	.71594	8
Effective administration of variations and contract instructions	59	0.0	5.1	16.9	59.3	18.6	3.92	.74944	9
Employees are trained on how to effectively manage the cost of projects	59	0.0	1.7	22.0	59.3	16.9	3.92	.67691	10
Effective cost control during project delivery	59	0.0	5.1	28.8	39.0	27.1	3.88	.87266	11
Access to financial institutions for project funding	59	0.0	10.2	22.0	45.8	22.0	3.80	.90553	12
Ability to manage capital raised by owners of SMEs	59	6.8	3.4	13.6	59.3	16.9	3.76	1.00583	13
Money due to suppliers is paid on time to prevent any interest cost on projects	59	3.4	5.1	16.9	16.0	13.6	3.76	.87767	13
Scope creep is well managed to avoid over-budget/ escalation	59	0.0	1.7	33.9	50.8	13.6	3.76	.70317	13
Timely progress payment by client	59	5.1	11.9	18.6	32.2	32.2	3.75	1.18312	14
Precise cost estimating during the procurement stage of a project	59	0.0	5.1	35.6	47.5	11.9	3.66	.75681	15
Average	**59**						**3.90**		

4.5.2 Effective cost management practices through budgeting in SMEs

Table 4.9 presents the findings related to effective cost management practices through budgeting that can be adopted and implemented by SMEs to achieve sustainable construction project success in South Africa. A 5-point scale was adopted where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA). From Table 4.9, it is notable that effective and accurate cost estimate is ranked first, with an MV of 4.17. This is also corroborated by the fact that an overwhelming 81% of the respondents agreed that effective and accurate cost estimate is an efficient way through which construction SMEs could be able to achieve sustainable construction project success. However, a notable 10.2% of respondents were undecided, and 1.7% of the

respondents disagreed that this cost management practice through budget was effective. 72.9% of the respondents agreed that avoiding wastage on construction sites was a major modality contributing to cost management, with second highest MV of 4.07 and ranked second. Nevertheless, 27.1% of the respondents were undecided and none of the respondents disagreed that this modality is effective. Effective procurement strategy was a notable effective cost management modality, and is ranked third with a MV of 4.03 and with standard deviation (std) of 0.76. It is also important to highlight that 76.3% of the respondents agreed that cost management through effective procurement strategy is efficient. However, 22.0% of the respondents were neutral and 1.7% of the respondents disagreed that SME cost is managed through effective procurement strategy. Also, the effective budget planning at tender stage is ranked third, also with MV=4.03 and std deviation 0.67 for effective effective budget planning compared to std=0.76 for effective procurement strategy. 83% of the respondent agreed, with minor 15.3% neutral and 1.7% disagreeing, that cost management can be managed through budget planning at tender stage. The least ranked factor is managing budget through effective cost schedule, with MV=3.93. The average mean value for all factors relative to SME cost practice through budgeting is 4.05, which implies that adopting and implementing the modalities would assist SMEs to achieve sustainable construction project success in South Africa.

Table 4.9 Cost management through budgeting

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Effective and accurate cost estimate	59	0.0	1.7	10.2	57.6	30.5	4.17	.67345	1
Avoiding wastage on construction site	59	0.0	0.0	27.1	39.0	33.9	4.07	.78487	2
Effective procurement strategy	59	0.0	1.7	22.0	47.5	28.8	4.03	.76488	3
Effective budget planning at tender stage	59	0.0	1.7	15.3	61.0	22.0	4.03	.66866	3
Through effective cost schedule	59	0.0	0.0	22.0	62.7	15.3	3.93	.61207	4
Average	**59**						**4.05**		

4.5.3 Effective time management practices in SMEs

Table 4.10 presents the findings with regard to effective time management practices for SMEs to achieve sustainable construction project success in South Africa, using a 5-point scale where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA). Table 4.10 shows that 88.2% of the respondents agreed that effective progress meetings with consultants to ensure regular monitoring of the progress of work is the core time management practice. This modality is ranked first with Mv=4.29. Notably, only 11.9% of the respondents were neutral, whereas none of the respondents disagreed. Strategic planning to recover time lost, together with effective management of subcontractors are at par and ranked second, with Mv=4.27. Nonetheless, effective subcontractor management was most important, with std=0.72, compared to 0.69 for

strategic planning to recover time lost. It is notable that 94.9% of the respondents agreed that effective management of subcontractors, with MV=4.27 is important in respect to SME time management. Nevertheless, 3.4% of the respondents were neutral and 1.7% of the respondents disagreed. With respect to strategic planning to recover time lost, an overwhelming 88.2% of the respondents agreed to adopting the modality, while 10.2% of the respondents were neutral and 1.7% of them disagreed. However, 86.5% of the respondents agreed on effective allocation of tasks to workers according to their skills and expertise, shown by a MV=4.24 and ranked third, 11.9% of the respondents were neutral, and only 1.7% of them disagreed on this modality. It can be seen that the least rated modality is project bonuses for fast tracking the project delivery, with MV=3.73. Nevertheless, it can be highlighted that the average MV=4.03, which indicates that the modalities are important in terms of influencing construction SMEs to achieve sustainable construction project success.

Table 4.10 Effective time management practices

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Progress meetings with consultants to ensure regular monitoring of the progress of work	59	0.0	0.0	11.9	47.5	40.7	4.29	.67084	1
Strategic planning to recover time lost	59	0.0	1.7	10.2	47.5	40.7	4.27	.71512	2
Effective management of subcontractors	59	1.7	0.0	3.4	59.3	35.6	4.27	.69059	2
Allocation of tasks to workers according to their skills and expertise	59	0.0	1.7	11.9	47.5	39.0	4.24	.72728	3
Effective decision-making by management team	59	0.0	0.0	15.3	52.5	32.2	4.17	.67345	4
Recruiting management team with relevant experience	59	0.0	1.7	16.9	50.8	30.5	4.10	.73567	5
Client project changes during construction stage influence the project delivery	59	0.0	3.4	22.0	40.7	33.9	4.05	.83921	6
Timeously requesting outstanding drawing information or specification	59	0.0	3.4	20.3	47.5	28.8	4.02	.79852	7
Effective coordination of available resources	59	0.0	0.0	22.0	55.9	22.0	4.00	.66953	8
Time management on project is set as the culture of the company	59	0.0	1.7	20.3	57.6	20.3	3.97	.69397	9
Administration of contract instruction on time	59	0.0	1.7	16.9	64.4	16.9	3.97	.64236	9
Availability of sufficient funds to avoid project time overrun	59	1.7	1.7	15.3	62.7	18.6	3.95	.75255	10
Timeous payment by client	59	3.4	3.4	23.7	39.0	30.5	3.90	.99473	11
Timeous response by the design team on requested information	59	0.0	1.7	33.9	47.5	16.9	3.80	.73765	12
Common objectives with regard to achieving construction project delivery	59	1.7	0.0	35.6	44.1	18.6	3.78	.81087	13
Project bonuses for fast tracking project delivery	59	1.7	3.4	37.3	35.6	22.0	3.73	.90650	14
Average	**59**						**4.03**		

4.5.4 Effective time management through leadership, project work schedule and control

Table 4.11 presents findings related to effective time management practices through leadership, project work schedule and control. A 5-point scale was adopted where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA).

From Table 4.11, it is notable that effective progress meetings to resolve uncertainties is ranked first, with MV=4.15. This is indicated by the fact that an overpowering 86.4% of the respondents agreed that effective progress meetings to resolve uncertainties is a significant modality through which construction SMEs could be able to achieve sustainable construction project success. However, a notable 16.9% of the respondents were neutral, and a minority of 1.7% of them disagreed. Also, adequate sequencing of activities on site to avoid unnecessary idle time is ranked second, with MV=4.12, with 81.4% of respondents agreeing on this modality, while there were only 1.7% of respondents who disagreed. 83% of respondents agreed that effective communication between contractor and designing team is significant, and this ranked third, with Mv=4.08. 15.3% of the respondents were neutral and 1.7% disagreed. From the results, it can be noted that the least ranked modality is effective works schedule development and control, with MV=3.93. Hence, all of the modalities are significant, with each average above the Likert scale, which is 3.00. The average mean value of 4.06 indicates that most SMEs adopt time management through adequate leadership skills at project level.

Table 4.11 Time management through leadership, work schedule and control

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Progress meeting to resolve uncertainties	59	0.0	0.0	13.6	57.6	28.8	4.15	.63825	1
Adequate sequencing of activities on site to avoid unnecessary idle time	59	0.0	1.7	16.9	49.2	32.2	4.12	.74475	2
Effective communication between the contractor and the design team	59	0.0	1.7	15.3	55.9	27.1	4.08	.70192	3
Effective as built project sensing	59	0.0	0.0	18.6	54.2	27.1	4.08	.67691	3
Continuous monitoring at project level	59	0.0	1.7	15.3	57.6	25.4	4.07	.69144	4
Effective on-time project monitoring	59	0.0	0.0	27.1	49.2	23.7	3.97	.71838	5
Effective works schedule development and control	59	0.0	3.4	18.6	59.3	18.6	3.93	.71594	6
Average	**59**						**4.06**		

4.5.6 Effective quality management practices in SMEs

The respondents were asked to indicate the level of agreement with regard to effective quality management practices that can be adopted by construction SMEs to achieve sustainable construction project delivery in South Africa, using a 5-point scale where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA).

It is evident from Table 4.12 that clear working drawings supplied by architect was ranked highest, with MV= 4.29. This is supported by the fact that a majority of the respondents (86.5%) agreed, 11.9% of the respondents were neutral and 1.7% of the respondents disagreed. Periodic requests for quality inspection is ranked second, with a mean value of 4.19. It is also notable that 86.4% of the respondents agreed that adopting quality management through periodic requests for quality inspection is significant for construction SMEs to achieve sustainable construction project success. 11.9% of the respondents were neutral and only 1.7% of the respondents disagreed. Nonetheless, 88.1% of the respondents agreed that effective implementation of quality management is also a core of construction SME quality management, with MV=4.15. 81.4% of respondents also indicated that it is important for construction SMEs to benchmark for quality management on project delivery, with MV=4.15 ranked third, similar to implementation of total quality management, but less significant with std=0.71. The least recognised modality is quality function development, with MV=3.86. It is notable that the combined modalities have MV=4.06. These findings imply a good quality management culture on SME construction sites in South Africa.

Table 4.12 Effective quality management practices

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Clear working drawings supplied by the architect	59	0.0	1.7	11.9	42.4	44.1	4.29	.74396	1
Periodic request for quality inspection on project	59	0.0	1.7	11.9	52.5	33.9	4.19	.70649	2
Effective implementation of total quality management	59	0.0	0.0	11.9	61.0	27.1	4.15	.61064	3
Benchmarking for quality management	59	0.0	0.0	18.6	47.5	33.9	4.15	.71471	3
Quality management planning	59	1.7	0.0	6.8	66.1	25.4	4.14	.68122	4
Adopting or using appropriate construction methods and processes to achieve quality workmanship	59	0.0	1.7	11.9	59.3	27.1	4.12	.67171	5
Adhering to specifications to achieve quality workmanship	59	0.0	1.7	13.6	56.6	27.1	4.10	.68720	6

Projects executed in accordance with drawings and specifications	59	0.0	0.0	13.6	64.4	22.0	4.08	.59562	7
Measurement of quality throughout project life	59	0.0	1.7	16.9	59.3	22.0	4.02	.68207	8
Quality of design specification	59	0.0	0.0	23.7	52.5	23.7	4.00	.69481	9
Strategic implementation of quality management system	59	0.0	0.0	20.3	61.0	18.6	3.98	.62949	10
Comply with International Standard Organisation for continuous quality improvement	59	0.0	0.0	33.9	37.3	28.8	3.95	.79706	11
Commitment of top management regarding quality issues	58	0.0	1.7	22.0	54.2	20.3	3.95	.71137	11
The influence of management with regard to quality considerations on project delivery	59	0.0	1.7	23.7	54.2	20.3	3.93	.71594	12
Balance between owners' requirements and cost	59	0.0	0.0	25.4	59.3	15.3	3.90	.63504	13
Quality function deployment	59	0.0	0.0	30.5	52.5	16.9	3.86	.68122	14
Average	**59**						**4.05**		

4.5.7 Effective material management practices in SMEs

Table 4.13 presents the findings related to effective SME material management practices that can be adopted by construction SMEs to achieve sustainable construction project delivery in South Africa. Respondents were requested to indicate their level of agreement to each modality using a 5-point scale where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA).

It is apparent from Table 4.13, that the use of specified material for construction project is ranked peak, with MV=4.25. This is reinforced by the fact that 90% of the respondents agreed that the use of specified material for construction project is significant for SMEs to achieve sustainable construction project success. 8.5% of the respondents were neutral and 1.6% of the respondents disagreed. Managing material through effective utilisation of construction material is ranked second, with MV=4.19. It is clear that 89.9% of the respondents agreed that effective utilisation of construction material is a significant modality for construction SMEs to achieve sustainable project success. However, 10.2% of the respondents were neutral, and Table 4.13 indicates none of the respondents disagreed. Notably, 84.5% of the respondents agreed on adoption of effective material strategy, which ranked third with a mean value of 4.12. 15.3% of the respondents were neutral on this factor and none of them were in disagreement. In addition, the least recognised factor by construction SMEs is worker awareness of budgeted material against available material, with a mean value of 3.48. Nonetheless, it can be noted that

these modalities proved to be significant for construction SMEs to achieve sustainable construction project success, with an average mean value of 3.97.

Table 4.13 Material management practice

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
The use of specified material for construction project	59	1.7	0.0	8.5	52.5	37.3	4.25	.68464	1
Effective utilisation of construction materials	59	0.0	0.0	10.2	61.0	28.8	4.19	.60099	2
Effective material recording strategy	59	0.0	0.0	15.3	57.6	27.1	4.12	.64553	3
Adequate scheduling of construction materials	59	0.0	0.0	16.9	55.9	27.1	4.10	.66163	4
Availability of materials	59	1.7	0.0	13.6	55.9	28.8	4.10	.75874	4
Integrated material management approach among the team on site	59	0.0	0.0	27.1	42.4	30.5	4.03	.76488	5
Effective leadership on site to avoid material wastage	59	0.0	3.4	27.1	33.9	35.6	4.02	.88066	6
Materials stored in safe areas	59	0.0	1.7	30.5	35.6	32.2	3.98	.84060	7
Effective management of materials by the use of requisitions	59	1.7	0.0	20.3	55.9	22.0	3.97	.76488	8
Building relationship with construction material suppliers	59	0.0	1.7	30.5	42.4	25.4	3.92	.79412	9
Sustainable procurement system	59	1.7	1.7	25.4	54.2	16.9	3.83	.79117	10
Effective processes for purchasing material from external suppliers	59	1.7	3.4	28.8	47.5	18.6	3.78	.85234	11
Material is ordered and delivered on time	59	13.6	0.0	11.9	47.5	27.1	3.75	1.25387	12
Worker awareness of budgeted material against available material	59	1.7	15.3	28.8	42.4	11.9	3.48	.95332	13
Average	**59**						**3.97**		

4.5.8 Effective manpower management practices in SMEs

Modalities associated with SME manpower management practices are presented in Table 4.14. The opinion of the respondents was obtained using a 5-point scale where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA). From Table 4.14, it is clear that all workers are managed equally to prevent conflicts is ranked high, with MV=4.29, and is thus the most important manpower management modality adopted by construction SMEs to achieve sustainable construction project success, with an overwhelming 91.5% of the respondents agreeing. 5.1% of the respondents were neutral and 3.4% of respondents disagreed that equal management of workers should be adopted by construction SMEs as a framework to achieve sustainable construction project success. Involvement of team leaders in decision making of labour allocation is also significantly a notable effective manpower management modality,

ranked second highest with MV=4.24. It is also important to note that 88.1% of the respondents agreed, 11.9% of the respondents were neutral and no respondents disagreed on adoption of this modality. However, 79.7% of the respondents agreed that their firm supports employees' values and beliefs, with Mv=4.20. 16.9% of respondents were neutral and 3.4% of respondents disagreed that firm supports employees' values as the modality to achieve sustainable success in construction projects. It can be noted that the least ranked modality is allowing labourers to take initiative decision, with a mean value of 3.75. These modalities prove to be significant for SMEs construction project delivery, with Mv=4.08, which indicates that a significant number of construction SMEs adopt these strategies in their construction projects.

Table 4.14 Effective manpower management practices

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
All workers are managed equally to prevent conflicts	59	0.0	3.4	5.1	50.8	40.7	4.29	.72041	1
Team leaders are involved in decision making of labour allocation	59	0.0	0.0	11.9	52.5	35.6	4.24	.65229	2
The firm supports employees values and beliefs	59	1.7	1.7	16.9	33.9	45.8	4.20	.90553	3
Training programme for all staff to ensure continuous growth of the company	59	0.0	3.4	16.9	39.0	40.7	4.17	.83362	4
Experienced labour to transfer skills	59	0.0	3.4	13.6	47.5	35.6	4.15	.78375	5
Labourers are transferred from one site to another to perform their trades when required	59	0.0	5.1	16.9	37.3	40.7	4.14	.88000	6
Labour wages is paid on time to avoid disruptions	59	0.0	5.1	15.3	40.7	39.0	4.14	.86018	6
Monitoring labour production on site	59	0.0	1.7	13.6	59.3	25.4	4.08	.67691	7
Favourable working conditions on site	59	0.0	3.4	15.3	52.5	28.8	4.07	.76258	8
All workers are happy on the job and there is no labour absenteeism on site	59	0.0	1.7	15.3	59.3	23.7	4.05	.68036	9
Artisans and unskilled workers take full responsibility of their duties	59	0.0	5.1	15.3	52.5	27.1	4.02	.79852	10
Incentives to motivate workers at all levels	59	3.4	3.4	20.3	40.7	32.2	3.95	.99001	11
Effective communication between management team and artisans	59	0.0	3.4	28.8	39.0	28.8	3.93	.84821	12
Allowing labourers to take initiative decision	59	0.0	8.5	32.2	35.6	23.7	3.75	.92089	13
Average	**59**						**4.08**		

4.5.9 Effective machinery management practices in SMEs

The respondents were asked to indicate the level of agreement with regard to effective machinery management practices that can be implemented by construction SMEs to achieve sustainable construction project success using a 5-point scale where: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA). It is evident from Table 4.15 that hiring skilled operators is ranked first, with MV=4.25. This is substantiated by 88.1% of the respondents agreeing that it was a contributing modality to SMEs machinery management. 11.9% of respondents were neutral and no respondents disagreed. 83% of respondents agreed on effective maintenance plan for regular maintenance of plant and equipment as construction SMEs modality to achieve sustainable construction project success, ranked second with MV=4.08. However, 15.3% of the respondents were neutral and only 1.7% disagreed that effective maintenance plan lead to effective machinery management. Continuous use of hired plant until booked off site is important for construction SMEs to achieve sustainable construction project success, with MV=4.08 ranked second, which is the same as effective maintenance plan but effective maintenance plan is more significant, with std=0.77 compared to 0.73 for continuous use of hired plant. However, a notable 78% of the respondents agreed on continuous use of hired plant by construction SMEs, 22.0% of respondents were neutral and none of the respondents disagreed. Sequencing of activities on plant and equipment and plant arriving on time to site from suppliers, shared mean value of 4.05, but differed in standard deviation. The average mean value for effective machinery management is 4.03, which indicates that for SMEs to achieve sustainable construction project success, there is a need to adopt these modalities with regard to machinery management practice. These strategies are significant, but the least popular modality adopted by construction SMEs with regard to sustainable construction project success is SME owner's knowledge concerning whether to hire or buy plant/machinery, ranked last with MV=3.90.

Table 4.15 Effective machinery management practices

Statements	No	SD %	D %	N %	A %	SA %	Mean	Std.	Rank
Hiring skilled plant operator	59	0.0	0.0	11.9	50.8	37.3	4.25	.65898	1
Effective maintenance plan for regular maintenance of plant and equipment	59	1.7	0.0	15.3	54.2	28.8	4.08	.77210	2
Continuous use of hired plant until booked off site	59	0.0	0.0	22.0	47.5	30.5	4.08	.72607	2
Sequence of activities on plant and equipment production	59	0.0	0.0	18.6	57.6	23.7	4.05	.65453	3
Plant arriving on time to site from suppliers	59	0.0	3.4	22.0	40.7	33.9	4.05	.83921	3
Training of operators to operate machinery/plant	59	0.0	1.7	18.6	57.6	22.0	4.00	.69481	4

Adequate use of plant and equipment by workers	59	0.0	1.7	13.6	67.8	16.9	4.00	.61588	4
Management prioritise the importance of supplies on project delivery for hiring plant and equipment	59	0.0	0.0	27.1	47.5	25.4	3.98	.73088	5
Effective scheduling and planning the use of plant/machinery	59	0.0	0.0	22.0	61.0	16.9	3.95	.62763	6
SMEs owners knowledge concerning whether to hire or buy plant/machinery	59	0.0	5.1	23.7	47.5	23.7	3.90	.82410	7
Average	**59**						**4.03**		

4.5.10 Effective strategic management practices in SMEs

Table 4.16 presents the results with regards to effective strategic management practices of construction SMEs to achieve sustainable construction project success in South Africa using a 5-point scale which: Strongly Disagree = (SD); Disagree = (D); Neutral = (N); Agree = (A); and Strongly Agree = (SA).

Table 4.16 shows that 88.2% of the respondents agreed that adoption of integrated management system strategies by SME contractors is ranked highest, with MV=4.95. Notwithstanding, 10.2% of respondents were neutral whereas 1.7% of respondents disagreed that integrated project management system was a significant modality. Firms adopt health and safety strategies is ranked second, with MV=4.42. Notably, 91.4% of the respondents agreed that adoption of a health and safety strategy is important, 10.2% of the respondents were neutral and 3.4% of them disagreed. With respect to effective health and safety management, a vast 86,4% of the respondents agreed to adopting this modality, with MV=4.34. 10.2% of the respondents were neutral and 3.4% of the respondents disagreed. The lowest ranked modality is adoption of the best project management practice by the management team, with MV=3.97. However, it is significant to point out that all the MVs are above the midpoint of 3.00 and the overall average MV=4.21 for the combined modalities, which indicates that the modalities are important with regard to leading construction SMEs to achieve sustainable construction project success.

Table 4.16 Effective strategic management practice

Statements	N	SD %	D %	N %	A %	SA %	Mean	Std	Rank
Integrated project management system	59	0.0	1.7	10.2	47.5	40.7	4.95	5.22073	1
Firms adopt health and safety strategies	59	0.0	3.4	10.2	35.5	55.9	4.42	.77021	2
Effective health and safety management	59	0.0	3.4	10.2	35.6	50.8	4.34	.80108	3
Effective leadership skills	59	0.0	5.1	10.2	35.6	49.2	4.29	.85199	4
Effective goals for management team	59	0.0	1.7	11.9	44.1	42.4	4.27	.73884	5
Effective communication channel within the organisation	59	0.0	1.7	10.2	50.8	37.3	4.24	.70317	6
Available resource are used effectively on projects	59	0.0	1.7	8.5	54.2	35.6	4.23	.67821	7
Effective recruitment of competent management	59	0.0	1.7	16.9	39.0	42.4	4.22	.78932	8
Knowledge management is deemed to be a strategic asset	59	0.0	0.0	15.3	49.2	35.6	4.20	.68932	9
Management team use their knowledge and experience to deliver projects	59	0.0	0.0	11.9	55.9	32.2	4.20	.63733	9
Commitment of top management to project delivery in terms of cost, time and quality	59	1.7	1.7	13.6	45.8	37.3	4.15	.84718	10
Effective owners' business information	59	0.0	1.7	13.6	55.9	28.8	4.12	.69691	11
Effective scope control on project	59						4.10	.73567	12
The involvement of executive management at all levels of a project	59	0.0	3.4	11.9	57.6	27.1	4.08	.72607	13
Knowledge management based on organisational culture to stimulate employees	59	0.0	5.1	15.3	45.8	33.9	4.08	.83642	13
Effective project scope planning	59	0.0	3.4	18.6	45.8	32.2	4.07	.80653	14
Firm's involvement in social development activities (e.g. CSR)	59	0.0	1.7	22.0	50.8	25.4	4.00	.74278	15
There is a share of knowledge management	59	0.0	5.1	16.9	50.8	27.1	4.00	.80943	15
Adoption of best project management practice by the management team	59	0.0	3.4	15.3	62.7	18.6	3.97	.69397	16
Average	**59**						**4.21**		

4.6 Factor analysis

4.6.1 Identifying the most significant cost management modalities adopted by construction SMEs to achieve sustainable construction project success

This study adopts factor analysis as the way to identify the most significant modalities employed by construction SMEs to achieve sustainable construction project success. A total of 18 modalities were assessed to identify the most significant modalities. Factor analysis was carried out to reduce and categorise the most significant modalities adopted by SME contractors. This assessment was also performed to validate the consistency of the quantitative analysis. Furthermore, principal component analysis was used to extract the variables.

4.6.1.1 KMO adequacy and Bartlett's test

According to Pallant (2012) factor analysis can be performed in three main steps to test the significance of the study. Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity was performed to determine the most significant variables influencing the construction SMEs sustainable project success in South Africa. Table 4.17 presents the results of KMO and Bartlett's test sphericity. Both KMO and Bartlett's test of sphericity provide the minimum standard that the data should meet to be considered as significant for the factor analysis. Pallant (2012) recommends that for significant factor analysis, the value of KMO should range between 0 and 1, and the minimum value is suggested to be 0.60. In addition, Fied (2013) reveals that the Bartlett test is the indicator of the relationship among the variables, and for the purpose of this research, Bartlett test requirements are considered. For factor analysis to be considered as significant and appropriate, the Bartlett test associated with significance level should be $p<0.005$. Table 4.17 indicates the KMO value as 0.765, which is more than the minimum value of KMO 0.60. In addition, the Bartlett's test sphericity significance level was $p=0.000$, which is less than the minimum value of $p<0.005$. These results prove that the results meet the minimum requirements and factor analysis can be performed.

Table 4.17 KMO and Bartlett's test of SMEs cost management practices

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.765
Bartlett's Test of Sphericity	Approx. Chi-Square	455.865
	Df	153
	Sig.	.000

4.6.1.2 Principal components of cost management modalities adopted by construction SMEs

The step which has been followed after checking the significance of the variables is the factor extraction. With regard to factor extraction, Pallant (2012) noted the most commonly-used extracting factor techniques are: Kaiser-Meyer-Olkin criterion; where eigenvalues greater than 1 are considered most significant; Cattell's scree test; retaining all factors above the elbow in the structure and Horn's parallel analysis; and comparing the eigenvalue with those randomly generated data of the same size. The principal components analysis was adopted to determine the most significant cost management modalities employed by SME contractors to achieve sustainable project success. Pallant (2012) notes most significant KMO values as those with eigenvalues that are greater than 1. Table 4.18 present five (5) factors that have their eigenvalues greater than one, which are adopted by SMEs as a tool to achieve sustainable project success. The table below indicates the eigenvalues of the five (5) extracted components as follows: 5.905, 2.258, 1.616, 1.236 and 1.118. Further, Table 4.18 present the most significant factor extracted

with 32.81% of the variance, the second component is 12.55% of the variance, the third component extracted is 8.98% of the variance, while the fourth and the fifth components are 6.86% and 6.21% of the variance respectively. Nonetheless, the combined components extracted constitute 67.41% of the variance, and these components are most significant for construction SME sustainable construction project delivery.

Table 4.18 Total variance explained by components

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.905	32.804	32.804	5.905	32.804	32.804
2	2.258	12.545	45.350	2.258	12.545	45.350
3	1.616	8.976	54.326	1.616	8.976	54.326
4	1.235	6.859	61.184	1.235	6.859	61.184
5	1.118	6.209	67.393	1.118	6.209	67.393
6	.975	5.419	72.813			
7	.764	4.244	77.057			
8	.695	3.861	80.917			
9	.572	3.179	84.097			
10	.523	2.905	87.002			
11	.461	2.562	89.564			
12	.415	2.308	91.872			
13	.363	2.017	93.889			
14	.300	1.666	95.555			
15	.266	1.477	97.031			
16	.213	1.184	98.216			
17	.192	1.065	99.281			
18	.129	.719	100.000			

Extraction Method: Principal Component Analysis.

As stated by Pallant (2012) components with eigenvalue greater than 1 are considered the most significant factors adopted by construction SMEs. Figure 4.1 shows the Catell's scree test, which confirms the number of components that are significant, namely those above the elbow on.

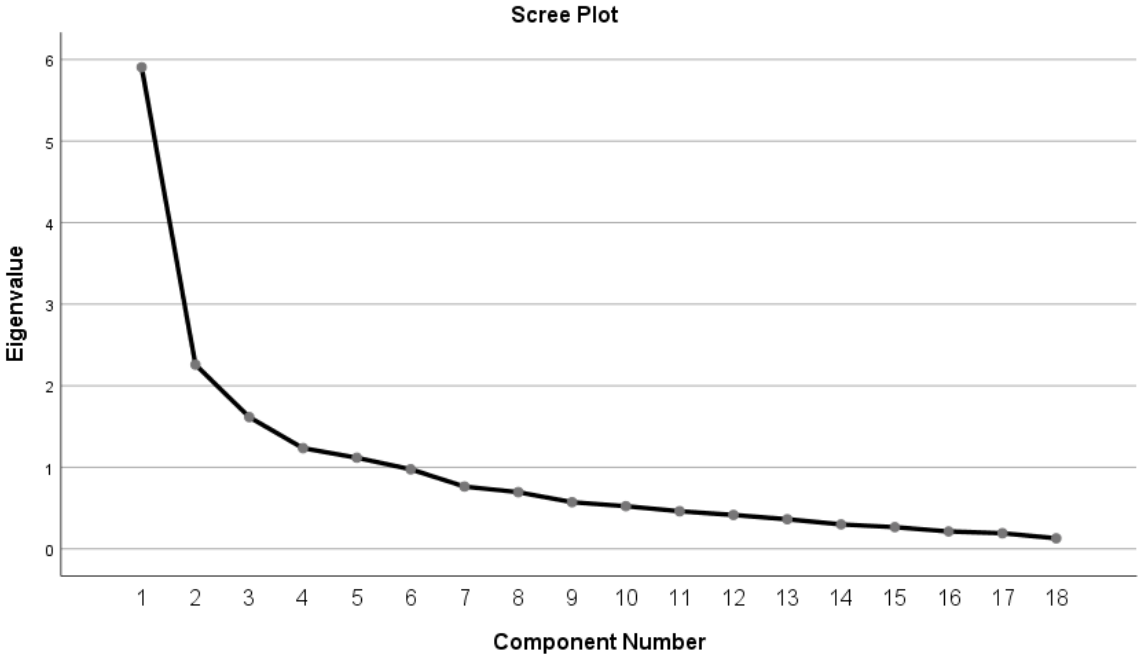

Figure 4.1 Catell's scree plot on cost management variables adopted by construction SMEs to achieve sustainable project success

4.6.1.3 Summary of factor analysis on cost management practices adopted by construction SMEs

A total of 18 variables were assessed to identify the most significant cost management modalities adopted by construction SMEs to achieve sustainable project success. This research adopts principal component analysis as a tool to perform factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were performed, as indicated on table 4.17. The Kaiser-Meyer-Olkin value was at 0.765 which exceed the suggested value of 0.60, as indicated by Pallant (2012). Bartlett's test of sphericity was significant, at p=0.000 which is less than the recommended value of p=0.005. Component loading was performed using component matrix on five components. As indicated on Table 4.19, the values are all greater than 0.30 and all the variables less than 0.30 were suppressed. Further, components that are most significant in construction SMEs cost management practices variables, the variable that is coverage on component 1 is "*effective cost control during the project delivery*", component 2 was on "*managing cost through work production*", component 3 was on "*subcontracting work to transfer financial responsibility*", while component 4 was on "*employees are trained on how to effectively manage the cost of project*" and component 5 was on "*effective administration of variation and contract instruction*".

Table 4.19 Component matrix[a]					
	Component				
	1	2	3	4	5
Ability to manage capital raised by owners of SMEs	.525	-.515			
Effective system for monitoring cash flow of business/project	.525	-.550			
Scope creep is well managed to avoid over-budget/escalation	.519	-.320		-.445	
Access to financial institutions for project funding	.774	-.348			
Timely progress payment by client	.627	-.453	.410		
Effective cost control during the project delivery	.775				
Precise cost estimating during the procurement stage of a project	.608	.453			-.369
Resource allocation on a project is well defined	.444				
Managing cost through project cost reporting	.550		-.498		
Managing cost through work production	.371	.612		.417	
Managing cost through effective allocation of budget to each activity	.681				
Procurement of materials based on comparative market analysis	.685	.307			-.323
Subcontracting work to transfer financial responsibility	.392	.398	.592		
Employees are trained on how to effectively manage the cost of projects	.568			-.550	
Money due to suppliers is paid on time to prevent any interest cost on projects	.394		.501	.390	.398
Appointment of experienced estimators who are conversant with the industry	.581		-.454	-.304	.348
Effective administration of variations and contract instructions	.608				.521
Effective circulation of drawings and specification among management team to identify abortive works	.460	.508			.380
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

4.6.2 Identifying the most significant time management modalities adopted by construction SMEs to achieve sustainable construction project success

This study adopts factor analysis as the way to determine the most significant modalities employed by construction SMEs to achieve sustainable construction project success. A total of 16 modalities were assessed to determine the most significant modalities. Factor Analysis (FA) was done to reduce and categorise the most significant modalities adopted by SME contractors. FA was also performed to validate the consistence of the quantitative analysis. Furthermore, principal component analysis was adopted to extract the variables.

4.6.2.1 KMO adequacy and Bartlett's test

For effective time management practices, the analysis of the obtained data revealed that the KMO measure of sampling adequacy was 0.706, which is greater than 0.60, and indicates that the sample was suitable for factor analysis. Also, the Bartlett test of sphericity was 358.166, and associated significance level was 0.000. KMO and Bartlett's test recommend that factor analysis could be conducted with the data, as presented on Table 4.20.

Table 4.20 KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.706
Bartlett's Test of Sphericity	Approx. Chi-Square	358.166
	Df	120
	Sig.	.000

With the adoption of principal component analysis, the factor analysis extracted five latent factors with eigenvalues greater than 1.0 from 16-time management practices adopted by construction SMEs at project level. Table 4.21 present eigenvalues of the extracted components as 4.953, 2.005, 1.484, 1.315 and 1.039, thus explaining 67.48% of the variance.

Table 4.21 Total variance explained by components

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings[a]
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	4.953	30.956	30.956	4.953	30.956	30.956	3.492
2	2.005	12.533	43.489	2.005	12.533	43.489	1.870
3	1.484	9.278	52.767	1.484	9.278	52.767	3.011
4	1.315	8.219	60.986	1.315	8.219	60.986	2.792
5	1.039	6.493	67.479	1.039	6.493	67.479	2.191
6	.934	5.839	73.318				
7	.814	5.086	78.404				
8	.717	4.481	82.885				
9	.618	3.865	86.750				
10	.477	2.984	89.734				
11	.405	2.531	92.266				
12	.334	2.091	94.356				
13	.293	1.832	96.189				
14	.268	1.675	97.863				
15	.188	1.177	99.040				
16	.154	.960	100.000				

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

In addition, to confirm the number of components to retain, Catell's scree test was adopted and the results are presented in Figure 4.2. This component indicates the most variance in the data set and thus components align with the results on Table 4.21.

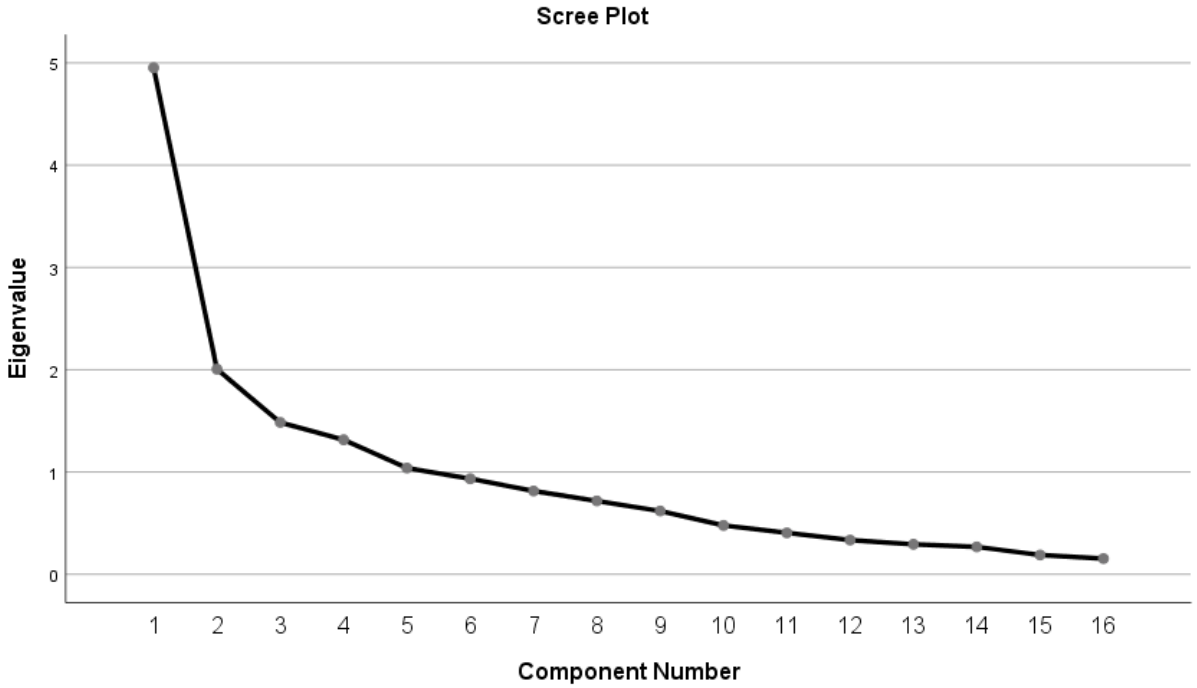

Figure 4.2 Catell's scree plot on time management variables adopted by construction SMEs to achieve sustainable project success

4.6.1.3 Summary of factor analysis on time management practices adopted by construction SMEs

As indicated on Table 4.22, the values are all greater than 0.30 and all the variables less than 0.30 were suppressed. Further, components that are most significant in construction SME time management practices variables: the variable that is covered on component 1 "*effective decision making by management team*", component 2 was on "*client changes during construction stage influence the project delivery*", component 3 was on "*effective coordination of available resources*", while component 4 was on "*effective management of subcontractors*" and component 5 was on "*project bonuses for fast tracking the project delivery*".

Table 4.22 Component matrix[a]

	Component				
	1	2	3	4	5
Administration of contract instruction on time	.515		-.362		.428
Availability of sufficient funds to avoid project time overrun	.707			.361	
Progress meeting with consultants to ensure regular monitoring of the progress of work	.325	.440	-.657		
Timeously requesting outstanding drawing information or specification	.636	-.422			
Effective management of subcontractors	.495		.394	.587	
Recruiting management team with relevant experience	.534		.354		-.444
Strategic planning to recover time lost	.556	.455			
On-time payment by client	.392	.494		.403	
Client project changes during construction stage influence the project delivery		.707			

Allocation of tasks to workers according to their skills and expertise	.436	.436			
Effective decision making by management team	.722			-.316	
Project bonuses for fast tracking project delivery	.608				.449
Common objectives with regard to achieving construction project delivery	.606	-.403		-.495	
Timeously response by the design team on requested information	.646	-.410			-.372
Time management on project is set as the culture of the company	.600		-.346		
Effective coordination of available resources	.627		-.483		
Extraction Method: Principal Component Analysis.					
a. 5 components extracted.					

4.6.3 Identifying the most significant quality management modalities adopted by construction SMEs to achieve sustainable construction project success

One of the important components of this study was to evaluate the most significant quality management practices adopted by construction SMEs. A total of 16 items was loaded together to determine the most significant modalities. Factor Analysis (FA) was done to reduce and categorise the most significant modalities adopted by SME contractors. FA was also performed to validate the consistence of the quantitative analysis. Furthermore, principal component analysis was adopted to extract the variables.

4.6.3.1 KMO adequacy and Bartlett's test

The test of the appropriateness of the data for factor analysis was performed in respect of effective quality management practices adopted by construction SMEs, with both KMO measure of sampling adequacy test at 0.644 and Bartlett sphericity at p=0,000, being significant. Thus, findings indicate that the data was suitable to perform factor analysis. The results are presented in Table 4.23.

Table 4.23 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.644
Bartlett's Test of Sphericity	Approx. Chi-Square	347.570
	Df	120
	Sig.	.000

Kaiser's criterion using eigenvalues was adopted and oblim rotation was used to extract the variables loaded on each component. Table 4.24 present 6 variables with eigenvalues greater than 1, with 4.791, 1.763, 1.449, 1.407, 1.176 and 1.027. These results add up to 72.58% of total variance.

Table 4.24 Total variance explained by the components						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.791	29.945	29.945	4.791	29.945	29.945
2	1.763	11.016	40.961	1.763	11.016	40.961
3	1.449	9.059	50.020	1.449	9.059	50.020
4	1.407	8.794	58.814	1.407	8.794	58.814
5	1.176	7.349	66.163	1.176	7.349	66.163
6	1.027	6.416	72.580	1.027	6.416	72.580
7	.929	5.806	78.385			
8	.763	4.767	83.152			
9	.508	3.174	86.326			
10	.476	2.973	89.299			
11	.422	2.637	91.936			
12	.389	2.434	94.369			
13	.326	2.040	96.409			
14	.247	1.543	97.953			
15	.193	1.205	99.158			
16	.135	.842	100.000			
Extraction Method: Principal Component Analysis.						

In confirmation of the number of components to retain, Catell's scree test was performed on the variables and the results, as indicated in Figure 4.3, which indicates the 6 components are retained.

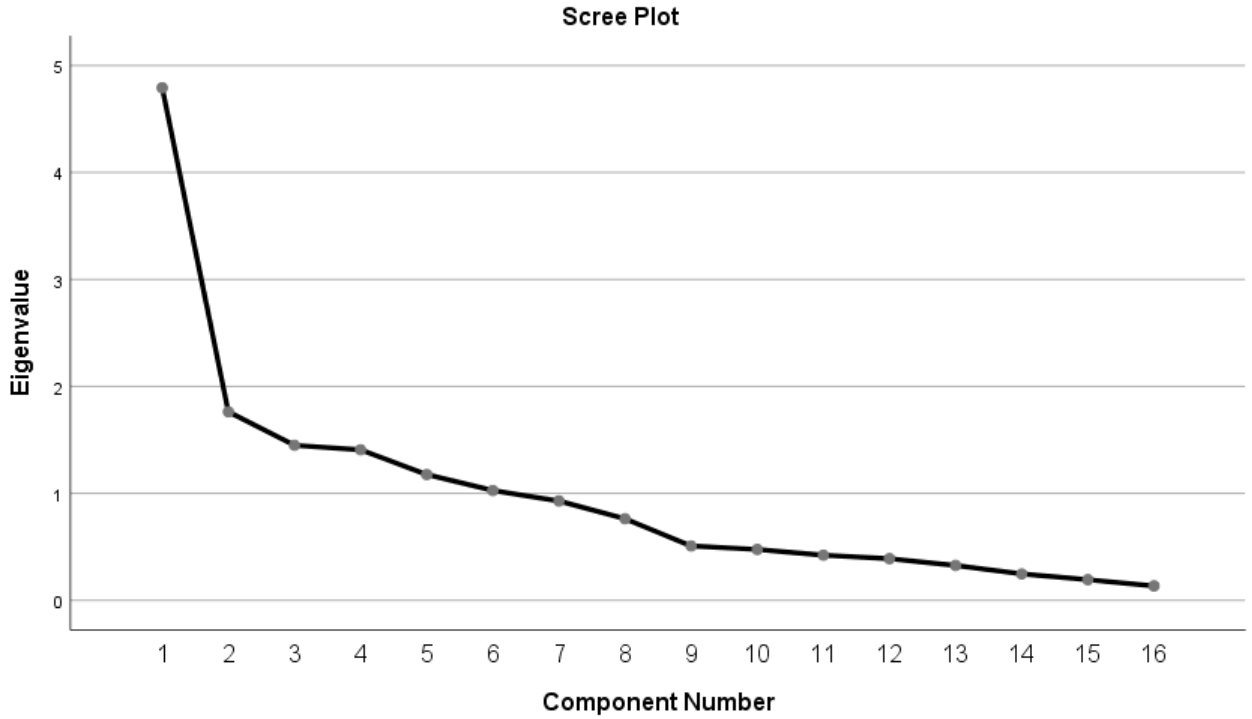

Figure 4.3 Catell's scree plot on effective quality management variables adopted by construction SMEs to achieve sustainable project success

4.6.3.3 Summary of factor analysis on effective quality management practices adopted by construction SMEs

It is evident from Table 4.25 that 6 components showed a number of strong loadings on component matrix, with most of the variables greater than 0.30, while all other variables less than 0.3 were suppressed. In addition, Table 4.25 also indicates that the variables fit well into components, with most variables greater than 0.30, which indicates a positive relationship between 6 components. It can be seen that components that are most significant in construction SME cost management practices variables, the variable that is covered on component 1 represent "*effective implementation of total quality management*", component 2 present "*clear working drawings supplied by the architect*", component 3 present "*the influence of management with regard to quality considerations on project delivery*", while component 4 present "*comply with international standard organisation for continuous quality improvement*", component 5 present "*quality function development*" and component 6 present "*quality management planning*".

Table 4.25 Component matrix[a]

	Component					
	1	2	3	4	5	6
Quality management planning	.534				-.445	.494
Measurement of quality throughout project life	.587					
Quality of design specification	.622	-.344			-.447	
Balance between owners' requirements and cost	.633		.543			
The influence of management with regard to quality considerations on project delivery	.438		.553	.377		
Projects executed in accordance with drawings and specifications	.478	-.431		.332		
Effective implementation of total quality management	.701		-.301			.326
Strategic implementation of quality management system	.669					
Benchmarking for quality management	.575		-.304	-.507		
Comply with International Standard Organisation for continuous quality improvement	.449		.314	-.623		
Quality function deployment	.577				.495	-.407
Commitment of top management regarding quality issues	.549	.320			.493	
Adopting or using appropriate construction methods and processes to achieve quality workmanship	.528		-.471	.425		
Adhering to specifications to achieve quality workmanship	.628					-.380
Clear working drawings supplied by the architect	.334	.718		.329		
Periodic request for quality inspection on project		.703	.433			

Extraction Method: Principal Component Analysis.

a. 6 components extracted.

4.7 Qualitative interview

The purpose of the interview is to validate the quantitative data obtained from SME contractors. Four construction sites were selected to conduct interviews and the

interviewees included construction SME directors, site managers and experienced site agents. The interview session conducted with each interviewee started by introducing the research title and the underlying purpose of the study. The data collection instrument was semi-structured and the interview questions were formulated using the quantitative results obtained after the analysis of the data. All the interviews were conducted using a recording device in order to record all the respondent's views. A copy of the interview questions can be viewed under annexure B.

4.7.1 Interview with Respondent A

4.7.1.1 Background information of the respondent and the firm

The interview was conducted with the company director on 05 September 2019 in King William's Town, a suburb of East London in the Eastern Cape Province, at 10:00 am in the construction site office during teatime. The interview lasted for about forty-four minutes, as the respondent responded to each of the question after reading by the interviewer from the copy. The respondent interviewed had twelve years of experience in the construction industry. The respondent had a degree in Forestry Engineering and was also involved in land optimization, which the respondent was championing for five years before moving to the construction industry. The respondent was the director of the company, which was operating under CIDB grade 4 GB (General Building) and involved with both capital and conventional contracts.

4.7.1.2 Effective cost management practices and effective management practices through budgeting in SMEs

With regard to effective cost management practices, the respondent stated that cost management practices depended on the environment in which SMEs operate, and pointed out that there are contract documents such as JBCC and NEC guiding the operations of SMEs. The respondent also mentioned the allocation of human resources according to their skills. The respondent was of the view that cost could be managed through self-designed Excel programmes, by looking at all the cost activities and monitoring the cost by benchmarking on construction programmes.

According to the interviewee, at the tender stage of the project, the company does a cost breakdown of each activity and once the contract has been awarded to the contractor, there is a review of the estimated cost. The respondent further stated that the use of cost activity reporting was the key element of cost management and that the cost report meeting was where the company reviewed the cost and discussed the way forward. The respondent further stated that timely payment by the client for the work done for the contractor to effectively manage cash flow.

The circulation of information is managed through a site instruction book, which is known as a contract instruction book, and where there is a complete new variation order which

was never originally part of the scope, the company will get quotations and do a precise pricing of that item for approval prior to the commencement of the activity.

4.7.1.3 Effective time management practices in SMEs

The respondent defined “planning” as time management practice, the planning of activities which are carried out directly with people who are directly involved in the project. The director also pointed out that planning is carried out through software and manual planning sheets. The programme is managed through weekly progress meetings, and if there are any changes to the programme, these get communicated to everyone involved on the project, who also check safety issues on project. The respondent also indicated that there is also a monthly meeting held with consultants and the contractor to evaluate the progress of work.

4.7.1.4 Time management practices through leadership, project work schedule and control in SMEs

The respondent mentioned that leadership qualities were looked at during the recruitment of the management team, and people are employed based on their skills and experts. The respondent was also of the view that a leader on a construction site has to be willing to work with the team and also to be responsible for controlling and managing the team.

4.7.1.5 Effective quality management practices in SMEs

According to the interviewee, quality was managed through clear working drawings and specifications issued by consultants, and also as a result of the accuracy from the team working with those drawings. The respondent also stated that the company carried out work inspections to ensure that the work complied with the standard prior to the quality inspection by the consultants. The respondent recommended that the company adopt the quality checklist to measure the compliance of the work. The respondent indicated that the company used the central system of deliveries coming on to site to check the quality of the work and the person who was responsible for the ordering of the material was the project manager on site.

4.7.1.6 Effective material management practices in SMEs

The respondent declared that material was managed through material recording of the material coming in and material going out, and the respondent also suggested that construction SMEs have a buying department in their organisational structure that is responsible for overseeing what is needed on site. The respondent also recommended that after recording the material the project manager do the reconciliation of the material.

4.7.1.7 Effective manpower management practices in SMEs

The respondent recommended that the labour or manpower is managed through effective allocation of labourers to each task and that labour should be managed by their supervisors, with allocation carried out based on their skills. In addition, the respondent

disclosed that project milestones are communicated with the foremen and that labour input on project gets recorded to ensure effective utilisation of labour.

4.7.1.8 Effective machinery management practices in SMEs

The director indicated that the plant is managed by employing a qualified plant manager, also the effective utilisation of hired plant on site by adopting correct sequencing of work to achieve sustainable success rate. The respondent recommended that the hiring of plant is determined through work study of the project, and the time available on the project to determine whether to buy or hire plant.

4.7.1.9 Effective strategic management practices in SMEs

The respondent recommended proper construction planning, including proper organisation of the available resources and monitoring of the progress during the project delivery. In addition, the respondent also emphasised that it was difficult to plan for someone, and recommended the importance of involving the person who will be involved on the activity. Lastly the respondent recommended integrated project management planning and the incorporation people who are directly involved.

4.7.2 Interview with Respondent B

4.7.2.1 Background information of the respondent and the firm

The second interview was conducted with the company director, on 06 September 2019 in Southernwood suburb of East London at 14:45 pm in the meeting room of the SME contractor during office hours. The interview lasted for about 70 minutes, as the respondent responded to each of the questions after a reading by the interviewer from the copy. The respondent had ten years of experience in the construction industry and held a BTech degree in both construction management and quantity surveying. The respondent's company was operating under CIDB 3GB and 1CE, and involved with renovation and alterations contracts, including housing and small road maintenance projects. The director further stated that most of the clients are financed by banks.

4.7.2.2 Effective cost management practices and effective management practices through budgeting in SMEs

With respect to effective cost management practices, the company used a spreadsheet for the activity rate build up. Most of the projects were priced using the schedule of quantities. The respondent recommended that the company adopt rate build-up as the basis of estimate for future projects. The respondent also suggested that spreadsheets be adopted as a tool for the record of the invoices on a month-to-month basis of which those recorded invoices indicates the lost or profit on project and subsequently forms the bases of cost reporting. The Excel spreadsheet is also used to base the respondent's financial year submissions to SARS at the end of the financial year. The respondent further stated that the rates are built based on supplier's quotations and a continuous

update of the spreadsheet is necessary for effective cost management. Furthermore, the respondent noted that good communication and relationships with supplies played a key role with regard to the completeness of the company's tender because of the discounts given by the long-serving suppliers. Nonetheless, the respondent also recommended that during the construction stage of the project, the actual cost be compared with the budgeted cost on Excel spreadsheets and that actual measured cost should also serve as the final account.

4.7.2.3 Effective time management practices in SMEs

The company normally planned the time per task using the estimated time and the experience on the task performance possibilities, which were used as the basis of the construction programme at the beginning of the project. With that accurate programme developed, the company was able to develop a projected cash flow for the project, and that construction programme was developed using MS Project. The respondent further noted that for some small projects, the company did not necessarily develop the construction programme, but rather that the project was built based on previous experience. Project planning was carried out through the integration of the team involved on construction sites and the team looking after sites were hired based on their qualifications and experience.

4.7.2.4 Time management practices through leadership, project work schedule and control in SMEs

At the beginning of each project, the company had a team-building session where the team discussed the scope of work and how to successfully deliver the project. The respondent indicated that in the event where they fall behind the programme they addressed those issues and increased the labour, also working on weekends and holidays to recover lost time. The respondent further stated that the key was to continuously monitor and revise the programme as work progressed and communicate the changes with the team. The respondent stated that every month during the construction stage, the company had a team-building meeting to reflect on the progress of the work and used those meetings to avoid previously- experienced mistakes. During the team-building meeting everyone was given the opportunity to advise. The respondent further mentioned that the company had no manuals of time management practices, as they were always rushing to perform the projects.

4.7.2.5 Effective quality management practices in SMEs

The director of the company oversaw the project quality, and also employed an experienced team. The respondent further stated that before the inspection carried out by the consultants, quality checks and calls for inspection were carried out. Through that inspection carried out by the director, the defect list would be given to the foremen for correction before the client or consultant inspection. The company developed a quality

worksheet for quality checks and that was used to measure the project quality. The company was also registered at NHBRC, which helped the company on quality management and gave advice to the company to carry out the tasks. The respondent further stated that the knowledge gained at school through construction technology was also vital to the company's quality management. The respondent mentioned that the working drawings are the ones that show the finished product of the project. There were dynamics when it came to the drawings circulated by the designing team, which at times made life difficult for the contractor at project level. In addition, the respondent indicated that designing team need to look on material that will be used when designing such as counting number of bricks that will be used on a linear wall to avoid waste. Before setting out on the project the company analysed the drawings and ascertained all the project requirements, as well as double-checking the building lines, and those drawings formed part of the contract document. The missing information on the drawings was timeously requested from the designing team. The company had no other tools to control the quality, other than a physical quality check on site. The company monitored the subcontractors through quality checks and withholding payment for poor quality.

4.7.2.6 Effective material management practices in SMEs

The respondent stated that at the beginning of each project there, a storeman would oversee the material recording on site, although the director was the one to quantify the material to order. The storeman kept the record of the available material. The material was ordered based on the quantities taken from the drawing, not from the BOQ, and the material was stored in the safe area and in a lockable area for small materials (door locks) for safety reasons. The respondent also indicated that the storeman was strictly responsible for the storeroom and keeping the record of the material. The storeman was to check the delivery notes of the material to ensure that the correct material was delivered on site and the storeman was given necessary training to be able to read the delivery notes.

4.7.2.7 Effective manpower management practices in SMEs

Furthermore, the respondent recommended that the project manager available on site record the labour available on site and also advise on the labour performance. The respondent also physically went to the site and observed the labour performance in order to be realistic on costing. The respondent stated that the company allowed the labourers when having a problem to speak to a director directly, and that they were all treated equally, with no favouritism. Labourers were employed based on their skills, and an unskilled labourer always worked with a skilled labourer to facilitate a transfer of skills and training while keeping the production on site. Labour was allocated based on the requisitions made by the site manager or foreman on site, and the skilled labour was

rotated from one site to another when required. The foreman on site was the one who grouped the labour in task allocation, based on their labour production observations.

4.7.2.8 Effective machinery management practices in SMEs

The respondent stated that the company normally hired the plant and only the small machines were owned by the company. The small plant was recorded by the storeman for all tools going out or transferred to other sites, and only the big machines like TLB that comes with the plant driver and for other plant there is plant operators available on site. The respondent stated that the hired plant was kept busy for the day on which is was hired.

4.7.2.9 Effective strategic management practices in SMEs

The director cautioned that, although the spreadsheet was effective, it required significant time, and stated that if software can be used at project level by SMEs to improve their sustainability, then the staff working at the company should be trained to keep up with the industry. The respondent further stated that for the company to function properly, he had to be hands-on and hire the right staff for the project. The company had achieved success through planning and time management and always doing the right thing first time to control losses and manage the project properly. Lastly, the respondent outlined the importance of powerful quality management systems and querying the information from the design team, which formed the basis of integrated management systems involving everyone on the project.

4.7.3 Interview with Respondent C

4.7.3.1 Background information of the respondent and the firm

The third interview was conducted with a company director, who was the sole management executive at the company, on 19 September 2019, in Butterworth at 2 pm in the construction site office. The interview lasted for about 28 minutes, as the respondent responded to each of the questions after a reading by the interviewer from the copy. The respondent had 15 years of experience in the construction industry. The respondent was the director of the company, which was is operating under CIDB 3CE and 2GB. The respondent had a Matric certificate (Grade 12). The respondent confirmed that the company was involved in alterations, renovations and roadwork.

4.7.3.2 Effective cost management practices and effective management practices through budgeting in SMEs

The respondent confirmed that the cost was managed through continuous work tendering and that the estimator had to visit the site prior to the pricing of the tender document to understand the scope of work, which assisted in accurate tender estimates. The respondent also pointed out that being always involved on project was the key with regard to cost management, as well as being hands-on and including time management and

guiding labour. The respondent also mentioned that costs were also saved through early project completion. The respondent pointed out that the company managed and controlled the cost through cost reporting on a monthly basis.

4.7.3.3 Effective time management practices in SMEs

The respondent pointed out that when the project fell behind, the company increased the labour working hours, including working on weekends to catch up on programme, and working on holidays.

4.7.3.4 Time management practices through leadership, project work schedule and control in SMEs

The respondent claimed that there was effective communication among the project team, which included the team on site and the directors of the company.

4.7.3.5 Effective quality management practices in SMEs

The respondent further pointed out that project quality was managed through precise reading and understanding of drawings before constructing a building. The respondent pointed out that the quality was managed through effective communication with the designing team regarding drawings and specifications.

4.7.3.6 Effective material management practices in SMEs

A 0% waste initiative was implemented on construction sites in order to reduce cost on material, which made up the lion's share of costs on a project. The respondent recommended that material be managed through effective site security on construction sites and that orders be managed and controlled by the site manager, including the ordering of materials.

4.7.3.7 Effective manpower management practices in SMEs

The respondent argued that labourers working on a site should be utilised effectively to increase their production on site, and that effective labour management on site included effective communication with labourers available, allowing them to share their experience and treating all labourers equally on project.

4.7.3.8 Effective machinery management practices in SMEs

Furthermore, the director pointed out that the plant was hired and managed through effective utilisation of hired plant. He pointed out that tracking the plant operators' time management in terms of working hours was effective.

4.7.3.9 Effective strategic management practices in SMEs

The director further argued that planning was the key strategy to deliver the project successfully, as well as company delivery of the project in accordance with client specifications. This ensured sustainable success rates on projects and effective production on projects.

4.7.4 Interview with Respondent D

4.7.4.1 Background information of the respondent and the firm

The fourth interview was conducted with the contract manager, who managed all the construction sites of the company, on 23 September 2019 in Mthatha at 8 am in the construction site office. The interview lasted for about 76 minutes, as the respondent responded to each of the questions after a reading by the interviewer from the copy. The respondent had 20 years of experience in the construction industry, and the respondent had a matric certificate (Grade 12), as well as some experience of tertiary education (incomplete qualification). The contract manager was also a registered project manager at SACPCMP since 2006. The respondent stated that the company was operating under CIDB 3CE and 4GB and confirmed that the company was involved with alterations, renovations and roadwork. The company was registered as a closed corporation.

4.7.4.2 Effective cost management practices and effective management practices through budgeting in SMEs

The respondent recommended that the company manage the cost through the capital raised by partners, and that when they had money they should invest in the company. The respondent indicated that there was a cost budget in the company as a backup of the company to recover cost during hard times in the construction industry. The cost was managed through the adoption of new technology. The respondent indicated that the company performed a site visit prior to the tendering in order to do a precise cost estimate of the tender by considering the scope of work and also benchmarking the company prices with big firms. The respondent pointed out that effective communication with the client and the designing team led to timely payments of claims by the client. There was periodic cost reporting to determine the cost risks of the project and so that the company could take corrective action to stay on budget.

4.7.4.3 Effective time management practices in SMEs

With regard to effective quality management practices, the performance in projects was tailored to meet the client's requirements in order to have a competitive advantage in the industry. Clear planning from the company using bar charts and/or construction software to set construction milestones was carried out. The respondent reported that the planning was always carried out in such a way that the goals set were realistic.

4.7.4.4 Time management practices through leadership, project work schedule and control in SMEs

The respondent also stated that the time on project was managed through effective communication among the team involved on project. In addition, the respondent stated that the drawings were an important part of project scope and periodic meetings (technical or progress) were held on site to address any missing information on the project. The company timeously requested the missing information and put timeframes on the request, as the information missing on the drawing was provided.

4.7.4.5 Effective quality management practices in SMEs

The respondent recommended that the company complied with quality standards such as NHBRC and that, if there were quality test that had to be carried out for material such as concrete, it should be documented. He further stated that the company timeously called the consulting team to come and inspect the work carried out and that the quality was benchmarked from the drawing and the standard to satisfy the designers and the client.

4.7.4.6 Effective material management practices in SMEs

The respondent pointed out that the company carried out planning to procure the material, as well as planning to effectively utilise the material available.

4.7.4.7 Effective manpower management practices in SMEs

In relation to manpower management the respondent stated that the employees were managed equally in the company, and everyone was treated equally. The labour was allocated based on skill and experience over each activity, and the labour was controlled by team leaders to ensure production on the project.

4.7.4.8 Effective machinery management practices in SMEs

The company managed the plant through the plant schedule to mitigate the cost and the company performed plant cost analysis to determine the cost effectiveness of hiring vs owning for each project.

4.7.4.9 Effective strategic management practices in SMEs

The respondent stated that the most strategic management practice was planning and project control, while the final step was the incorporation of the designers and the contractor's management team in planning. Lastly the respondent argued that it was very key for SMEs to consider location when tendering. The respondent advised that SMEs need to project planning when doing planning.

Table 4.26 Summary of qualitative interviews

Modalities'/Practices	Respondent A	Respondent B	Respondent C	Respondent D
Cost management Practices	Allocation of human resources Cost report meetings Periodic payments by the client	Clear rate build up Continuous revision of rates based on the market changes Discount negotiation from long-serving suppliers	Visiting the site to get accurate estimate	Capital raised by directors Adoption of new technology Clear and accurate estimate Cost reporting Timeous payment by client
Cost management practices through budgeting	Accurate pricing	Comparing actual cost with budgeted cost	Implementing zero waste on project to manage cost	Backup budget plan Benchmarking prices from big firms
Time management practices	Effective project planning Weekly progress meeting Effective communication	Using experience to determine activity duration Monthly progress meeting	Labour production Early project completion	Clear planning Realistic goals Construction drawings Periodic progress meetings
Time management practices through Leadership	Willingness of the team to deliver Employment of human resources based on their skills	Increasing labour and working on weekends to recover time lost Involving site management team on planning	Effective communication among the project team Increasing working hours to catch up on delays	Requesting outstanding information
Quality management practices	Clear construction drawings Quality checklist Central system of checking deliveries	Company quality inspections Comply with NHBRC quality requirements Building as per latest drawings Monitor subcontractor's quality	Construction drawings Effective communication with designing team	Quality compliance with quality standard Quality inspection Benchmarking quality with drawings
Material management practices	Material recording Reconciliation of the material	Material recording Material stored in a safe area Material is ordered as per drawings	Effective site security Monitoring and controlling	Material procurement Effective utilisation of material
Manpower management	Labour allocated to each task Project milestones are communicated	Monitoring labour performance Labour allocation to each task Training of unskilled labour	Effective labour production Effective communication with labourers Transfer of skills at project level	Labourers are equally managed Labour allocation
Machinery management	Hiring qualified plant manager Utilisation of hired plant Correct sequencing of work	Utilising hired plant Effective training of plant operators	Effective utilisation of hired plant Monitoring operators' working hours	Plant schedule Plant analysis
Strategic management practice	Project planning Involving line managers in planning	Hiring experienced staff Effective planning Effective communication on project	Effective planning Effective production at project level	Planning and control Considering site location when tendering
Others	None	Non	None	None

4.8 Discussion of findings

The main objective of this study is to establish effective modalities to achieve a sustainable success rate of SME construction project delivery, as indicated earlier in the study. This section of the thesis presents discussions relative to effective cost management practices, effective time management practices, effective quality management practices, effective resource management practices and effective strategic management practices that lead to sustainable success rates for SMEs. Effective project cost budgeting and leadership skills at project level are also discussed in the following subsections.

4.8.1 Effective cost management practices

The quantitative results reveal effective circulation of drawings and specification information being a notable effective cost management practice (MV=4.08). This result aligns with Maas and Gassel's (2005:440) assertion that effectiveness of circulation of information among the project team during the construction project delivery assists in terms of identifying changes on project in order to add the cost of new works.

Maas and Gassel (2005:440) add that the reporting process of site information is essential to developing a computing system to check the available project information, such as drawings and instructions. The finding is also consistent with that of Francis and Miresco (2011). Francis and Miresco (2011) reveal that the speed, clarity from the consultant and accuracy of drawing information issued ensures that both site and manager have the proper information as soon as they are available on site.

The quantitative analysis depicted in Table 4.8 also divulged that the effectiveness of managing cost through work production is the second most significant cost management modality, with a mean value of (4.07). The finding aligns with Kazaz and Ulubeyli (2007:2132), who reveal that improving productivity on construction through work production decreases the unit cost and also serves as the project cost indicator. Also, the appointment of experienced estimators is indicated as a significant SME cost management practice (MV=4.02). For SMEs to be successful on project, a proper project cost estimate is the key, as the project budget is drawn from the effectiveness of the estimator's cost estimate. This is corroborated by An, Kim, and Kang (2007:2573) and Sui and Wang (2013:86). For instance, An *et al.* (2007:2573) state that engaging an experienced estimator on a project is effective, especially in explaining the procedure for obtaining and estimating the cost of a new project, and utilises the specific knowledge attained from the previous contracts to estimate a cost of the new project. Sui and Wang (2013:86) also opine that the estimator must not only have the financial knowledge, but incorporate the financial knowledge with clear understanding of construction drawings,

construction material and construction methods. The analysis also indicates that subcontracting work to transfer financial risks (MV=4.00) is one of the effective cost management practice that may be adopted by construction SMEs. This result is supported by Ogbari, Ajagbe, Isiavwe and Turton (2015:4) who claim that subcontracting a portion of work benefits firms by reducing their operation cost and lowering the cost of overheads, thus reducing the cost of project administration.

The qualitative results reveal that effective cost management practices adopted by construction SMEs include periodic payment by clients, indicated by respondent A and respondent D in Table 4.26 as the tool used by SMEs to manage cost. This modality relates to timely progress payment by clients, with MV=3.75 in quantitative analysis Table 4.8. Respondent B suggested that discount negotiations from long-serving suppliers could be utilise as a modality for SMEs to achieve sustainable construction project success. This modality is supported by Zhong, Ding and Zhang (2007) who recommend that in the supply chain of construction, SME contractors and suppliers get together and negotiate during the tender stage of the project and ensure that the relationship is maintained between the two parties.

Respondent B also recommended the following modalities: clear rate build-up, continuous rate update based on market. These modalities relate to the appointment of experienced estimators, as discussed on quantitative findings Table 4.8. As indicated in Table 4.26, the qualitative findings revealed that visiting the site before the project cost estimate, this finding relate quantitative findings. However, respondent D recommended the following modalities: capital raised by directors, clear and accurate estimate, cost report and periodic payment by client. Clear and accurate estimation is discussed in quantitative analysis, while cost reporting relating to managing cost through project cost was reported with MV=3.93. This finding is supported by Adler (2009), who notes that SMEs need to adhere to a uniform procedure to monitor operations and changes in cash flow, as well as changes in financial status of the firm. SMEs adopt capital raised by directors to recover losses and keep the business sustainable. This confirmation is supported by San and Heng (2011): with construction SMEs lacking in ability to obtain finance from the financial institutions, SMEs adopt capital raised by directors as a tool to recover losses on construction projects.

Concerning factor analysis, effective cost control during project delivery was the most significant modality adopted by construction SMEs. This modality is in line with Elghaish, Abrishami, Hosseini, Abu-Samra and Gaterell (2019) who states that construction cost control structure must be adopted by SMEs to ensure that there is no missing profit in the

estimated cost. Also, managing cost through work production was a popular tool adopted by SMEs. this Modality is similar with that one of quantitative analysis with MV= 4.07.

4.8.2 SMEs effective cost budgeting

Among the cost management practices, SMEs managed cost through effective budgeting. As presented in Table 4.9, the quantitative findings indicate that accurate cost estimates, with a mean value of 4.17, was the most significant cost management practice that adopted by SMEs in order to remain competitive in the industry. This is corroborated by Cheng, Tsai and Sudjono (2010) who maintain that accurate cost estimation is fundamental in all engineering-related projects, and influences the project planning, bidding and also cost management or cost budgeting, as well as construction project management.

Avoiding waste on construction sites is the second most significant cost budgeting practice employed by SMEs with regard to effective cost management modalities. It is important to note that SME contractors that can boast zero percent waste on site and improved the work production, achieve this by sticking to their budgeted cost. Hence, economic and environmental benefits are gained through waste minimisation and recycling of material, which benefits SMEs in terms of cost reduction on construction projects (Begum *et al.,* 2006). Effective procurement strategy ranked third, with MV=4.03, and was a notable SMEs cost budgeting practice employed by construction SMEs. This finding is consistent with the normative literature. For instance, Arslan, Kivrak, Birgonul and Dikmen (2008:481) postulate that the procurement strategy for construction projects is a very significant decision for companies. Harris and McCaffer (2013) suggest that the project manager, along with the client, should take on the major task of preparing the project brief covering the project details such as performance criteria, budgeting, control and project reporting. Also, the budgeting planning, with MV=4.03, similar to effective procurement strategy, is significant for SME cost budgeting practice. This finding is bolstered by Nikitina, Litovskaya, Savinkova, Zinovyeva and Ponomareva (2017) who reveal that management budget planning requires an effective managerial accounting, planning of inventory, and financial resource flow of the company at all stages of the project financial cycle.

Qualitative analysis divulged that construction SMEs manage cost through accurate pricing (respondent A), comparing actual cost with budgeted cost (respondent B), implementing zero waste in construction sites (respondent C) and backup budget plans and benchmarking prices from big firms (respondent D), as indicated in Table 4.26. Accurate cost estimates relate to Table 4.9, effective accurate cost estimate with

MV=4.17, which is discussed in quantitative discussion. However, with respect to SMEs comparing actual cost with budgeted cost to manage cost through budget, this finding is similar to managing cost through project cost reporting, with MV=3.93 in Table 4.8. The qualitative results present that SMEs adopt zero waste in construction sites as a modality to manage cost. This finding is supported by Hosseini (2016), who reveals that construction SMEs employ resources efficiently by minimising waste and increasing profit in construction projects. Back-up budget plan is significant for effective budgeting, and this finding relates to effective budget planning, as indicated in Table 4.9. Respondent D advised SME contractors to benchmark their prices from big firms so as to effectively manage cost through budgeting. This finding is supported by Pollitt (2005) who argues that, for firms operating in construction, effective analysis of cost categories against similar functions and comparing with similar well established organisations is required.

4.8.3 SMEs effective time management practice

The quantitative findings revealed that effective progress meetings with consultants to ensure regular monitoring of work progress was the most significant effective time management practice, with MV=4.29. This finding parallels that of Emmitt and Otter (2007) who point out that meetings are used for different purposes, from teambuilding and maintenance through to discussions of progress, the resolution of arising problems and closure of tasks. Ludwig (2018) adds that each party working on a construction project has different expectations for how to gauge the project success, which is carried out through communication between all parties involved.

The quantitative results revealed strategic planning to recover time lost, together with effective subcontractor management, as the second notable time management practices employed by SMEs during construction project delivery, with MV=4.27. With regard to strategic planning Hazir (2015) opines that a strategic planning, monitoring and control system works to minimise time overrun from project plans and consists of identifying and reporting the project status and comparing the progress with the planned progress, including analysing the problems and implementing the corrective action. Regarding effective subcontractor management, Wang and Liu (2005) reveal that a good project management strategy is to pay more attention to subcontractors, to prevent any delay that might arise in construction projects. In effort with regard to delivering sustainable projects, SMEs rely on effectiveness of strategic planning and the effectiveness of management, as well as communication with subcontractors. The quantitative findings indicated the allocation of tasks to workers according to their skills and expertise as the third significant modality to be adopted by construction SMEs, with MV=4.24. This is corroborated by

Nagaraju and Roddy (2012), who note that in a construction project, each and every activity is allocated a specific amount of resources and must be completed within the available time in order for SMEs to successfully complete the project on time.

Qualitative analysis revealed that the following factors were significant: effective project planning, weekly progress meetings, effective communication (all from respondent A), using experience to determine activity duration, monthly progress meetings (all from respondent B), labour production, early project completion (all from respondent C), clear planning, setting realistic project goals and periodic progress meeting (all from respondent D). Qualitative findings reveal time management modalities adopted by SME contractors to achieve sustainable construction project success, as indicated on Table 4.26. Nonetheless, effective project planning, weekly progress meetings, effective communication and labour production confirm the results in Table 4.10 and 4.11. As regards using experience to determine activity duration, this is in line with Oztar and Okmen (2005) who refer to experience as the ability of the firm to schedule and control activities during sustainable construction projects. However, construction SMEs adopt setting of realistic goals for the team as a tool in order to complete the project on time, as indicated by respondent D in Table 4.26. This is corroborated by Hsiaw (2013), who points out that people react to goals in a way that is consistent with outcomes of the project, which is why the project management team need to set realistic goals for the team working on site.

Regarding factor analysis, effective decision-making by management is the most important modality adopted by SMEs to achieve sustainable construction project success. This modality is corroborated by Scherer and Schapke (2011) who notes that the core of construction project delivery relies on decision making taken by firms at management level. In addition, client changes during the construction stage influence the project deliver, hence, a well-known scope of the project SMEs are able to deliver the project. Demirkesen and Ozorhon (2017) reveals that the effective project scope management with limited project changes at project implementation stage has the direct impact on project outcome.

4.8.4 Effective leadership in SMEs

Among effective time management practices, construction SMEs manage time through effective leadership, work scheduling and control. As indicated in Table 4.11, the quantitative analysis signpost that progress meetings to resolve uncertainties, with MV=4.15, is the most significant leadership modality adopted by construction SMEs to

complete projects in time. This finding is supported by Maki (2015) who maintains that sustainable success is achieved through SMEs behaviour, interaction and communication in construction projects, and the clarification on issues relating to the project by different parties to share their knowledge.

Adequate sequencing of activities on site to avoid idle time is the second most significant time management modality of effective leadership. This finding correlates with Harris and McCaffer (2013), who argue that effective scheduling of activities forms the basic logic to achieve planning models and help the project manager in understanding the project and interrelationships between the major activities. Furthermore, Table 4.11 indicates that effective communication between the SME and the project design team as the third most significant leadership skill applied by construction SMEs, with MV=4.08. This finding is in line with normative literature. Ochieng and Price (2010) suggest that effective communication among project teams is the evidence that indicates that integrated team is significant with regard to the improvement of productivity. In addition, Baiden and Price (2011) conclude that effective communication adopted by construction SMEs and other parties involved in construction projects is central to effective performance with regard to fulfilment of different skills required in the construction industry.

With respect to effective leadership adopted by construction SMEs to achieve sustainable construction project success, SMEs employ the following: employment of human resources based on their skill, willingness of the team to deliver (respondent A), increased working hours, involving site management team in planning (respondent B), effective communication among the team (respondent C) and requesting outstanding information (respondent D), as indicated in Table 4.26. However, employment of human resources based on their skills confirms quantitative findings in recruitment of management team with relevant experience, with a value of MV=4.10. This finding is justified by Wright and McMahan (2011), who suggest that construction firms need to employ skilled human resources with multiple skills in order to fill the gap, and those individuals can be moved between the construction sites. The qualitative results revealed requesting outstanding information from the designing team as constituting the most significant tool adopted by SMEs to manage time in construction projects. In support of this finding, Higgins, Fryer, Stratton and Reginato (2012) opine that request for information as a tool for SME contractors, subcontractors and designing teams as too to record circulated information to achieving sustainable construction project success. Other modalities mentioned confirm quantitative results in Table 4.11.

4.8.5 Effective quality management practices in SMEs

The quantitative findings revealed clear working drawings supplied by the designing team as the most important quality management strategy employed by SMEs, with MV=4.29. This finding aligns with Lam, Chan, Chau, Poon and Chun (2011) who note that that drawings provide graphical information on physical arrangement, while specifications in the drawing indicate the direction regarding material, practices, personnel, equipment and workmanship, including tolerances, and should give clear information for tendering, construction and including handover requirements of the project. The quantitative results depicted on Table 4.12 revealed that the effectiveness of periodic requests for quality inspection is the second significant modality for construction SME quality management (MV=4.19). This finding is supported by Kurniati, Yeh and Lin (2015) who state that a consistent monitoring of quality to ensure that the project meets the requirements as per design is necessary. Also, the finding aligns with that of Wang (2008) who suggests that quality inspection should be an integral part of daily work, so that the project is recorded on the system daily and the progress of the project is documented. Also, effective implementation of total quality management by SMEs is the third most significant modality adopted by SMEs to manage quality in construction project, with MV=4.15. This finding is corroborated by Shahin and Dabestani (2010) who reveal that implementation of total quality management is comprehensive and requires SMEs to include top management support, strategy, continuous improvement benchmarking, customer focus, quality departments, quality systems, human resources management recognition and rewards, problem analysis, quality service technology, service design, employees and social responsibility of the SME.

The quantitative analysis also revealed benchmarking for quality management as the third most significant quality management modality, with MV=4.15, similar to implementation of total quality management. In support of the finding, Chan and Chan (2004) define benchmarking for quality management as the search for best quality management practices that lead to optimal construction project performance for the company.

The qualitative analysis highlighted SME contractors' quality management practices such as adopting quality checklists, complying with NHBRC quality requirements, effective communication with designing team and complying with quality standards, as indicated in Table 4.26. These modalities were taken from each respondent as most significant. With regard to adopting quality checklists, Ashokkumar (2014) reveals that contractors usually prepare the quality checklist in advance, and that it is completed by those who are carrying out the operations or monitoring the progress. Also, in support of complying with NHBRC

quality requirement, Emuze, Shakantu and Wentzel (2012) argue that quality is measured with regard to client satisfaction, and is based on the concept that clients' project satisfaction measures the difference between actual and desired construction projects. It is clear from Table 4.26 that complying with quality standards is important for construction SME quality management. The other qualitative findings from Table 4.26, such as clear construction drawing, monitoring subcontractors and benchmarking for quality confirm the quantitative results in Table 4.12.

In respect to factor analysis, SMEs adopt the effective implementation of total quality management to achieve project quality requirements. Khanna, Sharma and Laroiya (2011) notes that to implement total quality management at project level numeral factors has to be considered, factors like the commitment of the management team, the involvement of employees in quality planning and effective communication. On the other hand, FA reveals effective use of clear working drawings supplied by the designing team aligns with both quantitative and qualitative findings.

4.8.6 Effective resource management practices on SMEs

4.8.6.1 Effective material management practices in SMEs

Among the effective resource management practices, the effective use of material for the construction project contributes more to sustainable material management. As presented in Table 4.13, the quantitative findings indicate that the use of specified construction material in construction projects is the most important modality adopted by SMEs in sustainable construction projects, with MV=4.25. The specification on construction project forms the bases of contract which the SME has to comply with. This finding is justified by, Lam, Chau, Chau and Poon (2011) who note the significant material specification and promote the effective use of project specification by SMEs, as this forms the basis of contractual documents with regard to achieving project goals. The effective utilisation of materials during construction project delivery is the second important effective material management practice. It is significant to note that SME contractors who adopt effective utilisation of construction material in construction project do so to minimization project cost and increase production (Safiuddin *et al.,* 2010; Ahmadi & Al-Khaja, 2001). Effective material recording strategy ranked third, with MV=4.12, and is a notable material management modality adopted by SMEs. Mikulakova, Konig, Tausche and Beucke (2010) support this finding, arguing that most material management system utilise material recording techniques.

Quantitative analysis suggested that SMEs adopt material recording, safe storage of material, monitoring and controlling material and material procurement strategy in order to achieve sustainable construction project success. As indicated in quantitative analysis, material recording is significant for SME contractors' effective material management strategy, indicated in Table 4.13 with MV=4.12. Qualitative findings also revealed effective monitoring and controlling of material as a tool used by SME contractors to manage material. This result correlates with Omar, Mahdjoubi and Keder (22018), who point out that monitoring and controlling systems assist project managers to see the progress of the project and identify potential delays, as well as take corrective action to prevent risks. In addition, the qualitative findings in Table 4.26 indicate effective material procurement as the significant strategy adopted by SMEs. Arbulu, Ballard and Harper (2003) reveal that material procurement includes functions like identifying, acquiring, distributing, and disposing of materials on construction projects.

4.8.6.2 Effective manpower management practices in SMEs

The quantitative results revealed that SMEs effectively manage all workers equally to prevent conflicts on construction projects in order to manage the manpower in construction projects, with MV=4.29. The result aligns with that Lil (2008) and Loosemore, Dainty and Lingard (2003), who reveal that simulation of human resource management increases the possibility of production on construction sites. Also, the involvement of the team leaders in allocation of labour is the second most significant modality in manpower management with MV=4.24. Raiden, Dainty and Neale (2004) as well as Chang (2014) support this finding, noting that the fundamental requirement of selecting the team in construction is involving the team leaders in the team deployment to select the team members carefully on the basis of their skills and personality. Senaratne and Samaraweera (2015) add that allowing the management to perform to the best of their ability and inspiring them to cooperate when necessary is a major key to success in construction project delivery. Support of employee values and beliefs in order to increase production in construction projects is the third important modality (MV=4.20) adopted by SMEs in their construction projects. This finding aligns with Abdul-Rahman, Wang and Yap (2010), who argue that the uniqueness of the construction projects and the need for alignment among the employees is achieved by ethics and professionalism in an integrated framework.

The qualitative findings revealed that effective manpower management practices can be achieved by construction SMEs through, to mention a few: project milestones being communicated, monitoring labour performance, transfer of skills during construction projects and labour allocation. In respect to communication of project milestones, the literature reveals that the subsections of the project work given to the operating time, need

to be clear and communicated with the team, so that the team can be responsible and accountable for the section of work (Van der Velde & Van Donk, 2002). However, construction SMEs also adopt monitoring labour performance as a modality to achieve sustainable success. This finding is supported by Al-Jibouri (2003) who recommends monitoring labour through the use of quantitative information in order to control the action of the labourers. To add more SME contractors, adopt skills transfer from the skilled labourers to unskilled labourers as modality to ensure availability of labours at all times during construction project delivery. This qualitative finding is corroborated by Karim, Hassan, Yunus and Hashim (2012) who state that contractors who create a flexible working environment on job sites allow workers to work together in performing duties and stimulate skills transfer, while increasing productivity benefits, as well. While effective labour allocation is the strategy adopted by construction SMEs to achieve sustainable construction project success. This modality is confirmed by quantitative results in Table 4.14, which indicate effective team leader involvement in labour allocation to promote labour production.

4.8.6.3 Effective machinery management practices in SMEs

The most significant machinery management modality is hiring skilled operators. As presented in Table 4.15, the quantitative findings indicate that 88.1% of respondents agreed that hiring skilled plant/machinery operators be adopted by SMEs as a tool to manage machinery. This finding correlates with Schutz, Huenges, Spalek, Bruhn, Perez and Gregorio (2013), who indicate that it is important for SMEs to adopt the project-based related skill when hiring personnel in order to address skills-related issues.

Effective plant/machinery maintenance plans during construction project delivery is the second most important machinery management strategy employed by SMEs to achieve sustainable construction projects. In supported of this finding, Harris and McCaffer (2013) suggest that SMEs, in order to effectively manage the plant, adopt an appropriate maintenance and servicing of the equipment, as well as a planned system of maintenance in terms of corrective, preventative and predictive plans. The analysis also indicates that continuous use of hired plant until booked off site is adopted by SME contractors as a modality to manage machinery, with MV=4.08. With respect to continuous use of plant, this result aligns with Kozlovska, Krajnak, Sirochmanova, Baskova and Stukova (2015) who state that project performance is achievable by means of the full use of machines available and with qualified control and maintenance. The quantitative analysis also indicates sequencing of activities on plant and equipment production, together with plant arriving in time to site from suppliers is the third most significant modality adopted by SME contractors, with MV=4.05. With regard to sequencing of activities, Randunupura and

Hadiwattege (2013) recommend that during the planning stage of the project, scheduling of activities that require plant are scheduled in such a way that the hired plant is kept at optimum levels of use to increase production on the project site.

The qualitative analysis confirmed that SMEs adopt machinery management practices to achieve construction project success. To mention a few modalities: correct sequencing of work, effective training of plant operator, monitoring operators' working hours and adopting plant schedule as a tool to effectively manage machinery in construction projects. With regard to correct sequencing of work, the normative literature by Alsakini, Wikstrom and Kiiras (2004) reveals that a plant schedule is recommended to be used by construction SMEs in order to indicate a detailed project plan. However, effective training of plant operators is supported by Obisi (2011), who suggests that training of employees should be an integral part of the SME contractor methods, with regard to improving the project performance in relation to project objectives. In addition, monitoring operators' working hours aligns with Harris and McCaffer (2013) who recommend improving the plant performance by monitoring the operators' working hours as the key to raising productivity which is related to the input.

4.8.7 Effective strategic management practices in SMEs

The quantitative results revealed integrated project management system strategy as a notable effective strategic management practice, with MV=4.95. This result aligns with Zeng, Shi and Lou (2007) who maintain that the integrated management system approach provides a tool that enables the SME to control and manage the impact of their collective decision. SMEs apply integrated management systems to achieve a sustainable success rate (Table 4.14 & Table 4.16). Forsythe, Jupp and Sawhney (2013) add that for SME contractors to realise the full potential of project success, a paradigm shift is required among the management team such that decision collaboration and integration must become the norm of the company.

The quantitative results depicted in Table 4.16, also identify strategies to adopt health and safety as the second most significant strategic management practice employed by construction SMEs, with MV=4.42. This finding parallels with Santos, Mendes and Barbosa's (2011) recommendation that creating health and safety strategic management by maintaining a safe working environment and ensuring that workers have high health levels, including protecting them from any hazards, illnesses or discomfort in the working area, and ensuring and efficiency of activities and process will lead to high levels of production in the work environment. Nonetheless, effective management of health and

safety is the third important strategy adopted by SMEs during construction projects, with MV=4.34. In support of this finding, Harris and McCaffer (2013) suggest that SME contractors need to effectively engage workers in H&S matters through management soliciting ideas and views for current working conditions and following up with regular updated actions and suggestions to improve safety. As indicated in (Table 4.11, 4.14 & 4.16) the quantitative analysis noted effective leadership skills as the most significant strategy used by SMEs to achieve a sustainable success rate. Ofori and Toor (2012) justified that SMEs effective leadership skills in construction project delivery enhance project goals and prevent conflict among the team.

The interviews held with four respondents revealed that SMEs adopt effective strategic management practices as a framework to achieve sustainable construction project success. Project planning was identified as the most significant strategy adopted by SMEs, as indicated by respondent A and respondent D. This finding corroborated with quantitative analysis summarised in Table 4.10. This finding is supported by Ranawat, Bhadoriya and Trivedi (2018) who point out that it is necessary to understand the project requirements from the beginning and initiate project planning which subsequently provides the right direction to the management team. However, hiring experienced staff to run the project is also a significant strategy employed by SME contractors in construction projects. Love, Holt, Shen and Irani (2002) justify this modality by stating that in the recruitment of personnel, SMEs need to employ management with relevant experience to undertake the construction project.

4.9 Chapter summary

This chapter presents an analysis of the collected data, presentation of the findings from the available data and discussion of the results attained from the findings. SPSS Software (version 25) descriptive statistics was adopted to analyse quantitative data.

The results were ranked hierarchically using the mean value to determine the most significant SME modalities to achieve a sustainable success rate during construction project delivery. With respect to effective cost management practices, effective circulation of drawings and specification information was the most significant modality adopted by SMEs. The results of Factor Analysis also revealed that effective cost control during construction project delivery was the most significant factor. Among the cost management practices, SMEs managed cost through effective budgeting. Table 4.9 indicates that accurate cost estimates, with mean value of 4.17, is a significant practice for SME cost management, as indicated in Tables 4.8 and 4.9. The findings reveal that SMEs use effective progress meetings with consultants to ensure regular monitoring of work

progress. The findings indicate SMEs adopt progress meeting to resolve uncertainties during construction project delivery to achieve sustainable success. In respect to FA, the results revealed effective decision-making by project teams as the most significant modality adopted by construction SMEs. The findings reveal that clear working drawings supplied by the designing team either the architect, the engineer or any other consulting team member lead to SMEs sustainable project success. Concerning FA, the findings agreed with clear working drawings supplied by architect as the most significant quality management strategy adopted by SMEs. The effective use of available material is indicated as the strategy used by SMEs to achieve project goals and SMEs objectives. Not arguable SMEs manage all workers equally to keep equality on projects and improve labour production. Almost all respondents indicate that hiring skilled operators to operate plant/machine in order to effectively manage operators time and increase production to achieve sustainable project success. Additionally, SMEs adopt effective integrated management system as the strategy to achieve sustainable success rates in project delivery.

CHAPTER FIVE

CONCLUSIONS, LIMITATIONS, AND RECOMMENDATIONS FOR FURTHER RESEARCH

5.1 Introduction

This chapter presents the conclusions of the research and highlights the limitations involved in this project, as well as the recommendations and areas for future research regarding modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa. The preceding chapters: revealed more details with regard to the aim and objectives of the study. The aim of the study is to establish SME modalities to achieve a sustainable success rate in South Africa. To achieve the aim of this research study, the following objectives were formulated:

- To identify effective cost management techniques to achieve sustainable construction project delivery by the SMEs;
- To identify the modalities to avoid time overrun on SME projects;
- To evaluate appropriate quality achievement techniques regarding project delivery;
- To ascertain the resource management techniques that would be employed to enhance success rates of SME contractors; and
- To establish and recommend effective modalities to achieve a sustainable success rate of construction project delivery by SMEs.

Further, in consideration of each of the abovementioned objectives, both quantitative and qualitative research approach, aided by administering questionnaire surveys as well as semi-structured interviews, were used to gather information from management teams of SMEs in the Eastern Cape. A summary of the findings with respect to SME modalities to achieve a sustainable success rate in construction project delivery is presented in Table 5.1.

Table 5.1: SME modalities to achieve a sustainable success rate in construction project delivery

SME project management concepts	SME management practices	Summary of the study findings
SME project management constraints	Modality one: SME cost management practices	Effective circulation of drawings and specification Accurate cost estimate Work production Avoiding waste on construction projects Appointment of experienced estimator Effective procurement strategy
	Modality two: SME time management practices	Progress meeting with designing team and progress meeting within the company to resolve uncertainties Strategic planning to recover time lost Adequate sequencing of activities Effective subcontractor management on construction sites Strategic communication with designers
	Modality three: SME quality management practices	Clear and detailed drawing supplied by the design team Effective request for quality inspections Implementation of TQM
SME Project resource management practices	Modality four: Effective material management practices in SMEs	SMEs uses specified material for construction SMEs apply the best use of available material during the construction stage of a project SMEs keep track of delivered material by doing recording schedule
	Modality four: Effective manpower management practices in SMEs	SMEs manage all workers equally to avoid any conflict on construction sites Project team leaders are involved in the allocation of building personnel SMEs support the values and beliefs of the employees to assure equality.
	Modality four: Effective machinery management practices in SMEs	Recruitment of skilled plant operators Effective maintenance plan, to keep record of the plant usage Effective utilisation of plant until booked off site
SME construction project management practices	Modality five: Effective strategic management practices in SMEs	Adoption of integrated project management system Adoption of health and safety strategies Effective health and safety management plan

5.2 Conclusions relative to SMEs modalities to achieve a sustainable success rate in construction projects

5.2.1 Effective cost management practices in SMEs

The identification of effective cost management techniques/practices was one of the modalities to achieve SMEs success rate in construction project delivery. To achieve significant results in respect of this objective, a review of the existing literature was performed and administration of research survey questionnaires was carried out to construction management teams, including interviews with selected members of management teams. Based on the quantitative analysis, the most significant cost management practices, in hierarchical order, include effective circulation of drawings and specification information (MV=4.08), effectiveness of managing cost through work production (MV=4.07), the appointment of experienced estimators (MV=4.02) and subcontracting work to transfer financial risk (MV=4.00).

The qualitative results were consistent with the quantitative analysis, as the respondents revealed that effective cost management practices adopted by construction SMEs include timely payment by clients, discount negotiations from long-serving suppliers, and accurate rate build-up and continuous rate update based on the market price, which is related to the appointment of experienced estimators, as discussed in the quantitative findings. In addition, the qualitative findings revealed that site visits prior to preparation of project cost estimates, capital raised by directors, and cost reports are the most effective cost management practices that could be adopted by construction SMEs in their quest to sustain their businesses.

Concerning factor analysis, effective cost management practices were categorised into five components, namely: effective cost control during project delivery, managing cost through work production (which is similar to both qualitative and quantitative findings), subcontracting work to transfer financial risk, training employees on how to effectively manage cost of project, and effective administration of variations and contract instructions.

In summary, the findings from this study reveal that some SMEs in South Africa use work production to manage cost during construction project delivery, while others believe that avoiding waste on projects leads to cost savings. In this research study, it is found that SMEs manage cost by appointing experienced estimators to ensure accurate cost estimate. Nevertheless, others believe that to achieve a sustainable success rate in construction projects, SMEs should adopt effective procurement strategies.

5.2.2 Time management practices in SMEs

In the objectives of this study, the second objective was to identify the modalities to avoid time overruns on projects. Among time management practices, progress meetings held between the contractor and the designing team is significant (MV=4.29), strategic planning to recover time lost (MV=4.27), similar to effective management of subcontractors (MV=4.27) with Std=0.69 compared to Std=0.71 for strategic planning to recover time lost and allocation of tasks to workers according to their skills and expertise (MV=4.24).

Concerning qualitative findings, the results align with quantitative analysis, as the respondents noted effective time management practices that are adopted by construction SMEs include effective project planning by the construction SMEs and effective progress meetings which relate to strategic planning to recover time lost. Furthermore, qualitative findings revealed the significance of effective communication between the SME contractor and the designing team, willingness of the team within the company to deliver and involvement of the management team on project planning. Also, increasing working hours to recover time lost on construction project and setting realistic goals for construction project are the most significant time management practices adopted by construction SMEs. In relation to factor analysis, time management practices were divided into five components, namely: effective decision-making by management team, client changes during construction stages influence the project delivery, effective coordination of available resources, effective management of subcontractors, and project bonuses for fast tracking the project delivery.

In conclusion, the findings from this research revealed that time management practices adopted by construction SMEs were: effective progress meeting and effective construction project planning. Nonetheless, some SMEs believe that time is managed through effective subcontractor management.

5.2.4 Quality management practices in SMEs

The evaluation of effective quality management practices adopted by construction SMEs in the literature was reviewed and both quantitative and qualitative research methods were adopted to evaluate the most significant quality management practices adopted by construction SMEs. Regarding quantitative analysis, the most notable effective quality management practices adopted by SMEs include: clear working drawings issued by the designing team (MV=4.29), periodic request for quality inspection of construction project (MV=4.19), and effective implementation of total quality management (MV=4.15).

In respect to qualitative findings, the results align with the quantitative analysis, as the respondents agreed with effective quality management practices adopted by construction SMEs, which include clear construction drawings which align with clear working drawings issued by designing team. Also, they felt that SMEs adopting central system for checking deliveries and complying with NHBRC requirements for quality management was significant. In addition, the respondents revealed that SMEs adopting quality inspections was important, and this related to the results from the quantitative analysis, namely periodic requests for quality inspections. The results from qualitative interviews revealed the significance of SMEs monitoring subcontractor work for quality compliance, effective communication between the contractor and designing team and benchmarking for quality with drawings.

The factor analysis categorised effective quality management into six components: effective implementation of total quality management, clear working drawings supplied by the architect, the influence of management with regard to quality considerations on project delivery, compliance with international standard organisation for continuous quality improvement, quality function development and quality management planning.

The findings indicate that periodic requests for quality inspection were the technique used by SMEs to effectively improve the delivery of construction projects in terms of quality. It was found that the SMEs adopt total quality management system during construction project delivery. Management team of the SME contractor is aware of the required quality on projects.

5.2.5 Resource management practices in SMEs

The study has revealed several resource management practices adopted by construction SMEs. SMEs' ability to manage their material, manpower and machinery is mostly significant with regard to project delivery. This objective is achieved through the review of the existing literature, and survey questionnaires were administered to SME management teams, as well as the interviews with selected members of management teams.

5.2.5.1 Material management practices in SMEs

Based on the quantitative analysis, the most significant material management practices adopted by construction SMEs to achieve a sustainable success rate included effective use of specified material for construction project (MV=4.25), effective utilisation of construction material (MV=4.19) and effective material recording (MV=4.12).

Qualitative findings were consistent with the quantitative analysis, as the respondents revealed that effective material management practices adopted by construction SMEs

include effective material recording, as discussed in quantitative findings, and reconciliation of the material. In addition, the qualitative findings revealed that materials stored in safe areas, material ordering as per issued construction drawings, effective site security, monitoring and controlling construction material, effective material procurement and effective utilisation of material could be adopted by construction SMEs to achieve sustainable construction project success.

5.2.5.2 Manpower management practices in SMEs

Towards achieving effective resource management practices, the second modality was effective manpower management practices. The quantitative analysis revealed the importance of the following factors: that all workers are managed equally to prevent conflicts (MV=4.29), team leaders are involved in decision-making regarding labour allocation (MV=4.24) and the SME contractors support employee values and beliefs (MV4.20).

The qualitative findings align with the quantitative analysis, as the respondents noted that the effective manpower management practices adopted by construction SMEs involve: labour allocation to each task, and during construction project delivery, project milestones are communicated with everyone involved. Also, the qualitative findings revealed monitoring labour performance during SME construction project delivery, SMEs adopt training of unskilled labour, effective labour production, effective communication between the management team and labourers and labourers are managed equally during construction project delivery are the modalities that could be adopted by construction SMEs to achieve sustainable construction project success.

5.2.5.3 Machinery management practices in SMEs

Based on the quantitative analysis on machinery management practices adopted by construction SMEs to achieve sustainable construction project delivery, the results include hiring skilled plant operators (MV=4.25), effective maintenance plans for regular maintenance of plant and equipment, (MV=4.08) and Std=0.77, and SMEs continuous use of hired plant until booked off site (MV=4.08 with Std=0.72) constitute the most significant strategies which could be adopted by construction SMEs during construction project delivery.

The quantitative analysis is supported by the results from qualitative interviews with respect to effective machinery management practices adopted by construction SMEs to achieve a sustainable success rate. The qualitative findings include: hiring qualified plant managers, effective utilisation of hired plant until booked off site (which aligns with quantitative analysis) correct sequencing of work to avoid plant stand-up time, effective

training of plant operators, monitoring plant operators' working hours and effective plant analysis.

In summary, the results of the study revealed that it was advisable for SMEs ensure that they continuously use the hired plant until booked off site, and the plan to do so is through the correct sequencing of activities to identify the areas in which they will require hired plant. The continuous use of hired plant is proven to be a significant strategy used by SMEs, similar to effective maintenance plans, but with some of the respondents slightly undecided with regard to continuous use of hired plant as the significant strategy used by SMEs to increase the project success.

5.2.6 Strategic management practices in SMEs

Based on quantitative analysis with respect to effective strategic management practices adopted by construction SMEs to achieve a sustainable success rate, these management practices include: integrated project management systems (MV=4.95), which was the most significant strategy adopted by construction SMEs, construction SMEs adopt health and safety strategies to achieve construction project success (MV=4.42) and effective health and safety management (MV=4.34).

The qualitative results were consistent with the quantitative analysis, as the respondents revealed effective strategic management included effective construction project planning as well as involving line managers in planning and construction programming. Also, the respondents revealed that hiring experienced staff is significant for construction project delivery, as is effective communication in construction project delivery, and effective production during construction project delivery. In addition, the respondent noted effective planning and control and that it was advisable for SMEs to consider site location during the tender stage.

In conclusion, the study recommended that SMEs adopt integrated project management systems, from upper divisions of the management to the lower level in order to achieve common project goals. As stated in 5.2.5.2, SMEs should involve everyone working on the project in decision-making to get the views of other project team members who are directly involved in the construction project. However, the project success does not only rely on project constraints and resources. Most respondents indicated that SMEs should adopt health and safety strategies in order to ensure the success of the project. There were a significant number of respondents who agreed on the adoption of health and safety strategy.

5.3 Operational framework for SMEs to achieve sustainable construction project success

Figure 5.1 below illustrates the operational framework for SME modalities to achieve sustainable construction project success. It can be seen from the figure that SMEs need to adopt these modalities from the tender stage till the project is complete. The figure indicates the most significant modalities in respect to cost management practices, time management practices, quality management practices, resource management practices and strategic management practices that could be adopted by construction SMEs to achieve sustainable construction project delivery.

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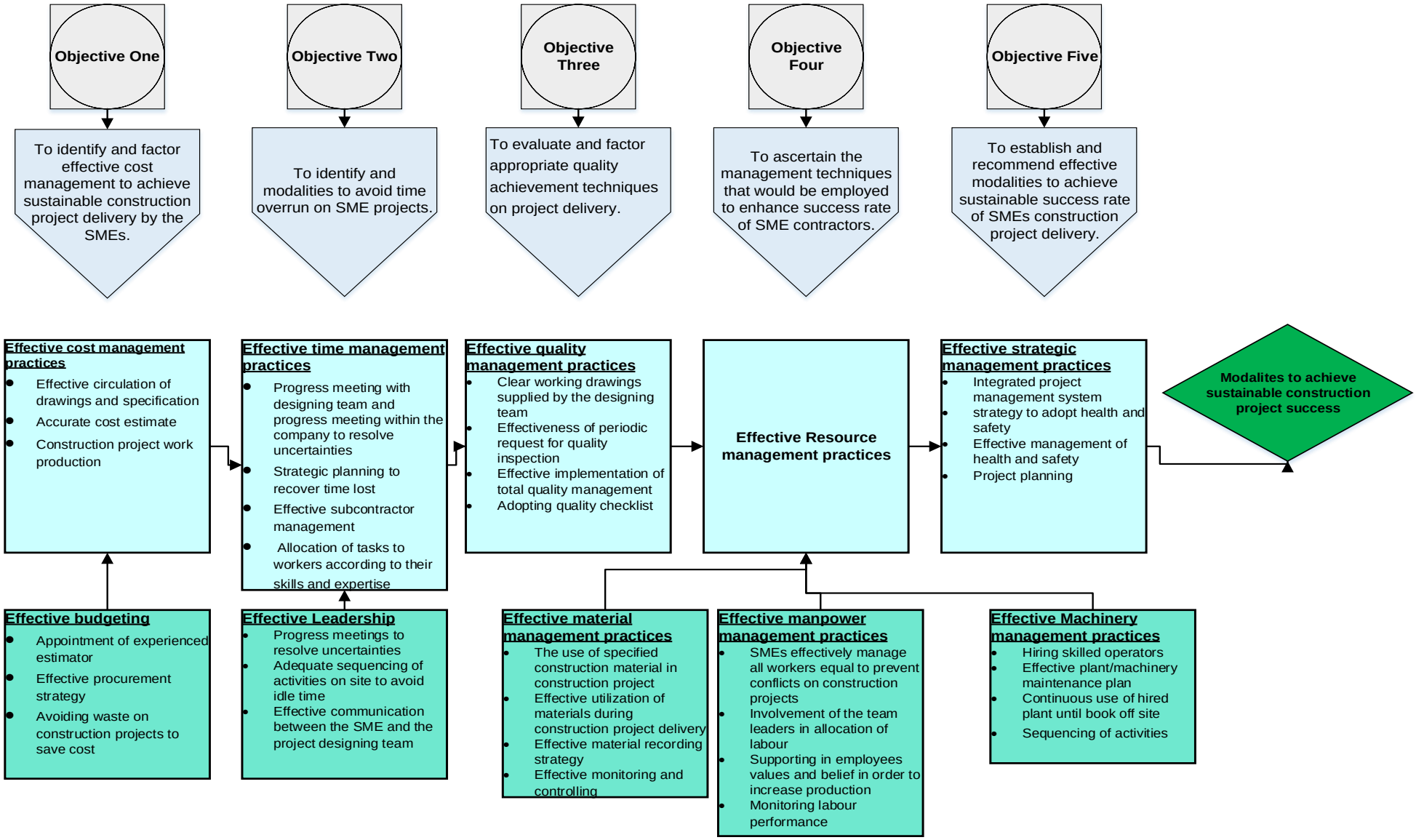

Figure 5.1: Operational framework to achieve construction project success

5.4 Limitations

The study was conducted in the Eastern Cape province of South Africa. This research project focuses on Small to Medium Enterprise (SME) contractors with CIDB grading between 1 and 4 who are registered in the Eastern Cape Province. It is also important to note that the collection of data from SME management teams was a challenging task, because the management teams of the SMEs were always busy and required to complete their projects within a tight schedule. For this reason, some of the respondents did not have time to provide proper responses and failed to successfully complete the questionnaires, which were discarded by the researcher. The research did not survey all provinces within South Africa, due to budgetary and time constraints.

5.5 Recommendations

In an effort to achieve a sustainable success rate for SMEs in construction, this study focused on cost management practices, time management practices, quality management practices, resource management practices (Material, Manpower and Machinery) and project management strategies. Based on the findings emanating from the survey, as well as the conclusions, the following is recommended:

- SMEs in South Africa should have a clear strategy regarding procurement practices based on their expertise, and tender for works that are within their jurisdiction, such as meeting the requirements relative to CIDB grading and other polices regarding SMEs which are in effect in South Africa;
- SMEs should endeavour to appoint qualified estimators to manage their tendering process, as this practice will assist in terms of preparing precise estimates for tendering purpose;
- With regard to the recruitment of personnel, SMEs should ensure that they employ experienced personnel, especially in the estimating department, which will increase the chances of securing work;
- During the construction stage of the project, the management team should ensure effective circulation of information, particularly drawings, among all managerial personnel working on the project for easy identification of variations and cost the abortive works if needs be;
- SMEs in South Africa should increase their production on construction projects by ensuring that there is progress made on their respective sites, to avoid construction penalties and save time;

- SMEs in South Africa should ensure that at least every month there is a meeting held with the design team or consulting team members in order to clarify the project direction and resolve any queries related to the project. The progress meeting will act as an effective platform for SMEs to communicate effectively with the design team members on projects, as well as ascertain the level of progress, which will subsequently assist them to stay on track;
- The findings confirm that SMEs should have a strategy available in the event of shortfall, to recover the time lost on construction projects. SMEs need to have corrective actions in place when the project falls behind the planned programme. This does not only require SMEs to have effective strategic planning to recover time lost during the construction stage of the project but also, SMEs could ensure that they timeously check on their subcontractors to achieve a smooth and sustainable project delivery;
- With regard to effective quality management practices, SMEs in South Africa should ensure that they use unambiguous drawings and specifications and keep updating the revised drawings, which requires SMEs to have good records in place. SMEs should implement total quality management at all levels of the company. This should be achieved by involving everyone working for the organisation being aware of the quality required. Thus, quality should be the culture of the company rather than an individual responsibility;
- During the construction stage of the project, SMEs should request periodic inspection from the consulting team in order to keep track of the project and avoid any defects at the end of the project, before achieving practical completion of the project. By asking for periodic project inspections, SMEs are increasing the chances of finishing the project on time.
- In terms of resource management by South African SMEs to achieve a sustainable success rate at project level, the following modalities should be prioritised by SMEs with regard to their sustainability:
- To ensure the success rate and sustainability of SMEs, SMEs should ensure that they utilise the available material effectively and avoid waste on construction sites by increasing production on site;
- With regard to the recruitment of personnel, SMEs should hire skilled personnel to operate plant and equipment on the construction site and ensure that there is a maintenance plan for continuous maintenance of plant;
- When using hired plant SMEs should utilise the hired plant at all times until booked off site to manage cost and increase the production on site;

- Nevertheless, this cannot be achieved by one level of personnel. SMEs should introduce effective integrated management systems in their construction projects to achieve a sustainable success rate in South Africa.

5.6 Further research areas

The literature indicates that most SMEs lack training and construction experience, which subsequently hinders their success. Therefore, further research should be conducted with respect to experience, competence and training of SME personnel on modalities that can assist SMEs to achieve project success in South Africa, particularly in the Eastern Cape province. This research study only focuses on modalities implemented by SMEs to achieve a sustainable success rate on construction projects. Further research is also recommended on developing decisions on project procurement, including expanding the dataset across the whole of South Africa.

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ANNEXURES

ANNEXURE A: QUESTIONNAIRE FOR THE STUDY

COVER LETTER REQUESTING PARTICIPATION IN THE SURVEY

Symphony Way
Bellville Campus
Cape Town
7535
Date: 03 June 2019

Dear Madam / Sir

Re: Modalities to achieve sustainable success rate of SMEs construction project delivery in South Africa

This survey is part of a research project aimed at meeting the requirements for a master's degree in Construction Management at Cape Peninsula University of Technology

The aim of this phase of the research process is to determine **Modalities to achieve sustainable success rate of SMEs construction project delivery in South Africa**

The questionnaire should **not take more than 20 to 25 minutes** to complete, and we would be grateful if you would endeavour to complete the questionnaire and return it on or before 21-June-2019 to:

Attention: Mr A. Sogaxa
per e-mail to: asogaxa@wsu.ac.za

Should you have any queries please do not hesitate to contact Mr A. Sogaxa at 061 393 7600 or per e-mail: asogaxa@wsu.
Please note that your anonymity is assured i.e. your individual response will not become public knowledge.

Thanking you in anticipation of your response.

Mr Athenkosi Sogaxa
Qualification (Construction Management) Candidate

Dr A.J Fapohunda PhD (Construction Management)
Main Supervisor

Dr E. Simpeh PhD (Construction Management

QUESTIONNAIRE SURVEY

SURVEY ON Modalities to achieve sustainable success rate of SMEs construction project delivery in South Africa.

Dear Respondent; *this questionnaire is an academic exercise investigating the survey on modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa*. ***Please do not put your name or any form of identification on the questionnaire.***

……

SECTION A: BIOGRAPHICAL INFORMATION

Indicate with an X in the relevant box and fill in the blanks when necessary.

1. **Please indicate your age group.**

18 – 25 26 – 39 40 – 49 50 – 59 60 & above

2. **Please indicate your relevant experience in your current position**

1-5 years 6-10 years 11-15 years 16-20 years 20 & above

3. **Please indicate your highest educational qualification**

Below Matric Matric Diploma Degree Other

If 'other', please specify.....

4. **Please indicate your role in the organisation**

Quantity Surveyor Project Manager Site Agent/ Forman Other

If 'other', please specify…..……

5. Please indicate your gender

Male Female

6. Please indicate which CIDB grading does your company fall under

CIDB grades	Less than or equal to	Tick one box
1	R 200 000	
2	R 650 000	
3	R2 000 000	
4	R4 000 000	

SECTION B – EFFECTIVE COST MANAGEMENT PRACTICES TO ACHIEVE A SUSTAINABLE SUCCESS RATE OF SMEs

1. The following are cost management practices that can be adopted and implemented by SMEs to achieve sustainable construction project success in South Africa. Please indicate your level of agreement using the following 5-point scale: **Strongly Disagree = (SD), Disagree = (D), Neutral = (N), Agree = (A), Strongly Agree = (SA)**

SMEs EFFECTIVE COST MANAGEMENT PRACTICES

No	Cost management practices	SD	D	N	A	SA
1	Ability to manage capital raised by owners of SMEs					
2	Effective system for monitoring cash flow of business/ project					
3	Scope creep is well managed to avoid over-budget/ escalation					
4	Access to financial institutions for project funding					
5	Timely progress payment by client					
6	Effective cost control during the project delivery					
7	Precise cost estimating during the procurement stage of a project					
8	Resource allocation on a project is well defined					
9	Managing cost through project cost reporting					
10	Managing cost through work production					
11	Managing cost through effective allocation of budget to each activity					

12	Procurement of materials based on comparative market analysis					
13	Subcontracting work to transfer financial responsibility					
14	Employees are trained on how to effectively manage the cost of projects					
15	Money due to suppliers is paid on time to prevent any interest cost on projects					
16	Appointment of experienced estimators who are conversant with the industry					
17	Effective administration of variations and contract instructions					
18	Effective circulation of drawings and specification among management team to identify abortive works					
No	SMEs Cost management through budgeting	SD	D	N	A	SA
1	Effective budget planning at tender stage					
2	Through effective cost schedule					
3	Avoiding wastage on construction site					
4	Effective procurement strategy					
5	Effective and accurate cost estimate					

SECTION C – TIME MANAGEMENT MODALITIES TO AVOID TIME OVERRUN ON SMEs PROJECT

2. The following are time management practices that can be implemented by SMEs to avoid time-overrun and achieve sustainable construction project delivery in South Africa. Please indicate your level of agreement using the following 5- point scale: **Strongly Disagree = (SD), Disagree = (D), Neutral = (N), Agree = (A), Strongly Agree = (SA)**

TIME MANAGEMENT MODALITIES TO AVOID TIME OVERRUN ON SMEs PROJECT

No	Time management modalities	SD	D	N	A	SA
1	Administration of contract instruction on time					
2	Availability of sufficient funds to avoid project time overrun					
3	Progress meeting with consultants to ensure regular monitoring of the progress of work					

4	Timeously requesting outstanding drawing information or specification					
5	Effective management of subcontractors					
6	Recruiting management team with relevant experience					
7	Strategic planning to recover time lost					
8	On time payment by client					
9	Client project changes during construction stage influence the project delivery					
10	Allocation of tasks to workers according to their skills and expertise					
11	Effective decision making by management team					
12	Project bonuses for fast tracking project delivery					
13	Common objectives with regard to achieving construction project delivery					
14	Timeously response by the design team on requested information					
15	Time management on project is set as the culture of the company					
16	Effective coordination of available resources					
No	SMEs leadership, project Work schedule and control	SD	D	N	A	SA
1	Adequate sequencing of activities on site to avoid unnecessary idle time					
2	Effective communication between the contractor and the design team					
3	Effective works schedule development and control					
4	Continuous monitoring at project level					
5	Effective on-time project monitoring					
6	Effective as built- project sensing					
7	Progress meeting to resolve uncertainties					

SECTION D – EFFECTIVE QUALITY MANAGEMENT PRACTICES TO ACHIEVE A SUSTAINABLE SUCCESS RATE OF SMEs PROJECT DELIVERY

3. The following are quality management practices that can be implemented by construction SMEs to achieve sustainable construction project delivery in South Africa. Please indicate your level of agreement using the following 5-point scale: **Strongly Disagree = (SD), Disagree = (D), Neutral = (N), Agree = (A), Strongly Agree = (SA)**

EFFECTIVE QUALITY MANAGEMENT PRACTICES TO ACHIEVE A SUSTAINABLE SUCCESS RATE OF SMEs

No	SMEs Quality management practices	SD	D	N	A	SA
1	Quality management planning					
2	Measurement of quality throughout project life					
3	Quality of design specification					
4	Balance between owners requirements and cost					
5	The influence of management with regard to quality considerations on project delivery					
6	Projects executed in accordance with drawings and specifications					
7	Effective implementation of total quality management					
8	Strategic implementation of quality management system					
9	Benchmarking for quality management					
10	Comply with International Standard Organisation for continuous quality improvement					
11	Quality function deployment					
12	Commitment of top management regarding quality issues					
13	Adopting or using appropriate construction methods and processes to achieve quality workmanship					
14	Adhering to specifications to achieve quality workmanship					
15	Clear working drawings supplied by the architect					
16	Periodic request for quality inspection on project					

SECTION E – EFFECTIVE RESOURCE MANAGEMENT TECHNIQUES TO ACHIEVE A SUSTAINABLE SUCCESS RATE OF SMEs PROJECT DELIVERY

4. The following are resource management practices that can be implemented by SMEs to achieve sustainable construction project delivery in South Africa. Please indicate your level of agreement using the following 5-point scale: **Strongly Disagree = (SD), Disagree = (D), Neutral = (N), Agree = (A), Strongly Agree = (SA)**

EFFECTIVE CONSTRUCTION RESOURCE MANAGEMENT PRACTICES

No	Material management practices	SD	D	N	A	SA
1	Adequate scheduling of construction materials					
2	Availability of materials					
3	Effective utilisation of construction materials					
4	The use of specified material for construction project					
5	Effective material recording strategy					
6	Integrated material management approach among the team on site					
7	Effective management of materials by the use of requisitions					
8	Workers awareness on budgeted material against available material					
9	Sustainable procurement system					
10	Effective processes for purchasing material from external suppliers					
11	Materials stored in safe areas					
12	Building relationship with construction material suppliers					
13	Material is ordered and delivered on time					
14	Effective leadership on site to avoid material wastage					
No	Manpower management practices	SD	D	N	A	SA
1	Incentives to motivate workers at all levels					
2	Allowing labourers to take initiative decision					

3	Training programme for all staff to ensure continuous growth of the company	
4	Labour wages is paid on time to avoid disruptions	
5	Labourers are transferred from one site to another to perform their trades when required	
6	Monitoring labour production on site	
7	All workers are managed equally to prevent conflicts	
8	All workers are happy on the job and there is no labour absenteeism on site	
9	The firm supports employees values and beliefs	
10	Artisans and unskilled workers take full responsibility of their duties	
11	Team leaders are involved in decision making of labour allocation	
12	Experienced labour to transfer skills	
13	Favourable working conditions on site	
14	Effective communication between management team and artisans	

No	Machinery management practices	SD	D	N	A	SA
1	SMEs owners knowledge concerning whether to hire or buy plant/machinery					
2	Effective scheduling and planning the use of plant/machinery					
3	Adequate use of plant and equipment by workers					
4	Management prioritise the importance of supplies on project delivery for hiring plant and equipment					
5	Training of operators to operate machinery/plant					
6	Sequence of activities on plant and equipment production					
7	Hiring skilled plant operator					
8	Plant arriving on time to site from suppliers					
9	Continuous use of hired plant until booked off site					

10	Effective maintenance plan for regular maintenance of plant and equipment	

SECTION F – STRATEGIC MANAGEMENT PRACTICES TO ENHANCE SMEs SUSTAINABLE SUCCESS RATE

5. The following are strategic management factors that can be implemented by SMEs to influencing sustainable success rate of construction project delivery in South Africa. Please indicate your level of agreement using the following 5-point scale: **Strongly Disagree = (SD), Disagree = (D), Neutral = (N), Agree = (A), Strongly Agree = (SA)**

SMEs STRATEGIC MANAGEMENT PRACTICES

No	Strategic management practices	SD	D	N	A	SA
1	Knowledge management is deemed to be a strategic asset					
2	There is a share of knowledge management					
3	Knowledge management based on organisational culture to stimulate employees					
4	Effective recruitment of competent management					
5	The involvement of executive management at all levels of a project					
6	Management team use their knowledge and experience to deliver projects					
7	Effective owners business information					
8	Available resource are used effectively on project					
9	Commitment of top management to project delivery in terms of cost, time and quality					
10	Firm's involvement in social development activities (e.g. CSR)					
11	Adoption of best project management practice by the management team					
12	Integrated project management system					
13	Effective project scope planning					

14 Effective scope control on project

15 Effective communication channel within the organisation

16 Effective goals for management team

17 Effective leadership skills

18 Effective health and safety management

19 Firm's adopt health and safety strategies

Do you have any comments in general regarding the modalities to achieve a sustainable success rate of construction project delivery by SMEs in South Africa?

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……
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……

Thank you for your kind cooperation.

ANNEXURE B: SEMI-STRUCTURED QUESTIONNAIRE

MODALITIES TO ACHIEVE SUSTAINABLE SUCCESS RATE OF SMEs CONSTRUCTION PROJECT DELIVERY IN SOUTH AFRICA

SECTION A: BACKROUND INFORMATION OF INTERVIEWEE

1. What is your current role or position in the company?
2. How long have you worked in the construction industry?
3. What is your highest educational qualification?
4. What is your company's CIDB grade?
5. What type of projects does your firm undertake?

SECTION B: SMEs MANAGEMENT PRACTICES

1. What are the most effective cost management practices / approaches adopted by SMEs in construction project to enhance their competitiveness and sustainability in the construction industry?

2. What are the most effective time management practices / strategies adopted by SMEs to avoid or minimize project delay to achieve a sustainable success rate?

3. What are the most effective quality management practices deployed by SMEs in project delivery to enhance their competitiveness and sustainability in the construction industry?

4. What are the management techniques employed by SMEs to effectively manage and monitor the following construction resources;

4.1. Material management?
4.2. Manpower management?
4.3. Machinery management?

What effective strategic management practice would you recommend to SMEs in project delivery to enhance their competitiveness and sustainability in the construction industry?

ANNEXURE C: DATA COLLECTION PERMISSION

nelson mandela bay
BUSINESS CHAMBER
Connecting business. Stimulating progress.

NELSON MANDELA BAY BUSINESS CHAMBER
KPMG HOUSE, NORVIC DRIVE, GREENACRES 6057,
PORT ELIZABETH
TEL: +27 (0)41 373 1122 | FAX: +27 (0)41 373 1142
EMAIL: info@nmbbusinesschamber.co.za

To whom it may concern

This letter confirms that Athenkosi Sogaxa from the Cape Peninsula University of Technology (student number: 212062662) was granted permission and assistance from my office in contacting and conducting interviews with members (i.e. member companies) of the Nelson Mandela Bay Business Chamber.

Kind regards

Jeremy Dobbin

Head of Research

Nelson Mandela Bay Business Chamber

ANNEXURE D: LIST OF PUBLICATIONS

JOURNAL OF CONSTRUCTION VOL.13 ISSUE 3

EFFECTIVE COST MANAGEMENT MODALITIES FOR SMEs TO ACHIEVE SUSTAINABLE DELIVERY OF CONSTRUCTION PROJECTS IN SOUTH AFRICA

Athenkosi Sogaxa[1], Julius Fapohunda[2] and Eric Simpeh[3]

[1]asogaxa@wsu.ac.za, [2]fapohundaj@cput.ac.za and [3]simpehe@cput.ac.za

[1,2,3]Cape Peninsula University of Technology

[1]Master student (0437094098), [2]Senior Lecturer (0219596007) and [3]Lecturer (0219596011)

ABSTRACT

Purpose - The purpose of this study is to propose effective cost management practices that could be adopted by SMEs to achieve sustainable construction project delivery.

Design - A mixed method research approach comprising quantitative and qualitative research was adopted.

Findings – The most significant cost management practices include effective circulation of drawings and specifications, effectiveness of managing cost through work production, the appointment of experienced estimators and subcontracting work to transfer financial risk. The study found that the quantitative and qualitative results were consistent.

Research limitations – The research focuses on SME contractors with the CIDB grading between 1 and 4 who are registered in the Eastern Cape province.

Practical implications - The results obtained could be adopted as a cost management tool for construction SMEs to achieve sustainable construction project success.

Value – The study makes contribution to the body of knowledge regarding the ongoing discourse about the performance of construction SMEs. The study provides insight appertaining to cost management modalities that will augment the performance of SMEs in project delivery.

Keywords – Budgeting, Construction project, Estimate, SMEs cost management and Sustainable success.

ASSOCIATION OF SCHOOLS OF CONSTRUCTION SOUTHERN AFRICA, 14TH BUILT ENVIRONMENT CONFERENCE, 20-21 SEPTEMBE, 2020, DURBAN, SOUTH AFRICA.

Effective quality management strategies for enhancing the success rate of indigenous construction SMEs in construction project delivery

Athenkosi Sogaxa[1], Eric Simpeh[2] and Julius Fapohunda[3]
[1]asogaxa@wsu.ac.za, [2]simpehe@cput.ac.za and [3]fapohundaj@cput.ac.za
[1]Walter Sisulu University,[2,3]Cape Peninsula University of Technology
[1]Master student (0437094098), [2]Lecturer (0219596011) and [3] Senior Lecturer (0219596007)

Abstract

Purpose - The purpose of this study is to develop effective quality management modalities that could be adopted by construction SMEs to achieve sustainable construction project success.

Methodology - A questionnaire was distributed to SMEs management team in the general building category registered under CIDB grade 1 – 4. To validate the questionnaire survey, interviews were conducted among purposively selected contractors who took part in the survey. The data was analysed using descriptive statistics and content analysis.

Findings - The findings revealed the most significant effective quality management practices for SMEs to promote sustainable success as clear working drawings, time to time request for quality inspection, effective implementation of total quality management and benchmarking for quality management. It should be noted that the quantitative findings were consistent with the qualitative findings.

Limitations - This paper focuses on SME contractors with CIDB grading between 1 and 4 who are registered in the Eastern Cape province.

Practical implications - The results obtained from this paper could be adopted as a quality management tool for construction SMEs to achieve sustainable construction project success.

Value - This paper is based on SMEs effective quality management strategies and provides more comprehensive effective quality management practices that could be adopted by construction SMEs.

Keyword: SMEs, Quality management, Sustainability, Project delivery and Client.