THE EVALUATION OF COMMUNICATION MANAGEMENT PRACTICES RELATIONSHIP WITH PROJECT OUTCOME IN ESWATINI (SWAZILAND) CONSTRUCTION INDUSTRY

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DEDICATION

To my mother, Idah Smangele Mavuso (nee Thwala) who independently raised me to be disciplined and confident to achieve the best in life.

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ABSTRACT

Communication management has long been acknowledged in the construction industry, as one of the essential knowledge areas of project management that influence the success of a project. However, there dearth consensus on the management of communication practices that are associated with effective communication management. Furthermore, the undertaking of communication management practices in construction projects are not given much priority.

Therefore, the intention of this research was to establish the communication management practices that influence project outcome in Eswatini (Swaziland) and propose a relationship model amongst the two. To achieve the study purpose, a critical analysis of literature on the challenges of implementing communication management practices and the benefits of using communication management practices was conducted. Further, evaluation was carried out on the communication management practices as well as the communication management practices relationship with project outcome.

A quantitative research paradigm was implemented, employing survey questions to collect data. A pilot study was conducted among 30 construction stakeholders. They represented the characteristic of the study population of construction industry council stakeholders of Eswatini (Swaziland). An entirety of 387 questionnaires were sent out crucial to the study, however only 86 were returned of which 66 were considered appropriate representing a 22.22% response rate. Data analysis was achieved using descriptive and inferential statistics with the Statistical Package for the Social Science (SPSS) version 25 software.

Spearman's rank order correlations were applied to ascertain the relationship of communication management practices and project outcome. Principal axis factoring was employed to interpret correlations amongst variables and analyze the best fit data from underlying hypothesized constructs of challenges of implementing communication management practices and benefits of using communication management benefits. The analysis further explored the communication management practices and project outcome. In addition, the mean score rating was used to determine the degree of agreement based on the Likert scale questionnaire responses.

Empirical findings from the nine hypotheses tested, established three significant relationships, i.e. information technology (IT), communication planning (CP) and clear channels within organization structure (COS) correlated with project outcome (PO).

This study further took cognizance of the challenges of implementing the practices of communication management and the benefits of employing the communication management practices in construction projects in Eswatini. In relation to the postulated fifteen variables of challenges of communication management practices, it was established that challenges were defined by three factors i.e. personal interaction difficulties (PID), personal behavioral problems (PHP) and personal cultural problems (PCP). It was further established that the respondents were neutral regarding the challenges stifling communication management practices. The benefits of using communication management practices was explained by two factors derived from eleven variables postulated in the review of literature. These comprised of organizational communication benefits (OCP) and project communication benefits (PCP). The respondents agreed that these benefits are achieved when construction communication management practices are implemented in the construction project.

In conclusion, this study provides construction stakeholders in Eswatini with critical information on the challenges they should be aware of which pose a risk to the implementation of communication management practices. Further, the study suggests the benefits of using communication management practices. In addition, the study provides the communication management practices that have positive relationship with project outcome in construction projects in Eswatini that the stakeholders should observe.

KEYWORDS: Communication management, communication management practices, construction industry, construction projects, project management, project outcome

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LIST OF ABBREVIATIONS

CIC	Construction Industry Council
CI	Construction Industry
CIDB	Construction Industry Development Board
CM	Construction management
CT	Communication technology
EFA	Exploratory factor analysis
FA	Factor analysis
GDP	Gross Domestic Product
ICT	Information Communication Technology
IT	Information Technology
KMO	Kaiser – Meyer – Olkin
MRA	Multiple Regression Analysis
MS	Mean Score
PAF	Principal Factor Axis
PCA	Principal Component Analysis
PM	Project management
PMBOK	Project Management Body of knowledge
PMI	Project Management Institute
RICS	Royal Institute of Chartered Surveyors
EAAES	Eswatini Association of Architects, Engineers and Surveyors
SD	Standard Deviations
SPSS	Statistical Package for Social Sciences
STATKON	Statistics Consultation Centre
UCLA	Institute of digital research and education

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LIST OF PUBLICATIONS

1. Mavuso, S.M., and Agumba, J.N., (2016). Factors of communication management for successful project delivery in the Swaziland construction industry: In "Sea change: Navigating the waves of change" of the *9th Annual SACQSP Quantity Survey Research Conference*, 19 -21st October 2016, Port Elizabeth, South Africa.

2. Mavuso, S.M., and Agumba J.N., (2015). A conceptual model for communication management for successful project delivery in Swaziland construction industry: In *CONSTENG'15/11. Civil and Construction Engineering and Technologies Conference*, 4 -5 December 2015, Istanbul, Turkey, DAKAM (Eastern Mediterranean Academic Research Center).

3. Khanyile, S.M., Musonda I., and Agumba J.N., (2019). Challenges and benefits of implementing communication management practices for successful construction projects in Eswatini (Swaziland): In *13th Built Environment Conference. Association of Schools of Construction of Southern Africa*, 2-3 September 2019, Durban, South Africa.

DEFINITION OF KEY TERMS

Communication

Communication is defined to be a functional, dynamic and transactional process, where two or more individuals deliberately share meaning and promote understanding through sending and interpreting verbal and non – verbal messages (Louw *et al*., 2005; and Gamble *et al*., 1998, p.9).

Communication management

Communication management is described as a knowledge area that employs the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information (Čulo *et al*., 2010, p.230)

Construction industry

Construction industry is the construction of buildings, road, highways, and other infrastructure construction; and specialized trades (Szymanski 2006, p.1).

Effective communication

Effective communication means that information is provided in the right format, at the right time, and with the right impact (Priyadharshini *et al.*, 2015, p.1494).

Project communication

Project communication is the exchange of project specific information with the emphasis on creating understanding between the sender and the receiver (Priyadharshini *et al.*, 2015, p.1494).

Project communication management

Is the knowledge area that employs the processes required to ensure timely and appropriate generation, collection, distribution, storage, retrieval and ultimate disposition of project information (Čulo *et al.,* 2010, p.230; Gouder 2010, p.2 and Muszynka 2015, p.1361)

Project life cycle

Project life cycle is project concept, project definition, project implementation and project handover/closeout (Gunakaran 2016, p.6)

Project outcomes

Project outcomes is associated with the final performance outcome of the projects that is measured in accordance to but not limited to traditional indicators of time, cost and quality (Pinto *et al*., 1988, Crawford, 2002 and Prabhakar, 2008, p.4).

Stakeholders

Stakeholders are all those who have an interest or role in the project and or influenced by the project (Gunasekaran 2016, p.6).

CHAPTER ONE
INTRODUCTION

This chapter presents an introduction to the study focusing on communication management and project success. It discusses the problem statement, research questions, research hypotheses, research methods to achieve the aims and objectives of the study. Other sections covered in this chapter are the scope and limitations, assumptions, significance and the outline structure of the dissertation. The details of the objectives of the study are discussed in the subsequent chapters.

1.0 Background

The construction sector is increasingly complex making the management of construction projects challenging (Priyadharshini and Satheesh Kumar 2015) and involves a great level of uncertainty and risk (Gunasekaran 2016). With such high level of complexity of the construction sector, to meet specified project targets, communication becomes a major concern in defining the construction industry requiring attention (Aiyewalehinmi 2013). Communication influences most project activities and areas because managing any aspect of the project involves communicating within the project team or with external stakeholders (Muszyńska 2015 and Ziemba 2017). Thus, in recent developments in project management and construction management, communication management is a key area of knowledge for managers of projects and construction managers and becoming fundamental to the success of a project.

Effective communication continues to be a challenge in the construction industry (Helms 2017). Ineffective communication has been found to be the primary cause of at least a third of project failures (Project Management Institute, (PMI), 2013 and Mnkandla 2013). Priyadharshini *et al*., (2015) indicated that the ailing management of the communication process could promote demotivated personnel, project errors, delays in work progress and catastrophic performance in production. Furthermore, Olaniran (2015) study on the role of communication in the construction industry elucidates the effects of communication to be associated with instances such as inexperience of interpretation of working drawings, poor distorted information, unclear channels of information and late dissemination of instructions. According to (PMI, 2013) in project management, the communication is understood to be crucial to stakeholders as it has a positive influence on the project outcome, programs, portfolios and subsequent business success Further, Muszyńska (2015) described project communication as the life blood of project management leading to success in the business

world. In construction, communication is understood as the nerve system that makes it feasible for a multitude of people to do variety of tasks in collective and logical manner in a construction project (Aiyewalehinmi 2013). Arguably, it is also described as a soft skill that helps people including technically highly skilled personnel to achieve those construction and engineering goals (Aulich 2013).

However, reports on communication management practices in Eswatini construction industry revealed a dampening scenario. Communication seems very alien to quantity surveyors and land surveyors. They believe that the technical skills are more important than the element of soft skills amongst professionals (Eswatini Association of Architects, Engineers and Surveyors, EAAES, n.d.). Furthermore, inadequate communication is a challenge that causes inefficiency in the construction projects of Eswatini (Ayodeji, Aigbavboa and Dlamini 2017). It is imperative to indicate there is a lack of consensus on the communication management practices associated with construction projects.

Perumal *et al*., (2011) and Hoezen (2006) specified the need to identify appropriate communication management practices in the construction industry. Hoezen (2006) further suggested that communication processes are still far from optimizing their goals and hence the need for their improvement to reduce delays and lower expenses in construction projects. The current study finds it important to focus attention into understanding the status of communication management in Eswatini (Swaziland) construction with the aim of investigating the degree to which communication management practices have an impact on the project outcome and describing the relationship. It is anticipated that the findings will enlighten and prepare industry practitioners to perform communication management effectively. However, for entirely understanding the consequences for communication management, it is necessary to give priority at ideas and try to explain the terms (Ströh *et al*., 2001).

1.1.1 Communication management

Defining communication management requires one to understand and distinguish the two words, communication and management, since there is no singular definition of communication management agreed upon. Communication is the exchange of information between two parties (Gunakaran 2016). It can also be described as method whereby we allocate and transmit the significance to create a common understanding (Perumal *et al*., 2011). On the other hand, management is an art of achieving organizational objectives through the employees by identifying organizational and individual differences (Giritili *et al*., 2014 and Sahin *et al*.,

2006). Furthermore, management is understood as tool that ensures effective and efficient operations (Rimmington 2015). Management of communication is arguably a unique and vital knowledge area of project management (Project Management Institute (PMI), 2013). Furthermore, termed project communication management (Muszyńska 2015 and Gouder 2010). Study on the role of communication in management dates to the last ten years of the early twentieth century associated with the work of H. Mintzberg (1989) (Drączkowska 2015). The managing of communication is becoming more pertinent and valuable, furthermore understood that its main task is the preservation of relations and the advancement of interactivity (Ströh *et al*., 2001). Client communication educates managers on the project size, duration and cost demands whereas intra teams' communication allows the project manager to deal with the project's performance (Naqvi *et al*., 2011). Studies such as; "project management as communication management", (Drączkowska 2015), "effective project communication management" (Gouder 2010) highlight how critical the topic is to attain a successful project (Čulo *et al.*, 2010). Moreover, communication management, is shown to have strong interconnection to managing stakeholders', human resource, project inclusion and change. (Drączkowska, 2015). Henceforth, from a management research agenda, the summary of previous studies, supports the general view and vital position of communication management. Thus, from this perspective, it is imperative to comprehend the universal impact of communication management in the industry of construction.

1.1.2 Communication management in the construction industry

The dependence of effective communication is not unusual in construction (Pérez Gómez-Ferrer 2017). In Katz *et al.'s*, study (1978) cited in Pérez Gómez-Ferrer (2017) it is explained that without being able to communicate, it is likely that any modern organisation would come to an end. (Perumal *et al*., (2011) argued that full acknowledgment and commitment to enhance joint communication and information sharing through the project stages has had a significant impact on the mechanization method of construction projects in construction organizations. In respect to such stance ineffective communication has been concluded to be the primary course of one third of project failures (PMI, 2013). Kliem (2008) found that the likelihood of project success depended on the success of the communicators, where if there is an indication of poor communication, it is likely that their projects will have poor outcomes.

On the other hand, from PMI (2013) outlook, communicating effectively was cited to lead to several successful projects. Effective communication is understood to link the gap between project stakeholders, diverse cultural and institutional backgrounds as well as differing levels

of expertise that include various perceptions and relevance in project implementation and outcome (PMBOK 2008 and Drączkowska, 2015). Thus, research by Naqvi *et al*., (2011) discovered and clarified that the role of communication in construction becomes a matter of stakeholder communication management that guides all other roles and expertise from the commencement of the project through completion. Its importance should be exalted by most stakeholders in the project management area (Muszyńska 2015) and construction related field.

Most studies that have been reviewed in the current study, argue that effective communication management can impact project outcome. However, there is no consensus on the communication management practices that must be in place to impact positively project outcome. Each study had a different set of communication management practices. In relation to this observation, this current research tends to address this void in the Eswatini construction industry.

1.1.3 Context of communication management in Eswatini construction

Construction contributes to the socio-economic development of Eswatini (Swaziland) with representation of approximately 5% input on gross domestic product (GDP) (Construction Indaba Report, 2015). Its source of capital emanates from two distinguishable clients: the public sector of the government as the main contributor, along with a discrete, but growing private sector, which constitutes of real estate developers and investors (Mafusire 2014).

In a further review of Eswatini (Swaziland) economic performance, a survey report from the Ministry of Economic Planning and Development (MOEPD) along with Central bank, (2017), found poor communication infrastructure as one of the challenges facing businesses, hence hindering their economic growth. It was found that inadequate communication was one challenge that caused poor quality performance in construction projects (Ayodeji *et al.*, 2017).

As a result of these findings, it is apparent to undertake this study, in order to draw attention on construction communication in Eswatini (Swaziland) construction industry. It was considered that if poor communication was a problem in construction as a business, certainly efforts of understanding this phenomenon could possibly provide answers to ways of mitigating the challenge and identify opportunities for improvement.

1.1.4 Problem Statement

The construction industry in Eswatini is important to the GDP of the country. However, the industry has been challenged by projects failure as a result of communication breakdown. The

communication breakdown arises mainly from lack of consensus of the communication management practices that the industry stakeholders should observe to enhance the project performance outcome. Present study aims to evaluate the relationship of the communication management practices and project outcome.

1.2 Aims and objectives

The main objective of this study is to evaluate the extent in which communication management practices would affect project outcome in Eswatini with aim of proposing a communication management relationship model.

To achieve this aim, specific research objectives were considered as follows:

i. Assess the challenges of implementing communication management practices in the construction projects of Eswatini;
ii. Assess the benefits of using communication management practices in the construction projects of Eswatini;
iii. Determine the communication management practices used in the construction projects of Eswatini;
iv. Establish the relationship of communication management practices and project outcome in the construction projects of Eswatini.
v. Develop a model that depicts the relationship of communication management practices and project outcome in construction projects of Eswatini.

1.3 Research questions

The detailed research questions conveyed are:

i. What are the challenges of implementing communication management practices faced in the construction projects of Eswatini?
ii. What are the benefits of using communication management practices in construction projects of Eswatini?
iii. What are the communication management practices used in the construction projects of Eswatini?
iv. Is there a relationship between communication management practices and project outcome in construction projects of Eswatini?
v. What are the communication management practices that affect project outcome in construction projects of Eswatini?

1.4 Research hypotheses

The underpinning hypotheses stated are:

H_0: There is no relationship between communication management practices and project outcome

$H_{1:}$ There is a relationship between communication management practices and project outcome

The detailed hypotheses are determined in the literature review in chapter two.

1.5 Research Method

The research process adopted to achieve the aim and objectives of this research is illustrated in Figure 1 below

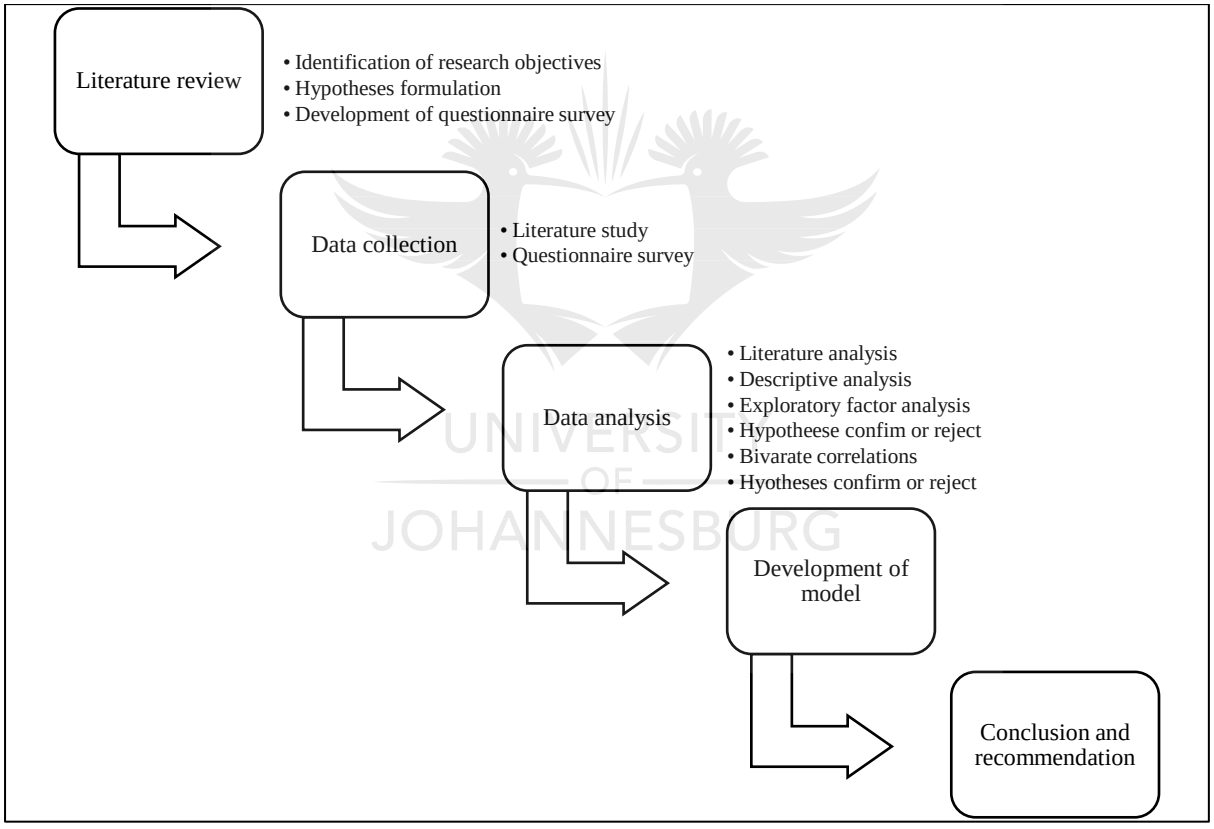

Figure 1.1: Research process (authors approach)

A quantitative study was performed using questionnaire survey. A survey methodology is the appropriate approach of testing theory and analyzing construct relationships. The study theoretical framework was associated with the theories of communication management. The primary and secondary data were from different sources. The primary sources were available from the questionnaire survey. Secondary information was retrieved from the internet and

included reports, conference proceedings, theses, journals, books and newspapers. The secondary sources assisted in understanding the research objectives and developing the hypotheses.

The respondents were sampled randomly from the Swaziland construction industry. Attention was given to construction professionals registered with the council of construction industry and practicing in the construction industry of Eswatini. This was done to gain representative sample of the population of construction consultants, contractors and allied professionals. Random sampling allowed equal opportunity for the participants to be included in the study. The analysis of results was undertaken using descriptive and inferential statistics. The descriptive statistics covered the frequency i.e. percentages and central tendencies i.e. mean values and standard deviation. On the other hand, inferential statistics define validity, reliability and correlations of the variables analyzed. Exploratory factor analysis (EFA) and spearman's rank correlations were undertaken using the Statistical Package for Social Sciences (SPSS) version 25. Detailed description and rationale for the choice of research method are presented in chapter three of this dissertation.

1.8 Assumptions of the study

The researcher presumes that construction stakeholders understand the communication management practices in use in their projects.

1.9 Significance of the study

One of the Eswatini (Swaziland) construction objectives is to support, determine and establish construction practices that promote an improved industry performance, for efficiency and effectiveness (Construction industry councils CIC, 2013). To promote that objective, it is necessary to carry out research focusing on communication management practices as previous research found communication management to impact project outcome (Chan *et al*, 2004, Prabhakar 2008, Walker *et al*., 2008, Čulo *et al*., 2010, Naqvi 2011, Garbharran *et al*., 2012, and Yong *et al.*, 2015).

There is little research focused on identifying and producing communication management practices and a model that illustrates the relationship with project outcome. Conducting this research within the Eswatini (Swaziland) construction industry, provides evidence of the communication management practices relationship with the project outcome. This will further afford the construction stakeholders a strategic benchmark for improving communication

effectiveness and project performance. Furthermore, Aulich (2013) contends that communication management has the potential to benefit the industry professionals as having for example a local communication document for recommendations, could significantly empower them to be better informed.

1.10 Delimitations of the research

A study was conducted in the Kingdom of Eswatini (Swaziland), and therefore, the results are delimited to the context of Eswatini. Comparative studies that may be conducted in other countries could yield different results. The findings of this research were from registered stakeholders of the construction industry council of Eswatini (Swaziland), unregistered participants were excluded.

1.11 Ethical consideration

Consent of this research study was taken into consideration with regards to integrity and ethical conduct from the University of Johannesburg ethical clearance committee. Attention was drawn into soliciting permission from the construction industry council (CIC) of Eswatini to conduct the survey with registered construction stakeholders. Approval was granted with clear information and understanding stating the benefits of this research and the intention to retain findings specifically for this research. Anonymity and confidentiality of respondents was assured with respect to sensitivity. Participation to the research study was voluntary.

1.12 Organization of study

The study was undertaken as follows:

Chapter One: Introduction

This section explores the setting of the study from understanding communication management and its impact globally and with Eswatini construction. The problem statement, objectives and research questions; research methods, assumptions, significance, delimitation, ethical consideration and organization of the study are also included in this chapter.

Chapter Two: Literature review

Chapter two provides the contextual understanding of implementing communication management challenges and the benefits of using communication management practices. The underlying practices of communication management and the relationship with project outcome also form part of this chapter. From this basis the hypotheses of this study are formulated.

Chapter Three: Research Methodology

This chapter presents the choice of research methodology and the rationale is also explained in detail. The research method adopted from literature, primary data gathering, and data analysis is clearly described in this section.

Chapter Four: Assessment and interpretation of survey results

Chapter four discloses the interpretation of the empirical responses collected during the survey. The outcome of the raw data from descriptive and inferential statistics are given in this chapter.

Chapter five: Results

Results from analysis of the findings of descriptive and inferential statistics related to challenges of implementation and use of benefits of communication management as well as relationship with project outcome are shown in this chapter.

Chapter Six: Discussion

Findings established relating to theoretical and empirical studies are mentioned in this section.

Chapter seven: Conclusion and Recommendations

This chapter discusses the conclusion drawn from the analysis in relations to the objectives of the study and endorses suggestion for future studies.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter contains the contextual understanding of this research and is classified in three sections. Firstly, a discussion and identification of possible challenges and benefits of using communication management practices is discussed. Secondly, a review of communication management practices. Finally, a discussion on the relationship of the communication management practices and project outcome is elucidated.

2.1. Challenges of implementing communication management practices

Since the construction industry is dynamic and project-oriented, problems arise as result communication difficulties (Gunhan *et al*., 2012). Rimmington *et al*., (2015) discovered that poor communication has been a deep-rooted issue stimulated by a problem in which construction is structured. Khoshtale (2016) explained the problem to be inspired by projects requiring specialist knowledge to work and coordinate with other individuals from different companies. Sustaining Khoshtale (2016) standpoint, Gititli *et al*., (2014) explicitly, advocated that promoting a project organisation culture that brings together stakeholders having different cultural values, personality types, styles and experiences, educational level, and business skills poses integration difficulties. Aulich (2013) attributed such difficulties to be enhanced by diverse character types and skills, often defined by the educational background they have acquired.

Furthermore, stakeholders in construction projects operate in changing relationships that are contractually driven, whereby various communication mediums are used at different project life cycles (Perumal *et al*., 2011). Also, amid project execution, several barriers to communication amongst stakeholders occur, creating great levels of uncertainties and risks regarding responsibility and scope of intentions of the building projects, consequently, leading to unsuccessful projects (Zulch, 2014). Some professional might not realize certain facets of a project in cases where the few details can be found resulting in ineffective communication that leads to demotivated personnel, design flaws, deceleration of whole work leading to closure. (Olaniran, 2015).

Peansupap (2005) found that low level of adoption on technology due to low levels of information technology (IT) skills prevents effective communication in projects. Luka *et al*., (2014) argued that inappropriate communication media for specific purposes/audience caused

this poor implementation. Maame (2012) found that poor listeners, information filtering, and language difficulties hinder business success. With regards to language difficulties, Hijiazi *et al*., (2008), expanded that the technical language used in transmittals increase conflicts and misinterpretations between different stakeholders. Adedapo, (2013) stated that bad writing can affect the level of work in projects with nervousness considered a barrier that results in mistakes if message conveyed is not structured.

Luka *et al*., (2014) presented that the lack or poor communication planning could increase the likelihood of disruption in implementing the project. Čulo *et al*., (2010) elucidated that inappropriate planning of communication leads to challenges like delays in delivering the message, mistakenly furnishing of confidential information and restricting necessary information to interested parties or stakeholders.

In another study, Giritli *et al*., (2014) found that loss of confidence, communication and cooperation results in conflicts amongst team members and can prevent the execution of the works in an effective and efficient way causing some staff to leave the job physically or psychologically. Maame (2012), opined that unclear channels of communication can impede project objectives. The opinion was backed by Perumal *et al*., (2011), sustaining that unclear channel of communication in the organization structure can result in project delivery failure.

Hoezen *et al*., (2006), found stakeholder's frame of reference has a great influence that can have opposing interests which could encourage hidden agendas, often leading to restricted communication. Gunasekaran (2016) further promoted various aspects of personal prejudice that could hinder communication. In agreement, Hijiazi *et al*., (2008) specified that usually various frame of references increase conflicts and misinterpretations between different stakeholders.

Adedapo (2013), stated detailed information could be misunderstood when workers feel a sense inadequacy. Molwus (2014) further advocated such ill feelings may lead to protests affecting the project. Hoezen *et al*., (2006) also discovered limited briefing, could negatively affect communication management practice. Correspondingly, Luka *et al*., (2014) clarified that unclear objectives provided during project briefing among the project advocates and their stakeholders lead to project setbacks and differences.

Louw *et al.*, (2005) and Gamble *et al.*, (1998) disclosed that the context of the environment could dictate the effectiveness of communication in that it can restrict a message depending on

the condition of the environment. The cause of communication failure includes physical, social, historical, psychological and cultural environments. In the case of the physical context, it was found that its influence could be negative in the content and form of communication as well as interpretation of messages.

Čulo *et al*., (2010) further corroborated that numerous project communication difficulties have taken place at boundaries. That is between organizations between departments within organizations, between teams within a department and finally between geographically and virtually dispersed teams. In the social context, the status of the relationship between communication parties involving their respective functions, standards and beliefs could have adverse effects on communication management practices, such as unfriendliness, informalities, and seriousness (Louw *et al.*, 2005 and Gamble *et al.*, 1998). Psychological effects on interpersonal communication management practices amongst individuals were also emphasized and were explained to cause moods and feelings stemmed from unfamiliarity that each person brings to a social encounter, unearthing further adverse communication consequences (Louw *et al.*, 2005 and Gamble *et al.*, 1998).

Additionally, Louw *et al.*, (2005) and Gamble *et al.*, (1998), explained that cultural beliefs have undesirable effects to communication management practice. Perumal *et al*., (2011) augmented that in many ways, intercultural communication may increase possibility of misunderstandings because there may be problems communicating caused by disagreements that strain the project. In conclusion, Gunasekaran (2016), supported that language and cultural barrier pose communication management practice challenges that impact completing projects on time with allocated budget and quality.

The information tabulated in Table 2.1, are the challenges stifling the implementation of communication management practices.

Table 2.1: Challenges of implementing communication management practices

Item	Challenges	Source
1.	Limited availability of information	Olaniran (2015); Luka *et al*., (2014); Čulo *et al*., (2010)
2.	Limited access to selected communication technology	Luka *et al*., (2014) and Peansupap (2005)
3.	Imposing a technology that is inappropriate to the project	Luka *et al*., (2014); Hijiazi *et al*., (2008) and Peansupap (2005)
4.	Poor listening skills of personnel	Maame (2012) and Čulo *et al*., (2010)
5.	Unclear and delayed instructions	Olaniran (2015); Zulch (2014); Maame, (2012) and Perumal *et al*., (2011)

Item	Challenges	Source
6.	Language difficulties	Maame, (2012) and Hijiazi *et al*., (2008)
7.	Poor writing skills of personnel	Adedapo, (2013) and Maame (2012)
8.	Personal prejudice	Molwus, (2014); Adedapo, (2009); Aulich (2013); Hijiazi *et al*., (2008)
9.	Preconceived and unwillingness to change beliefs	Gunasekaran (2016) and Hoezen *et al*., (2006)
10.	Misalignments of project stakeholder's visions	Zulch (2014); Luka *et al*., (2014) and Hoezen *et al*., (2006)
11.	Distance between the construction headquarters and construction sites	Gititli *et al*., (2014); and Louw *et al.*, (2005) and Gamble *et al.*, (1998)
12.	Unfriendliness and rigidness between project stakeholders	Gititli *et al*., (2014); and Louw *et al.*, (2005) and Gamble *et al.*, (1998)
13.	Hostile past encounters between personnel	Gititli *et al*., (2014); and Louw *et al.*, (2005) and Gamble *et al.*, (1998)
14.	Different moods and feelings of employees	Gititli *et al*., (2014); and Louw *et al.*, (2005) and Gamble *et al.*, (1998)
15.	Diverse cultures between project stakeholders	Gunasekaran (2016); Gititli *et al*., (2014); Perumal *et al*., (2011); Čulo *et al*., (2010); and Louw *et al.*, (2005) and Gamble *et al.*, (1998)

2.2 Benefits of using communication management practices

Currently, there is an awareness of effective communication practice for constructive communication management (Perumal *et al*., 2011). The PMI (2013) discussed the limited understanding of effective communication practices benefit in construction projects. To rationalize the uncertainties, the PMI (2013), established that high performing projects on effective communication yielded high benefits where 71% were on time, 76% were within budget and 80% met their original goals. Conversely, projects with minimal effective communication, the research found that a mere 37% were on time, 48% were within budget, and just 52 % met their original goals (PMI, 2013; and Norman 2017).

Molwus (2014) indicated that it was important to identify good communication management practices in early stages of a project to eliminate problems of achieving project success. Hence, Čulo *et al*., (2010), conveyed the view that communication provides project progress updates to everyone and facilitates a buy in and ownership of major decisions and milestones. Garbharran *et al*., (2012) and Gunasekaran *et al*., (2016), discovered that benefits of communication practice contribute significantly in bringing people together and deciding to make a project successful. Čulo *et al*., (2010) research realized that the process of communicating properly with a system of constant feedback amongst stakeholders, is a fundamental component necessary to maintain the support, commitment and loyalty of the project stakeholders. In agreement, Khoshtale (2016), advocated that this can be viewed more on implementation of comprehensive project delivery, where teams come to gather as an entity

producing timely deliveries, reducing costs and creating a conducive environment within the teams.

Perumal *et al*. (2011) described that communication practices promote collaboration and cooperation. The study discussed collaborative working to be a key element for the success of construction projects to be economical and on time. Studies by Faniran *et al*., (1999) found that communication practice could provide significant opportunities for preventing the impact stakeholder's disputes which is likely costlier if allowed to occur during a project.

Early literature equated output of good communication management practice with success, mainly in terms of time, budget and high-quality standards (Walker and Nogeste, 2008). Kleim (2008) substantiated that all processes and activities in construction projects centre on communication management practice since the project success depends on the quality of data as it does on completing the works on time and within budget. Following Kleim (2008) rationale, Melton (2007) explained that some projects have a defined and fixed target completion date and if this date is missed then the organisation may not be able to realize the benefits.

Henceforth, in renewed understanding it was determined that improving communication management practices not only maximizes success, but also minimizes risk (PMI 2013). Yong *et al*., (2015) related such risks to aspects of safety and health, functionality, user expectation and environmental performance. In terms of safety, Mitkus, (2013) illuminated that good communication management stimulates construction practitioners' awareness of their obligation and the procedures for health and safety to prevent concerns and clashes that may occur. Concurrently, Khoshtale (2016) also expounded that health and safety awareness promotes completions of projects without major accidents or injuries among the parties involved. This will reduce the cost of legal and insurance fees.

Finally, PMI's Pulse research (2013), concluded that effective communication to all stakeholders is the most crucial success factor in projects as companies that implement effectively communication practices are 1.7 times more likely to outperform their peers. Table 2.2 tabulates 11 benefits of using communication management practices.

Table 2.2: Benefits of using communication management practices

Item	Benefits	Source
1.	Ensures support, commitment and loyalty of project stakeholders	Gunasekaran *et al*., (2016); Garbharran *et al*., (2012) and Čulo *et al*., (2010)
2.	Encourages collaboration and cooperation	Khoshtale (2016) and Perumal *et al*. (2011)
3.	Reduces project stakeholder's conflicts	Faniran *et al*., (1999)
4.	Reduces delays and encourages completing work on time	Khoshtale (2016); PMI (2013) and (Walker and Nogeste, 2008)
5.	Reduces costs and encourages completing work within budget	Khoshtale (2016); PMI (2013) and (Walker and Nogeste, 2008)
6.	Improves the specified level of quality	Khoshtale (2016); PMI (2013) and (Walker and Nogeste, 2008)
7.	Ensures adherence to health and safety procedures	Khoshtale (2016) and Mitkus, (2013)
8.	Enhances the achievement of user expectations	Yong *et al*., (2015)
9.	Enhances specified level of environmental performances	Yong *et al*., (2015)
10.	Keeps everyone up to date	Čulo *et al*., (2010)
11.	Allows project stakeholders to take decisions	Garbharran *et al*., (2012) and Čulo *et al*., (2010)

2.3 Communication management practices

The previous sections provided the discussion and identification of possible challenges of implementing communication management practices and benefits of using communication management practices. This section reviews the communication management practices.

The literature implies that studies have been conducted focusing on management in communication practices (Chan *et al*, 2004, Shahin *et al*., 2006, Prabhakar 2008, Walker *et al*., 2008, Muller 2009, Čulo *et al*., 2010, Naqvi 2011, Ogwaueleka 2011; Garbharran *et al*., 2012, Ofori 2013 and Yong et al., 2015). However, in the process of focusing attention on to communication management practices, it appears that limited studies found it necessary to understand and come up with a comprehensive communication management practice. This study supports the view that there is clear basis of communication management practices from underlying communication management actions or measures or items. For this study the term measures will be used consistently. From this reasoning, a comprehensive review is made, and diverse aspects of communication management practices are studied.

Gunasekaran (2016) study in Sweden explained that the practices related to management of communication to be individual frame of reference, information and communication technology and well-planned communication system.

Zulch (2014) study in South Africa elucidated on communication as the foundation of project effectiveness and drew the following practices that stimulate management of communication to be communication skills, organizational structure, communication plan and lines of communication.

Aiyewalehinmi (2013) study of the construction industry in Australia identified various aspects of human communication practice to be human relationships and functional effectiveness; industrial conflict; integration between management and employees. Furthermore, line of power; communication policy; effective leadership communication style. Interaction and employee participation were also found to be communication practices.

Ho (2013) from Hong Kong provided an understanding of responses to effective communication management in practice to be based on attitudes and beliefs as well as clear communication channels, such as formal and informal , where the former is structured communication that follows an organisation chart and the latter is more of personal nature, not based on work position, such as through the grapevine.

Garbharran *et al.,* (2012) investigation in South Africa revealed that communication management practices that engendered communication to be a shared project vision and detailed communication plan.

Naqvi *et al.,* (2011) study in Pakistan concluded that stakeholder's communication management continues to be effective only on implementation of the following practices structured communication framework and inter/intra team communication management. Furthermore, on distributing of appropriate information and up-to-date information in a well-structured manner within a hierarchical reporting system amongst teams' members in a project.

Perumal *et al.,* (2011) from Malaysia summarized the following approaches to ensure effective communication as communication planning, proper and good communication skills and proper communication channels.

Čulo *et al.,* (2010) from a Croatian study identified the practices that influence communication management as being communication plan and technology.

Pietroforte (2010) advocates for governances and communication in construction practice which would include enabling communication and interactivity amongst project representatives through IT. Correspondingly, a study on Visual Reality Modeling Language

(VRML) by Hijiazi *et al.,* (2008) noted that stakeholders have turned to handling communications management practice using computer systems. The factors that were identified for communication management practice include information technology and computer system.

In another study Hoezen *et al.,* (2006) suggested that the effectiveness and efficiency of the building process is strongly dependent on the communication conformance. From the research on the problem of communication in the Dutch construction industry, the following practices were derived to be the stakeholders frame of reference, preparation of project brief and openness about the budget available including mutual responsibility.

In a study by Barakat (2009), argued that practices in which communication takes place may determine the most effective communication management practice. Louw *et al.,* (2005), Gamble *et al.,* (1998) further emphasized Kleim (2008)'s study by also revealing that communication does not exist in a void but takes place within context of environment such as physical, social, historical, psychological and cultural.

Peansupap *et al*., (2005)'s study in Australia, further augmented that to create new business opportunities, it is essential to have the practice of IT and Information Communication Technology (ICT) to enhance construction communication process.

Thus, the following important communication management practices are proposed and shown hereunder, in Table 2.3:

Table 2.3: Communication management practices

Practices	**Source**
1.Information Communication Technology	Gunasekaran (2016); Pietroforte (2010); Čulo *et al*., (2010) Hijiazi, *et al*., (2008); Peansupap *et al*., (2005) and Cheng *et al.,* (2004)
2.Communication skills or competence	Zulch (2014); Aiyewalehinmi (2013); and Perumal *et al*., (2011)
3.Communications plan	Gunasekaran (2016); Zulch (2014); Aiyewalehinmi (2013); Garbharran *et al*., (2012); Naqvi *et al.,* (2011) and Čulo *et al*., (2010)
4.Teamwork	Aiyewalehinmi (2013); and Naqvi *et al.,* (2011)
5.Channels within Organization structure	Zulch (2014); Ho (2013; Naqvi *et al.,* (2011); Perumal *et al.,* (2011); and Hoezen *et al.,* (2006);
6.Stakeholders Personality	Gunasekaran (2016); Giritli *et al,* (2014); Ho (2013); Garen (2012); and Hoezen *et al.,* (2006.)
7.Project briefing	Garbharran *et al*., (2012); and Hoezen *et al.,* (2006)
8.Context of an environment	Barakat 2009; Kleim 2008 and Louw *et al.,* (2005); and Gamble *et al.,* (1998)

An outcome of the literature deduction in this section, conceptualized eight aspects as practices of communication management discussed in the order of Table 2.3 above:

Information Communication Technology (ICT)

Meid (2015) accentuated that a society that lags in terms of technological advances is going to be isolated and excluded from the economic activity. In agreement, Abubakar *et al*., (2014) revealed that paper-based communication used between stakeholders on the construction industry has resulted in poor documentation and information management, fuelling the fragmentation of construction activities and attributing to project failure. Today's rapid growth and improvement in the field of telecommunications is changing the way people communicate, and Chissiakos (2007) discussed that more emphasis is to be given to ICT to surmount information and communication deficiency in construction projects. Rimmington *et al*., (2015) defined ICT as the actual hardware employed to perform a basic information processing task such as development of computers, computer software i.e., computer aided design (CAD) and building information modelling (BIM), internet, and mobiles phones. Chissiakos (2007) further discussed applications such as virtual reality that need to be adopted. From the research discussion it is believed that proper use of ICT could significantly contribute to timely, economical and successful deployment of construction project. Similarly, Čulo *et al*., (2010) found that electronic communication and conferencing tools, such as emails, fax, voicemail, telephone, video and web conferencing, websites and web publishing must be distributed or shared amongst stakeholders. Finally, in related research Pietroforte (2010) study on governance and communication in building process, advocates information technology (IT) should be broadened from controlling contractual compliance to facilitating communication and interaction amongst project participants.

Communication skills and competence (CSC)

Aiyewalehinmi (2013) study explained that all parties in a construction process are expected to have communication skills, including a common ground from an agreement about role definition or clear consensus about the meaning of terminology used by professionals and para-profession in the construction industry. According to Kliem (2008), the ability to communicate is a crucial competence that project managers must possess to expect a successful outcome of their projects, since communication is an essential skill and managerial tool for the construction industry (Bandulahewa 2015). Perumal., *et al*. (2011) clarified that the communication process

requires a vast repertoire of skills in intrapersonal and interpersonal processing, listening, observing, speaking, questioning, analyzing and evaluating. Additionally, Perumal., *et al* (2011) found that proper and good communication skills such as verbal, written and contractual skills are essential at all stages of a project. Molwus (2014) amplified that it is important that stakeholders possess certain level of communication skills to meet project objectives.

Communication plan (CP)

Tipili *et al*., (2014) revealed that communication plans and strategies established at the onset do improve projects. Chassiakos (2007)'s study on the use of ICT in construction found that communication plan proved to be very important in maintaining the projects team's dynamics as whole, and the flow of information for the entire process. Likewise, Čulo *et al.*, 2010 expressed that a little planning up front is worth its weight of gold, and further emphasized that before starting up the project, the project management should plan communication. Perumal *et al*., (2011) described a communication plan as instrument that provides information about the project detailing specific information of when that information should be delivered, and which communication channels should be used. Meid (2015)'s research realized that implementing a communication plan and encouraging a culture of open and honest communication, improvements could be expected in an organization. Ghabarren *et al*., (2012) and Long *et al*., (2004) elucidated that an effective communication system ensures good decision and integration throughout the project.

Teamwork (TMK)

A study by Molwus (2014) discovered that project success requires teamwork with cooperation amongst stakeholders. According to Azmy (2012) and Khoshtale (2016) in order to achieve project success, teamwork needs good communication. Simultaneously, Chow *et al*., (2005) confirmed that teams operating successfully have project productivity gains of increased outcome, improved quality and lowered costs. In a related study by Eddie *et al*., (2001) explained that network communication is critical to an alliance that enable communication to flow in a free manner. Further, Mungeria (2012), imparted that effective teamwork that develops and promotes open and clear communication, could enhance morale and productivity leading to saving time and money.

Clear channels within the organization structure (COS)

Anumbe, *et al*. (2002) discovered that the construction industry suffers from disintegration of functions undertaken by different disciplines conducted in project. According to Olaniran (2015), this is a result of unclear channels of information due to inappropriate communication management system. Perumal *et al*., (2011) explained that a proper organization structure influences the coordination and flow of organization system. Furthermore, Olaniran (2015) described that the communication structures define the lines of authority, communication and specifies the mechanism by which tasks and programs are accomplished. An earlier study by Otter Emmitt (2007) explained that defining the communication structures with their corresponding protocols favors the efficient use of information and helps to understand how it is transmitted. Ho (2013)'s research described that organization structure specifies the people with whom a person should communicate with and procedural communication requirements. In conclusion, Meid 2015 found that changing an organizational structure's process or operation style can improve organization objectives because it allows roles and responsibilities for more efficiency.

Stakeholders personality (SP)

Toor *et al*., (2010) and Molwus (2014) presented that stakeholders will probably have varying ideas about performance of a project when different procuring procedures are recognized. A study by Giritle *et al*., (2014) on interpersonal conflicts, inferred that when an individual enters an organization, he brings his complicated needs and attitude into the organization, where the train of thought is vastly different, and their interpretation has a significant contribution to communication. The National Archives (THA) (2013) indicated that attitudes have a major impact on how a message is interpreted. Hence, Hoezen (2012), established that stakeholder's frame of references does have a great influence on communication with opposing interest that could lead to hidden agendas. Louw *et al.* (2003), further explained that perceptions color the way we see other people and their behavior and consequently the way we respond. Čulo *et al*., 2010 expounded that to ease such difficulties, understanding the divergence in attitudes between parties involved in a communication encounter is significant. Kleim (2008) revealed that how stakeholders communicate with others reflect their personality. Moreover, it was realized that understanding personality types, preferences, characteristics and communication styles using models such as Myer Briggs temperant and birkman model could satisfy personality needs when communicating. Additionally, it could provide opportunities for effective approach to understanding one's own behavior in a communication encounter.

Ultimately, Ho (2013), agreed with Kliem 2008 and found that attitudes can be changed by persuasion with attitude change understood as a response to communication.

Project briefing (PB)

Loosemore (2011) and Khosrowshahi (2015) revealed that paucity in communication is a foundation of briefing drawbacks, because it results in development of misunderstanding about critical project objectives. To minimize such problems, Chandra *et al*., (2011) explained that a well-defined objective that explains the expected outcome of the project is an important attribute of communication management. Aulich (2013) advocated that preparing a clear project scoping brief encourages effective communication. Moreover, it encourages process consultation and cooperation that provides a reference point against communicating all decisions in a project. In the same context, the brief was described to include proper definition, analysis and translation of client requirements and likely risk and opportunities. A study by Khosrowshahi (2015) on enhanced project brief, explained that a flaw in a brief was due to lack of standardization of communication structures. Findings in another study from Othman (2005) showed that project brief performance feedback enhanced effective communication when continued to be undertaken throughout the project cycle. Furthermore, Khosrowshahi (2015) advocated that the quality of a project brief has a significant impact on decisions at design stage of a project in turn influences at all stages of construction project lifecycle if properly managed and adequate time is provided.

Context of environment (CE)

The way in which the context or atmosphere within a project is carried out has a significant influence on the success of the project 's life (Mnkandla 2013). Research from Naidoo (2011) discovered that the context is an important aspect of the communication process. Kleim (2008) explained that communication is affected by the context of the environment. Chan *et al*., (2004) then describes the "environment" as an external influence on the construction process. According to a study on effective communication by the National Archives (2013), communication method is certainly dependent on the general context with the message is being sent. Similarly, Louw *et al.,* (2005) and Gamble *et al.*, (1998) found that the process takes place within a complex, unique and dynamic context in which several variables could influence the course and interpretation of the communication event, which is explained below:

The physical context

The physical context can impact communication favorable or unfavorable (Furst 2014). According to Kliem (2008), the environment is a flux where challenges to communication are ever present. For example, under some circumstances, certain face-to-face encounters are more meaningful than virtual sessions, and under other conditions, it might be the reverse (Kliem 2008).

The social context

According Naidoo (2011), communication is relational, based on personal relationships where for instance poor relationships could lead to poor communication and good relationships could have the opposing effect and encourage collaboration and coordination.

The psychological context

A study by Mitkus (2013), identified that the effects of psychological defenses of parties could result in unsuccessful communication. In the study, a scenario was provided where a contractor had an accident due poor safety measures with the client. This research explained that the psychologically impact of the accident would pose communication difficulties between the two parties due to liability disputes that could take place. However, in the same circumstance of good health and safety, the emotional state would enhance communication.

The historical context

Earlier studies on interpersonal communication revealed that people's expectations of communication are defined by their past experiences (Louw *et al.*, 2005). For instance, unexpected organizational structure changes could affect previous communication channels that could in turn impose communication barriers.

The cultural context

Naidoo (2011) found that cultural concerns permeate all of communication, since messages are shaped and construed across the cultural context of participants involved. Kivrak *et al*., (2008) explained that managing cultural differences successfully seen is one of the key elements in projects success. Furthermore, Čulo *et al*., (2010) found that in geographically distributed (or virtual) teams, differences between regional cultures where fluency of language, or social attitudes and behaviors can come to play.

For understanding, the current study primarily undertook practices from the above literature as basis for measuring. The hypotheses of measures are built under relevant practices shown in Table 2.4.

Table 2.4: Practices and measures of communication management practices in construction projects

Practices	Code	Measures	Sources
Information communication technology (ICT)	ICT1	Telephones with voicemail services are used	Gunasekaran (2016); Meid (2015); Rimmington *et al*., (2015); Abubakar *et al*., (2014); Perumal *et al*. (2011) Čulo *et al*., (2010); and Pietroforte (2010 Chassiakos (2007); Hijiazi, *et al*., (2008); Peansupap *et al*., (2005) and Cheng *et al*., (2004)
	ICT2	Email communication are used	
	ICT3	Video conferencing facilities are used	
	ICT4	Internet and intranet are consistently available	
	ICT5	Social media communication is used e.g. WhatsApp chatting platform	
	ICT6	Building information modelling (BIM) software is appropriately adopted	
	ICT7	Computer Aided Design (CAD) software is appropriately adopted	
	ICT8	Virtual offices support software and portals is available	
	ICT9	Project management software is used e.g. Construction Computer Software (CCS)	
Communication skills and competence (CSC)	CSC1	Excellent verbal communication among project stakeholders	Gunasekaran (2016); Bandulahewa (2015); Zulch (2014); Molwus (2014); Aiyewalehinmi (2013); Garbharran *et al*., (2012); Naqvi *et al.,* (2011) ;(Perumal., *et al*. (2011); Čulo *et al*., (2010) and Kliem (2008)
	CSC2	Excellent written communication among project stakeholders	
	CSC3	Effective use of information communication technology among project stakeholders	
	CSC4	Proper interpretation of contractual matters is communicated	
	CSC5	Project stakeholders have excellent listening skills	
Communication planning (CP)	CP1	Communication requirements of the project team are critically analyzed in the project	Gunasekaran (2016); Meid (2015) Zulch (2014); Tipili *et al*., (2014); Aiyewalehinmi (2013); Garbharran *et al*., (2012); Naqvi *et al.,* (2011) and Čulo *et al*., (2010); Čulo *et al.*, 2010; Perumal *et al*., (2011); Chassiakos (2007); and Long *et a*l., 2004)

Practices	Code	Measures	Sources
	CP2	Communication technology is used to deliver information	
	CP3	The organization critically determines the objectives of communication	
	CP4	Proper channels of information delivery are established in the organization	
	CP5	Every personnel are accountable for the information they are required to send.	
	CP6	The organization clearly identifies the recipient of the information to be sent	
	CP7	The organization determines communication frequency to project stakeholders	
Teamwork (TMK)	TMK1	There is effective communication and coordination within the project stakeholders	Khoshtale (2016); Molwus 2014; Aiyewalehinmi (2013); Azmy (2012) Naqvi *et al.,* (2011); Chow *et al*., (2005); Eddie et al., (2001) and Mungeria (2012)
	TMK2	Decentralization of information among project stakeholders is effective	
	TMK3	Conducive working relationship between project stakeholders	
	TMK4	Group work effort enhances the quality of communication	
	TMK5	Strong inter-department alliance in the project enables communication to flow efficiently	
Clear organization structure (COS)	COS1	Organizational and operational processes are in place	Meid 2015; Olaniran (2015); Ho (2013); Ho (2013) Naqvi *et al.,* (2011); Perumal *et al.,* (2011); and Hoezen *et al.,* (2006); and Anumbe, *et al*., (2002)
	COS2	Roles and responsibilities of project members are clearly defined	
	COS3	There are clearly marked communication channels from superior to subordinates	
	COS4	The line of authority is clearly specified for the project tasks to be accomplished.	
	COS5	Clear determination and limits of who will communicate with whom and who will receive which information	
Stakeholders Personality (SP)	SP1	Attitudes are evaluated to develop specific communication methods	Gunasekaran (2016); Giritli *et al*, (2014); Molwus (2014); Giritle *et al*., (2014); Ho (2013); The National Archives (THA) (2013); Garen (2012); Toor *et al*., (2010); Čulo *et al*., 2010 Hoezen *et al.,* (2006.) and Louw *et al.* (2003)
	SP2	Behavioral styles of communicators are evaluated	

Practices	Code	Measures	Sources
	SP3	Individual perceptions are evaluated	
Project briefing (PB)	PB1	A brief provides proper definition of client requirements	Loosemore (2011); Garbharran *et al*., (2012); Chandra *et al*., (2011); Aulich (2013); Khosrowshahi (2015); Hoezen *et al.*, (2006 and (Othman 2005)
	PB2	A brief provides proper analysis of client requirements	
	PB3	A brief provides adequate translation of client requirements	
	PB4	The changes to brief are properly managed	
	PB5	Adequate time is provided for project briefing	
	PB6	Project risk are properly communicated	
	PB7	There is constant interaction amongst project team members	
	PB8	There is constant knowledge sharing amongst project team members	
	PB9	Project stakeholders are constantly updated on the progress and status of the project	
Context of the project environment (CE)	CE1	Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	(Furst 2014); The national archives (THA) 2013; Mitkus (2013); Naidoo, (2011); Čulo et al., (2010); Barakat 2009; Kleim (2008); Kivrak *et al*., (2008); Louw *et al*., (2005); and Chan *et al*., (2004)
	CE2	There are good interpersonal relationships among project stakeholders	
	CE3	Healthy mental wellbeing of project stakeholders is evaluated	
	CE4	Conflicts are resolved from previous communication episodes	
	CE5	Project stakeholders of different cultures are accommodated	

Literature review from this chapter has discussed the challenges and benefits of implementing communication management practices along with discussion and identification of possible communication management practices and there underlaying communication management measures. Hence, the subsequent section discusses the relationship between the communication management practices and project outcome.

2.4 Relationship of communication management practices and project outcome

Project outcome

To address the relationship of communication management practices with project outcome. As a starting point in this study it is worth understanding project success. Project success is known to be about managing expectations to be completed on time, within agreed budget and set quality referred to as the "golden triangle" (Chan *et al*, 2004; Prabhakar 2008; Walker *et al*., 2008; Dookran 2012; Garbharran *et al*., 2012; Ofori 2013 and Khoshtale 2016). However, nowadays, we are aware that determining if a project is a success, or a failure is much more complicated (Prabhakar 2008). Chan *et al*., (2000) and Yong *et al.,* (2015) clarified that the complexity is due to new discoveries like health and safety, sustainable environment, technical achievement which are also used as measures with growing importance. Furthermore, review from other studies show that restricting project indicators to time, cost and compliance to specification, takes success as offering solutions to the briefing and design issues and ignores the contradictory interest in project stakeholders (Winch 2010; and Molwus 2014).

Molwus, (2014) explained that a successful project is achieved in construction when the project outcome (realized asset) has become a matter of fully matching the client's needs at the time of realization. Regardless of no consensus on "what constitutes project success?", this study concurred with the general agreement of Prabhakar (2008) argument that although the schedule and budget performance alone are considered inadequate as measures of project success, they are still important components of the overall construct. Furthermore, expanded that the quality is intertwined with issues of technical performance, specification, achievement of functional objectives and its achievement against these criteria will be most subject to variation in perception by multiple project stakeholders. So, from this standpoint, Čulo *et al*., (2010) revealed that efforts have turned towards using effective means of communication since communicating information has been identified to have some direct impact on scope, time, cost, risk or quality of a task. In addition, Miller (2016) argued that without effective civil communication and information exchange, construction projects cannot achieve productive

project outcome for cost certainty, timely delivery, quality products and services. Therefore, based on the review findings, five measures were incorporated as part of developing the project outcome survey as indicated in Table 2.5.

Table 2.5: Project outcome

Item	Project outcome measures	Code	Source
1.	Scope of works of the project was achieved	P01	Miller (2016); Khoshtale (2016) Yong *et al.,* (2015); Garbharran *et al*., (2012); Dookran (2012); Čulo *et al*., (2010) and (Prabhakar 2008)
2.	Quality of works of the project was achieved	P02	Miller (2016); Khoshtale (2016) Yong *et al.,* (2015); Garbharran *et al*., (2012); Dookran (2012); Čulo *et al*., (2010) and (Prabhakar 2008)
3.	Project risks minimized i.e. occupational accidents	P03	Miller (2016) Khoshtale (2016) Yong *et al.,* (2015); Garbharran *et al*., (2012); Dookran (2012) Čulo *et al*., (2010) and (Prabhakar 2008)
4.	Project was within time	P04	Miller (2016); Khoshtale (2016) Yong *et al.,* (2015); Garbharran *et al*., (2012); Dookran (2012); Čulo *et al*., (2010) and (Prabhakar 2008)
5.	Project was within budget	P05	Miller (2016); Khoshtale (2016) Yong *et al.,* (2015); Garbharran *et al*., (2012); Dookran (2012); Čulo *et al*., (2010) and (Prabhakar 2008)

Based on literature review in chapter two, this research established the following theoretical discussion and propositions:

Pietroforte (2010) discovered that technology facilitates communication and interaction amongst project participants that could enhance productivity. Comparatively, Hijiazi *et al*., (2008) further augmented in the study of implementation of visual reality model language (VRML), that moving from "paperless" design in the construction industry was important to, reducing time and cost. Correspondingly, Peansupap (2005), explained that technology provides benefits throughout the design, construction and operation phase of the project lifecycle. Considering this standpoint, the following hypotheses are stated:

H_{01}: There is no relationship between information communication technology and project outcome.

H_1: There is a relationship between information communication technology and project outcome.

Aiyewalehinmi (2013) revealed that training of workers is essential for on - site communication to maintain construction project success. In another related study, Zulch (2015) revealed that communication skills are essential to convince stakeholders to follow a sustainable approach in managing the project. Under this concept, the following hypotheses are stated:

H_{02}: There is no relationship between communication skills or competence and project outcome

H_2: There is a relationship between communication skills or competence and project outcome

Čulo *et al*., (2010) specified that a clear and concise communication plan could impact the project in a good way. In a similar direction, Luka *et al*. (2014) explained that a regular review of the plan can reduce disruptions in project implementation and could improve projects. Garbharran *et al*., (2012) advocated that a detailed communications plan is promoted as necessary for effective dissemination of information in construction projects. Gunasekaran (2016), substantiated that a clear and well-planned communication plan could decrease failure of construction projects and lead to better decision making during various stages of project success. Taking that into account, the review undertakes that the role of communication plan allows for action to be proactive to solve problems rather than treating consequence. Hence, under this review, the following hypothesis is postulated:

H_{03}: There is no relationship between communication planning and project outcome

H_3: There is a relationship between communication planning and project outcome

Aiyewalehinmi (2013)'s study on factor analysis of communication in the construction industry discovered that human relationships and functionality with interaction between management and employees encourages employee participation. Luka *et al*., (2014) asserted that ongoing communication amongst project team members and its stakeholders improved project outcome. Naqvi *et al*., (2011) further elaborated that team management and the processes when produced in time could affect the project outcome positively. Hence, the following theory is stated:

H_{04}: There is no relationship between teamwork and project outcome

H_4: There is a relationship between teamwork and project outcome

Perumal *et al*., (2011) elucidated that a proper organization structure encourages a good flow of information and enhances effective communication in organization leading to the practice of better time, quality and cost management. In related study, Luka *et al*., (2014) further advocated that clear communication with clarification of roles of stakeholders drawn in the project plan improves success in the project. Čulo *et al*., (2010) corroborated that information has a direct impact on the scope, time, cost, risk, or quality of a task and warrants escalation or acceleration through the appropriate communication channels. Thus, under this investigation, the following hypotheses are asserted:

H_{05}: There is no relationship between clear channels with organization structure and project outcome

H_5: There is a relationship between clear channels with organization structure and project outcome

Molwus (2014), explained that stakeholders dynamics and activities on projects are volatile depending on the matters discussed and their influence in project relationship. Likewise, Hoezen *et al*., (2006) elucidated that if stakeholders were more professional, more responsible for their work as well as straight and clear about their work, it would increase better decision making that might lead to project success. Under such occurrences, the following hypotheses is then stated:

H_{06}: There is no relationship between stakeholders' attitude and project outcome

H_6: There is a relationship between stakeholders' attitude and project outcome

Gunasekaran (2016), discovered that stakeholders involved in projects need to be tracked and updated continuously about the project as well as their work plan to bring coordination. Similarly, Luka *et al*., (2014) clarifies that meetings help overcome communications barriers and increase performance levels. Garbharran *et al*., (2012) expounded that a shared project vision with constant update as the project progress in communication enhances project success. Under such an overview, the following hypotheses are postulated:

H_{07}: There is no relationship between project briefing and project outcome

H_7: There is a relationship between project briefing and project outcome

Kliem (2008), Louw *et al.*, (2005), and Gamble *et al.*, (1998) discovered the physical, social, historical, psychological and culture context of environment can dictate the effectiveness of communication on project success. Hence, the following hypotheses:

H_{08}: There is no relationship between context of the environment and project outcome

H_{8}: There is a relationship between context of the environment and project outcome

2.5 Chapter summary

This chapter reviewed literature on the background to the study and provides the premise for this study. Previous studies have indicated the need for understanding the major role of communication management practice in construction projects since absence or inadequate communication management practice have been found to impact project failure in construction. The review identified possible challenges of implementing communication management practices considered to be important to understanding the impact in construction projects of Eswatini. 15 challenges related to poor implementation of communication management practice have been identified with need to investigate which as aspects impact construction projects negatively and to what degree. Similarly, 11 benefits of implementing communication management practices suggested to be significant to construction projects were also determined. The review further proposed communication management practices anticipating a deeper understanding of which practices in Eswatini have a relationship with project outcome. Communication is dynamic, so there is a need to understand its position in practice to improve project outcome. The subsequent chapter discusses in detail techniques that were employed to collect data, analyze and present it. Thus, chapter three exhibits the methodology of research taken for entire study.

CHAPTER THREE RESEARCH METHODOLOGY

3.0 Introduction

This chapter discusses the research methodology for this study. It explains the methods and techniques that were employed for this research. To achieve the aims and objectives of the research, the study adopted the research 'onion' approach because it is more comprehensive and instructive, providing a clear dissection of the research design of this study (Molwus 2014). The layers of the onion are research philosophies, research approach, research strategy, time horizons, choices, data collection and data analysis concept. Figure 3.1 illustrates the research 'onion.' The methodology adopted as well as the validity and reliability discussions also form part of this chapter.

3.1 Research Design

The research's goal was to identify the relationship between communication management practices and project outcome. Based on the findings, a model outlining the key factors of communication management and their relationships was also theorized. Based on results from the questionnaire survey, mean score ratings were obtained and used to determine the most significant factors that are key to communication management. Research question 4, focused on determining the relationship between variables found in question 3 with project outcome along with developing a model that explains the relationship. The method adopted to accomplish the specific objectives are summarized in Table 3.1.

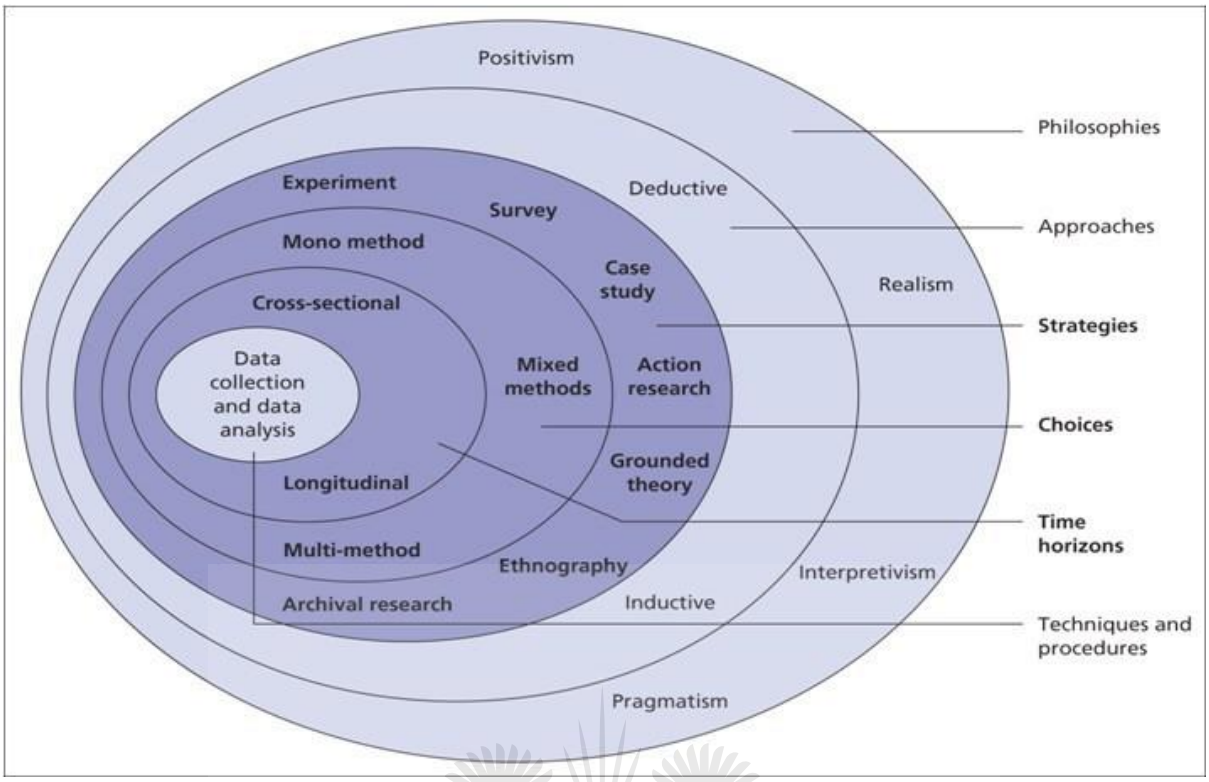

Figure 3.1: The research 'onion' (Saunders et al., 2007)

Table 3.1: Summary of research methodology

Research Questions	Data Collection	Methods of analysis	Results	Outcomes
i. What are the challenges of implementing communication management practices faced in the construction projects of Eswatini?	• Questionnaire survey	• Literature analysis • Factor analysis on the survey • Means scores rating	See Table 4.4	See Table 4.5
ii. What are the benefits of using communication management practices in the construction projects of Eswatini?	• Questionnaire survey	• Literature analysis • Factor analysis on the survey • Mean scores ratings	See Table 4.9	See table 4.10
iii. What the communication management practices faced in construction projects of Eswatini?	• Questionnaire survey	• Literature analysis • Factor analysis on the survey • Mean scores ratings	See Table 4.14; 4.18; 4.21; 4.24; 4.27; 4.31 and 4.35.	See Table 4.40.
iv. Is there a relationship between communication management practices and project success in the construction industry of Eswatini?	• Questionnaire survey	• Literature analysis • Factor analysis on the survey • Mean scores ratings • Spearman rank order correlations	See Table 5.5; 5.6; 5.7; 5.8; 5.9; 5.10; 5.11; 5.12 and 5.13	See figure 6.1.
v. What are the communication management practices that affect project outcome in construction project of Eswatini?	• Questionnaire survey	• Spearman rank order correlations	See Table 5.5;5.8 and 5.10	See figure 6.1.

3.2 Research philosophy

This study reflects research into the philosophy of positivism approach, based on epistemology theory because it involves what is adequate knowledge in this area of study. In this case the global perspective of communication management practices and project outcome is analyzed. Positivism is based on a phenomenon that is observable lead to production of credible data and is likely to use existing theory to develop hypotheses that are tested and confirmed or refuted (Sauder's *et al*., 2007). From using the positivist approach, this study believes that the relationship of communication management practices and project outcome in the context of Eswatini construction will be established.

3.3 Research Approach

This study used the deductive approach instead of the inductive. The inductive approach establishes universal generalization to be used as pattern explanations from qualitative data (Molwus 2014). However, the focus of this study was on the deductive approach in which according to Saunders *et al*., (2007), the theory and hypotheses development is subjected to testing from which a research strategy is designed. The theory development is based on challenges of implementing communication management practices and benefits using of communication management practices. Furthermore, the hypotheses of the relationship of communication management practices and project outcome were formulated in chapter two.

3.4 Research strategy

Survey strategy was implemented for this study because it allows for the collection of large amounts of data from the population in a highly economical way and allows the generalizing of the findings that are representative of the whole population. This strategy was selected based on the exploratory and descriptive nature of the research. Furthermore, the data gathered using survey strategy can serve to propose possible reasons for a relationship between variables and generate models of these relationship (Sauder's *et al*., 2007), of which this study intends to achieve. Other strategies were not incorporated because they did not support the research objective such as experimental, case study, action research, grounded theory, ethnography and archival research. One questionnaire was used to collect all quantitative data to address all the study objectives.

3.5 Research Choice

A quantitative instead of a qualitative technique was used during the time frame of research period (Leady *et al*., 2015). The use of this technique is understood as the mono method because this study used a single data collecting technique and corresponding analysis process (Sauder's *et al*., 2007). The quantitative approach was found appropriate for this study because the focus of the study seeks to explain and predict the challenges of implementing communication management practices, the use of benefits of communication management practices and the communication management practices. Furthermore, identify relationship among communication management practices and project outcome and based on the results confirm or reject existing practices. It is further suitable because it provides answers to theoretical findings of the study using instrument-based questions for data collection and statistical analysis.

3.6 Time Horizons

Cross-section was suitable due to the time constraint and limited budget of the study. The research objective was to observe a phenomenon over stipulated period, rather than changes over a period of longitudinal time horizon (Molwus, 2014). The duration of the study was limited to three years from the year 2016 to 2019.

3.7 Data collection

The study employed questionnaires survey that permits collection of data from more people compared to observations, interviews and experiments, to increase the reliability of research findings (Giritli *et al*., 2014). The questionnaire was administered to randomly selected construction stakeholders practicing in the Eswatini construction industry.

3.7.1 Questionnaire design

The questionnaire design encompassed a combination of descriptive and relational questions. A self-administered questionnaire was structured in English. Close ended questions where used for this study as opposed to open ended question because according to Okoro (2015), they are straight forward for data analysis, easier, understandable to respond and reduce item of non-response. Similarly, Ghabarran, *et al*., (2012) further explained that close ended questions are chosen because they reduce bias and facilitate coding of questions.

Pre-testing of the questionnaires was adopted to capture more understanding on the appropriateness of the questions. A pilot study of 30 participants were randomly selected and were similar to the characteristics of study population was undertaken to verify that the questionnaire was clear and easily understandable. The questionnaire was pre-tested by survey unit of specific construction organizations in specific construction projects. From the pilot sample, 13 participants responded representing 43% of the total number of respondents. Out of the 13, six responded with requests to refine the questions in certain section for more understanding. The remaining seven, completed the questionnaire suggesting clear understanding of the questionnaire.

The comments from participants were considered when conducting and refining the final questionnaire. The final draft questionnaire was emailed to participants with prior approval from the institution i.e. University of Johannesburg ethical clearance committee. A covering letter requesting permission to conduct the research was also elicited from the Eswatini CIC. The supplementary letter explained the goal of the study and provided assurance of anonymity, confidentiality of response and voluntary participation, this concurs with the approach of Okoro, (2015) and Agumba, (2013). Furthermore, the organizations agreed to participate in the research study and sign a form. Permission was granted by the Eswatini (Swaziland) construction industry council 23rd of March 2018 and data requested was supplied on the number of operating constructions related professionals. The questionnaire survey was administered online through monkey survey, a type of software that creates surveys and stores survey data online. An email was with a brief introduction to research participants, along with survey's hyperlink was sent to sampled participants. Azmy (2012) supports this approach.

3.7.1.1 Questionnaire

The questionnaire (Appendix one) was split into five sections. Section A, a biographical section consisting of categorical questions that is: organization, profession, position, education level, years of experience of registered industry stakeholders of the Eswatini construction industry council. Section A, B, C, D and E were Likert type frequency close ended questions applied to elicit the perception of respondents on the established theory of the study:

- Section B: Challenges of implementing communication management practices in construction projects of Eswatini;

- Section C: Benefits of the use communication management practices used in construction project of Eswatini;
- Section D: Communication management practices used in construction projects of Eswatini; and
- Section E: Relationship of communication management practices and project outcome in construction projects of Eswatini.

The Likert type questions were used to assess and test significance of the relationship of communication management practices and project outcome. Respondents to the survey were requested to answer to the questions asked established from their involvement in the construction projects. A 5-point Likert scale was implemented where (1 = strongly disagree, 2= Disagree, 3=Neither agree nor disagree, 4= Agree, and 5=Strongly agree). A total of 48 proposed communication management practices underlying six constructs and five project outcomes were developed. The responses were used to gain insight on the relationship of communication management practices in construction projects and project outcome.

The answers to the questionnaire were categorical and ordinal. Interval answers were not applicable in this research because there was no numerical relationship between possible answers. Categorical responses were accepted as level of measurement for biographical information, where the unordered scales were used. According to Trochim (2006) they simply allow the researcher to assign categories. For instance, the respondent's organization variable included: consultant's organization, allied professionals and contractor's organization.

Ordinal responses were also used, because the respondents' choices of answers ranged on a 5-point Likert scale from "strongly disagree" to "strongly agree", rather than interval responses that require numerical values to be spaced equally as aforementioned (Institute of digital research and education, 2017). Ordinal responses allow the study to rank order data (Leedy *et al*., 2015), such as the respondent's education variable that has four attributes, high school or below, diploma, bachelors and postgraduate that indicate ordered scale from lowest level to the highest level of education.

3.7.2 Area of study

The field survey was done in Eswatini (Swaziland) construction industry within the Manzini, Hhohho, Shiselweni and Lubombo districts to ensure that all stakeholders in the construction industry had an adequate opportunity to be included. The study was conducted in all four areas.

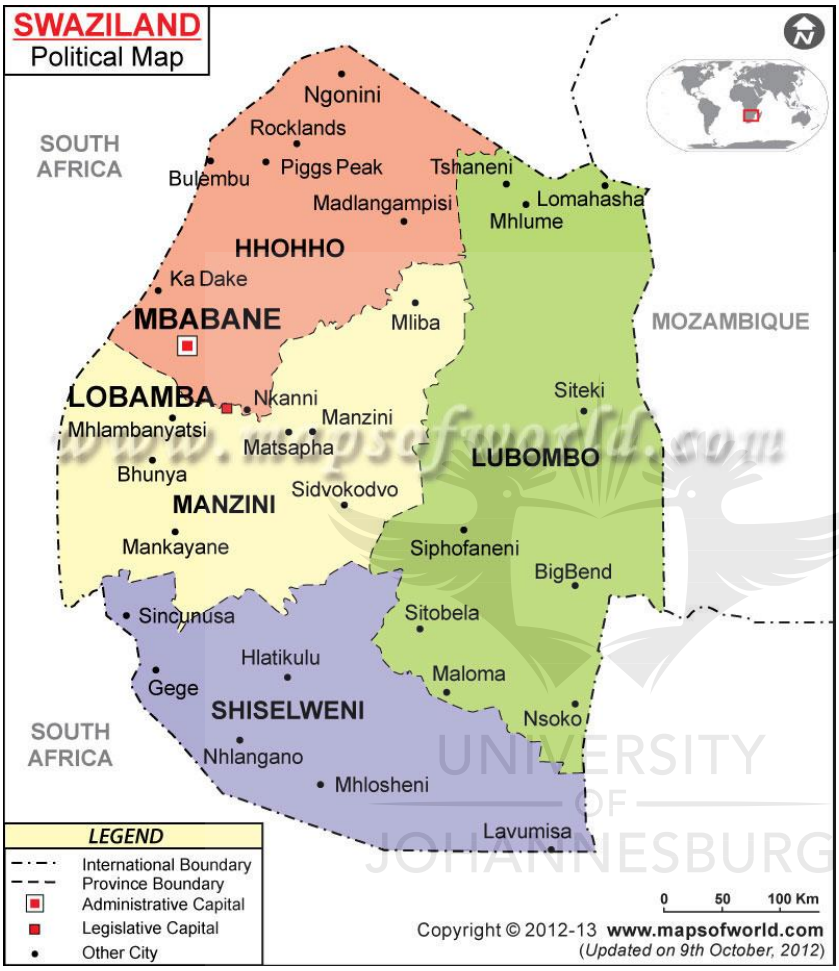

Figure 3.2: A map of Swaziland showing the different construction areas.

3.7.3 Sample frame

The target population for this study was the stakeholder registered within Eswatini (Swaziland) construction industry council (CIC). The sample was divided into three groups; consultant teams, allied professionals and contractors' teams. The first group included consultancy practices of architects, quantity surveyors and engineers (structural, civil, electrical and mechanical). The second group were allied professionals who have direct dealings with the construction projects that include: project managers, land surveyors, interior designers, property developers, geotechnical engineers, fire engineers, acoustic engineers, water

engineers, environmental consultants, urban planners. Construction firms made the last group. These included civil, building, specialist, electrical and mechanical contractors.

3.7.4 Sample technique

Simple random sampling method was employed from a probability sampling frame because it is more accurate and rigorous as explained by Trochim, (2006). The technique employed was heterogeneity, because the interest was not about indicating the opinions in proportion, but about including all opinions (Okoro, 2015). While considered to be more feasible and practical, non-probability sampling method, was not used in this study. The rational was that the non – probability sampling could be insubstantial because the study may or may not represent the population well.

To achieve the study objective, a probability sample size of 264 was required from a population of 843 professionals registered with the CIC for a confidence level of 95 % and margin of error at 5%. However, since an online survey was conducted an additional 123 participants were included to cater for inactive emails. This resolution was based on Duncan (2008) rationale that if online surveys are used, the respondents are more likely to be participants who are familiar with and able to use the medium.

Data collection was completed in two months, from March to April 2018. A sum of 86 questionnaires were returned with 66 responses completed accounting to a completion rate of approximately 77% and a response rate of approximately 22.22%. Out of the 86 responses received, 20 where rejected for incomplete responses. The total number of 66 useable questionnaires responses coincided with Molwus (2014) on the basis that considering intrinsic difficulty to gather data in construction management research combined with the characteristics looked for in targeted respondents which restrict number of suitable respondents, 61 would be acceptable study sample. Furthermore, Lucko *et al*., (2009) explained that reaching a high response rate is a dilemma that construction researchers often encounter. In order to improve the response rate follow-up emails and phones were conducted.

3.8 Data analysis

The questions were gathered and analyzed using statistical package for the social sciences (SPSS) version 25. Various statistical methods were incorporated to analyze the collected data which was aimed at tackling the specific study objectives. Descriptive and inferential statistics were applied to describe the data.

3.8.1 Frequencies distribution

Frequencies have been used to explain the characteristics of the sample (Pallant 2007). Table 3.2 presents the respondents profile stating their age, organization, profession and years of experience in construction projects. Furthermore, it shows how many respondents gave each response.

Table 3.2: Respondent profile of sample population

Demographic characteristic	Response category	Frequency	% Frequency
Age	21-30	7	10.6
	31-40	21	31.8
	41-50	23	34.8
	51-60	12	18.2
	Older than 60	3	4.5
Organisation	Consultants' organization	15	22.7
	Allied professionals' organisation	4	6.1
	Contractors' organization	47	71.2
Profession	Architect	3	4.5
	Quantity Surveyor	8	12.1
	Civil Engineer	9	13.6
	Electrical Engineer	7	10.6
	Mechanical Engineer	3	4.5
	Construction Manager	16	24.2
	Project Manager	19	28.8
	Environmental Consultant	1	1.5
Education	High School and below	6	9.1
	Diploma	30	45.5
	Bachelors	12	18.2
	Postgraduate	18	27.3
Experience	Less than 5 years	8	12.1
	5-10 years	21	31.8
	10-15 years	11	16.7
	15-20 years	8	12.1
	More than 20 years	18	27.3

3.8.2 Mean score rating

The mean value was used to rank level of agreement of each answer in the Likert scale questions. According to Okoro (2015), the mean value is described as the average score obtained from all weighted responses on the 5- point scale (1 to 5 that is “strong disagree” to “strongly agree” respectively), which was employed to rank the measures assessed by the

respondents. In order to present the statistics appropriately, a number of ranges were established, and where; strongly disagree (SD) =1.00-1.80, disagree (D) =1.81-2.60, neutral (N) =2.61-3.40, agree (A) =3.41-4.20, strongly agree (SA) =4.21-5.00. This approach of interpreting data has been used in the studies of Renault (2018) and Agumba et al., (2016). The results are presented in chapter five.

3.8.3 Exploratory factor analysis

Factor analysis is a statistical technique used to identify relatively few factors that may be used to represent relationships between multiple inter – related variable (Dada, 2014). This study incorporated exploratory factor analysis (EFA) because it aligns with the current research focus that postulated that there is a smaller set of unobserved (latent) variables or constructs that are the basis variables observed or measured (Pallant 2007 & 2013). Principal component analysis (PCA), was not used in this study, even though it is also described as variable reduction technique supported by EFA. Hair, *et al.*, (1998) and Molwus (2014), explained that PCA simply reduces initial information included in several variables into smaller clusters without lack of substantial information. On the other hand, principal axis factoring (PAF) was chosen because it met the requirement of the study objectives.

PAF was used based on Azmy (2012) argument on the conceptualization of each construct and examine if there are greater than one factor and if the factor represents the underlying respective construct (Nguru *et al*., 2015). Pallant (2007 & 2013) substantiates that this technique is used when developing scales and measures to identify the underlying structure. Table 2.3 of this study proposed eight underlying constructs: Information communication technology (ICT), communication skills and competence (CSC), Communication plan (CP), Clear channels within the organization structure (COS), Stakeholders personality (SP), Project brief (PB) and context of environment (CE). Each construct comprises of a few survey items relating to a construct that is built on literature analysis.

To analyze data using EFA, Pallant (2007), recommended that the overall sample size should be more than 150. However, from Pallant (2013) it was discovered that this sample size has several reservations from other authors that seem to not agree on its appropriateness. The sources from Pallant (2013) state that it is not the overall sample size that is crucial, rather the ratio of subjects to items is important where it was concluded that at least five cases per item is considered adequate. This then supported that the sample size of 66 respondents was enough

for analysis, since the questionnaire had at least five cases in each item, except for one item (stakeholders' personality) which was excluded on analysis because it did not meet the required threshold as explained in chapter 4.

PAF was used to compute factors, interpret correlation amongst variables and the best fit data for each observed variable to each latent (Pallant, 2007 & 2013). To test the appropriateness of the factor extraction, Kaiser – Meyer – Olkin (KMO) test of sampling adequacy and Bartlett's test of sphericity was used (Dada, 2014). The KMO specified ought to be .6 or above and the Bartlett's value should be significant ($p \leq 0.05$) (Pallant, 2013). For interpretation, orthogonal rotation was used because it is easier to interpret and as well as it minimizes the number of variables that have high loadings on each factor, whereas oblique rotation is more difficult to describe, interpret and report (Pallant 2007 & 2013). The orthogonal technique chosen was varimax rotation because it generates a clear-cut factor structure (Smith 2012). The output of this study met the requirements of orthogonal rotation, since the information of factors postulated are independent to each other for best fit factors. Communalities were also used to determine common variance between the variables, initial communalities above 0.30, were considered good. Decisions regarding which factor to retain were made using Kaiser's criterion and scree test. Eigenvalues (variance explained by a factor) above 1 were retained. Values above a "breaking" point on a scree plot line were retained and below rejected (Pallant, 2013). Before further analysis of the results, total scores were calculated from the scales and subscales derived from PAF analysis. Azmy (2012) explains that EFA identifies the structure of underlying variables and estimation scores to measure latent factors themselves.

3.8.4 Correlations

Correlations analysis is used to describe the strength and direction of linear or monotonic relationship between two variables. Correlation was used to determine the relationship between the factors found related to communication management practices and project outcome. Spearman's rank order correlations (non – parametric) was incorporated instead of Pearson product moment correlation (parametric) because ordinal (ranked) scale measure was used for the survey and the data did not meet linear relationship assumption required by Pearson's correlations. Further, Pearson correlation was not incorporated because it is used for interval level (continuous) scales. Moreover, it is known to have stringent requirements of significance level being strongly influenced by the size of the sample. For example, a small sample of 30 may have moderate correlation that do not reach statistical significance at the traditional

p<0.05 level (Pallant 2013). Although, this study met the sample size requirements, this study found Pearson product moment correlation to be not appropriate because interval (continuous) scales were not used. Multiple regression analysis was not used because the aim was not to determine how well a set variable is able to predict a particular outcome but was rather an understanding of the relationship that exists between two variables i.e. independent and dependent variable being analyzed. However, when clear structure of the relationship is established, Multiple Regression Analysis (MRA) will then be incorporated in future research.

3.9 Research validity and reliability techniques

The study incorporated content validity through literature review analysis to ensure that the questionnaire designed elicits answers from the research questions. This was also validated using the pilot survey with industry stakeholders. PAF as a factor analysis (FA) approach was used to assess construct validity. Construct validity refers to the question whether the operationalization of theoretical constructs is appropriate (Lucko *et al*., 2009). In other terms, it seeks to ensure that the survey effort is measuring the intended measure in line with its specified objective (Leedy *et al*., 2015). For this study, a theoretical structure of each observed variable to each latent variable was established and FA found factors that best fit the data (Pallant 2013). For criterion validity, statistical analysis such as correlations between variables assessed the criterion related validity. Criterion validity is the ability of the research questionnaire to make accurate predictions (Saunders *et al*., 2007). To determine external validity, simple random sample of construction stakeholders from the CIC were chosen. All construction stakeholders had the same probability of inclusion in the study survey. External validity is understood to be related to the generalizability of results. Lucko *et al*., (2009), Saunders *et al*., (2009) and Molwus (2014) emphasized that it is the main criteria for determining the quality of population and sample chosen in the study. To enhance internal reliability, internal consistency reliability was conducted for results to be reliable. Reliability is concerned with consistency and repeatability in the data collection and results of the data (Lucko *et al*., 2009). In this study, to attain reliability, Cronbach 's alpha measure was used to assess the items measuring the underlying constructs. According to Pallant (2007 & 2013), a value of 0.70 or more was considered as a good level of reliability to the model. The Cronbach's alpha values range from 0 to 1 and 0.80 or higher indicates good reliability (Mohajan 2017). Therefore, this study adopted a cutoff of 0.70 for internal reliability. However, Briggs *et al.*, (1986) argued that in case the internal reliability is below the threshold of 0.70, it might be appropriate to report the mean-inter correlation that should be within the range of 0.20 to 0.40.

3.10 Chapter summary

The preceding chapter presented the different research design philosophy and rationalized the research design undertaken for study. The chapter covers a discussion of the components of the research onion and illustrates the choice of data collection technique and analysis procedure. The research philosophy adopted a positivism approach that underpinned the research strategy and methods chosen for the strategy. A survey strategy was used derived from an output review of literature that formed the basis of the development of the questionnaire. Self-administered likert scale questions were used and required information concerning construction practitioner's opinion chosen by heterogeneity and probability sampling. The questionnaire entailed the challenges and benefits of implementing communication management practice in construction projects. Furthermore, it solicits views regarding communication management practices related to project outcome. The methods of data collection and data analysis of the study were also included for discussion. Data collection was analyzed using SPSS version 25 for descriptive and inferential statistics. For descriptive statistics, mean score and standard deviation were used to determine predominance relating to the challenges and benefits of implementing of communication management practices as well as the communication management practices in construction projects. For inferential statistics, PAF and correlation was used in data analysis. PAF was used to develop underlaying structure from the challenge and benefits of implementing communication management practices. Similarly, communication management practices relating to project outcome were also subjected to PAF analysis. The correlations were used to determine the existence of relationship between communication management practice and project outcome. Reliability and validity were also discussed in this chapter. From empirical studies, all measures relating to the challenges benefits of implementing communication management practices as well as communication management practices relating to project outcome communication had good internal consistency. Validity was enhanced by using pilot testing, expert reviews, PAF analysis and including construction participants from different locations. Chapter four shows analysis of data designed to address objectives of the study.

CHAPTER FOUR

INTERPRETATION OF SURVEY RESULTS

4.0 Introduction

This section introduces the survey results. The principal axis factoring (PAF) as explained in the methods section (chapter three), was used to analyze the collected data and determine the best fit data from each observed variable to the underlying construct. To answer objective one, two and three described in chapter one of this research, this chapter first gives the evaluation of the underlying constructs (conceptual variables), by analyzing the stringent structure and samples of answers to elements in the questionnaire.

4.1 Challenges of implementing communication management practices

From the results of the survey responses on challenges of implementing communication management practice in construction projects, 15 items were subjected to PAF. The correlation matrix in Table 4.1, revealed that the coefficients were above 0.30 and higher, with correlation above 0.60. This showed an adequate relationship between items, except for one (CCM3) that was excluded from the table because it indicated a lower coefficient, implying existence of no relationship with other items.

For measure of adequacy (MSA), the anti-image correlation matrix (Appendix B) indicated the presence of 13 items above 0.60, with only one (CCM11) below 0.60 scale. Hence, it was found incoherent and needed to be omitted. Since CCM3 (correlation matrix) and CCM11 (anti-image correlation matrix) were below the recommended threshold, they were eliminated and a second re -run was conducted where CCM 2 also indicated a low coefficient. The third re-run showed CCM1 anti-image correlation was also below the recommended threshold. Finally, a re-run of the remaining 11 items was done with all items above 0.30 and 0.60 diagonal coefficient, indicating presence of an adequate relationship amongst items. Communalities at extraction (Appendix B), implied that most the items shared about 60% of common variance between them, with most between 0.50 and 0.60, which is also good.

Table 4.1: Correlation matrix -CCM

Correlation for challenges of implementing communication management practices

	Variables	CCM4	CCM5	CCM6	CCM7	CCM8	CCM9	CCM10	CCM12	CCM13	CCM14	CCM15
Correlation	CCM4 Poor listening skills of personnel	1.000	.588	.422	.446	.491	.330	.236	.298	.229	.154	.389
	CCM5 Unclear and delayed instructions	**.588**	1.000	.330	.276	.441	.292	.314	.336	.348	.290	.417
	CCM6 Language difficulties	**.422**	**.330**	1.000	.629	.506	.202	.344	.098	.190	.278	.460
	CCM7 Poor writing skills of personnel	**.446**	.276	**.629**	1.000	.415	.261	.345	.114	.164	.258	.327
	CCM8 Personal prejudice	**.491**	**.441**	**.506**	**.415**	1.000	.463	.520	.159	.280	.225	.308
	CCM9 Preconceived and unwillingness to change beliefs	**.330**	.292	.202	.261	**.463**	1.000	.697	.333	.401	.268	.293
	CCM10 Misalignment of project stakeholder 's visions	.236	**.314**	**.344**	**.345**	**.520**	**.697**	1.000	.333	.509	.368	.361
	CCM12 Unfriendliness and rigidness between personnel	.298	**.336**	.098	.114	.159	.333	**.333**	1.000	.656	.513	.419
	CCM13 Hostile past encounters between personnel	.229	**.348**	.190	.164	.280	**.401**	**.509**	**.656**	1.000	.700	.423
	CCM14 Different moods and feelings of personnel	.154	.290	.278	.258	.225	.268	**.368**	**.513**	**.700**	1.000	.584
	CCM15 Diverse cultures between project personnel	**.389**	**.417**	**.460**	**.327**	**.308**	.293	**.361**	**.419**	**.423**	**.584**	1.000

For suitability of factor analysis in Table 4.2, the KMO value was 0.791, exceeding the recommended value of 0.60 and the Barlett's test of Sphericity reached statistical significance at $P < 0.05$, supporting the factorability of the correlation matrix.

Table 4.2: Measure of sampling adequacy -CCM

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.791
Bartlett's Test of Sphericity	Approx. Chi-Square	295.228
	Df	55
	Sig.	.000

Using Kaiser criterion in Table 4.3, PAF revealed the presence of three factors with eigenvalue exceeding 1, explaining 4.658, 1.675, and 1.133 with percentage variance of 42.347, 15.231 and 10.296 respectively. Three factors were retained for further interpretation and inspection on the scree plot in appendix B. It showed a clear break after the third component, therefore corresponding with the Kaiser criterion, analysis.

Table 4.3: Percentage variance explained - CCM

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**4.658**	**42.347**	**42.347**	**4.239**	**38.538**	**38.538**	**2.384**	**21.671**	**21.671**
2	**1.675**	**15.231**	**57.578**	**1.266**	**11.510**	**50.048**	**2.293**	**20.849**	**42.520**
3	**1.133**	**10.296**	**67.874**	**.765**	**6.956**	**57.004**	**1.593**	**14.483**	**57.004**
4	.954	8.669	76.543						
5	.567	5.155	81.698						
6	.513	4.660	86.358						
7	.415	3.775	90.133						
8	.363	3.303	93.436						
9	.287	2.610	96.045						
10	.252	2.288	98.333						
11	.183	1.667	100.000						

The rotated solution using varimax as indicated in Table 4.3 shows the presence of strong loadings on three factors with allowable variations, where factor 1 explained a percentage variance of 21.671, factor 2 at 20.849 and factor 3 at 14.483 with a cumulative percentage variance of 57.004.

Table 4.4: Structure factor loading coefficient of CCM after rotation

Variables	Factor 1	2	3
CCM6 Language difficulties	.764		
CCM7 Poor writing skills of personnel	.663		
CCM4 Poor listening skills of personnel	.631		
CCM8 Personal prejudice	.585		.458
CCM5 Unclear and delayed instructions	.490	.303	
CCM13 Hostile past encounters between personnel		.816	.319
CCM14 Different moods and feelings of personnel		.773	
CCM12 Unfriendliness and rigidness between personnel		.684	
CCM15 Diverse cultures between project personnel	.470	.538	
CCM9 Preconceived and unwillingness to change beliefs			.763
CCM10 Misalignment of project stakeholder 's visions	.260	.294	.745

From the result in Table 4.4, three separate subscales high loading of items observed in factor 1, 2 & 3 consecutively. This result represents a different structure from the theoretical structure in chapter two. CCM5 loaded high in factor 1 meaning it will be retained in that factor. Likewise, the same principle was applied for CCM 13 and CCM15 that weighed high in factor 2 and CCM10 weighed high in factor 3. Renaming of these three subscales was taken into consideration to be re- aligned according to the derived factors.

Renaming of the derived factors

The renaming of the variables was adopted from the study of communication problems between actors in construction projects by Ferrer (2017), which focused on analysis of the social dimensions of construction communication. Factor 1 was renamed personal interaction difficulties based on the understanding that it is difficult to distinguish personal connections produced within working parties during a construction process. Additionally, with further understanding that it is in the personal interactions that success and failures of any project is forged (Ferrer 2017). Personal interaction difficulties are related to speaking and listening, reading and writing as explained by Zulch (2014) study on communication skills impacts on sustainable and green project management. Ferrer (2017) suggest that communication is a basic social task that involves conversations, listening to co-workers, creating networks, information-gathering, guiding subordinates and transmitting information through electronic devices. For factor 2, personal behavioral problems were deemed as the new name because the items in the factor implied behavioral challenges. Ferrer (2017), elaborated that the way an individual translates information received is completely personal and is dependent on the

content, irrespective of structure of the project, that individual by their culture, can disregard and misunderstand the information received. It was also explained that some individuals may not communicate effectively, because of their inherent nature, such as their personal traits and prejudice of environment in which they were formed. An individual who come from a profession, with very marked environment, have their own language and defined behavior that can affect communication with the organization of the project (Ferrer 2017). For the third factor, personal cultural problems were adopted. Ferrer (2017) describes the limited focus to improve inter–organizational and interpersonal relationships that define the industry's culture. Ferrer (2017) found that unpredictable behavior can be expected in people participating in a construction project. The author elaborated various backgrounds and different perceptions, contribute to communication difficulties, leading to possible misalignment of the project vision. Kivrak *et al.*, (2008), highlighted that cultural difference is often dependent on personal beliefs of those involved. In conclusion, the final factors derived are illustrated in Table 4.5 below:

Table 4.5: Factors and measures of challenges of implementing communication management practices

Measure	Factor	Label
• Language difficulties • Poor writing skills of personnel • Poor listening skills of personnel • Personal prejudice • Unclear and delayed instructions	**Personal interaction difficulties**	**PID**
• Hostile past encounters between personnel • Different moods and feelings of personnel • Unfriendliness and rigidness between personnel • Diverse cultures between project personnel	**Personal behavioral problems**	**PBP**
• Preconceived and unwillingness to change beliefs • Misalignment of project stakeholder 's visions	**Personal cultural problems**	**PCP**

Reliability

The challenges of implementing communication management practice, reported Cronbach alpha coefficient of 0.862 indicating a good measure of internal consistency. In addition, the individual factors attained a good measure of 0.821 for personal interaction difficulties, 0.813 for personal behavioral problems and for personal cultural problems consecutively, 0.773.

4.2 Benefits of using communication management practices

Eleven items were subjected to PAF, requiring respondents to specify the benefits of communication management practices in construction projects. A number of statistical

measures were undertaken. Table 4.7 indicates that all items met the correlation coefficient of 0.30, with other items achieving as high as 0.80, correlation coefficient. This indicates a strong relationship between the items. For the adequacy of data about factor analysis, the anti-image correlation matrix in Appendix C disclosed all items to be above 0.60 further supporting adequate consistency. Communalities at extraction were as large as 0.80, showing a common variance of 80%, between items, which is suitable.

Table 4.6 shows the KMO value of 0.869 exceeding the suggested threshold of 0.60. The Barlett's Test of Sphericity achieved statistical significance, substantiating the factorability of the construct.

Table 4.6: Measure of sampling adequacy - BCM

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.869
Bartlett's Test of Sphericity	Approx. Chi-Square	505.071
	Df	55
	Sig.	.000

Table 4.8 shows that two factors with eigenvalue above 1, that i.e. 6.534 and 1.108 were extracted explaining a percentage variance of 59.403 and 10.075 with a totality percentage variance of 69.479. Further, the assessment of the scree plot (Appendix C) showed a distinct break after the second factor, therefore retaining the two factors for further investigation.

Table 4.7: Correlation - BCM

Correlation for benefits of communication management practices

	Variables	BCM1	BCM2	BCM3	BCM4	BCM5	BCM6	BCM7	BCM8	BCM9	BCM10	BCM11
Correlation	BCM1 Ensures support, commitment and loyalty of project stakeholders	1.000	.826	.689	.550	.612	.751	.346	.469	.621	.587	.616
	BCM2 Encourages collaboration and cooperation	**.826**	1.000	.690	.627	.607	.657	.417	.526	.628	.568	.591
	BCM3 Reduces project stakeholders' conflict	**.689**	**.690**	1.000	.697	.541	.701	.451	.575	.681	.613	.663
	BCM4 Reduces delays and encourages completing work on time	**.550**	**.627**	**.697**	1.000	.488	.434	.384	.220	.399	.597	.430
	BCM5 Reduces costs and encourages completing work within budget	**.612**	**.607**	**.541**	**.488**	1.000	.625	.421	.321	.406	.302	.418
	BCM6 Improves the specified level of quality	**.751**	**.657**	**.701**	**.434**	**.625**	1.000	.609	.596	.762	.573	.642
	BCM7 Ensures adherence to health and safety procedures	**.346**	**.417**	**.451**	**.384**	**.421**	**.609**	1.000	.528	.621	.326	.409
	BCM8 Enhances the achievement of user expectations	**.469**	**.526**	**.575**	.220	**.321**	**.596**	**.528**	1.000	.635	.298	.541
	BCM9 Enhances specified level of environmental performances	**.621**	**.628**	**.681**	**.399**	**.406**	**.762**	**.621**	**.635**	1.000	.549	.637
	BCM10 Keeps everyone up to date	**.587**	**.568**	**.613**	**.597**	**.302**	**.573**	**.326**	.298	**.549**	1.000	.541
	BCM11 Allows project stakeholders to take decisions	**.616**	**.591**	**.663**	**.430**	**.418**	**.642**	**.409**	**.541**	**.637**	**.541**	1.000

Table 4.8: Percentage variance explained - BCM

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**6.534**	**59.403**	**59.403**	**6.191**	**56.280**	**56.280**	**3.645**	**33.133**	**33.133**
2	**1.108**	**10.075**	**69.479**	**.721**	**6.558**	**62.838**	**3.268**	**29.705**	**62.838**
3	.779	7.085	76.564						
4	.672	6.107	82.671						
5	.480	4.366	87.037						
6	.406	3.688	90.725						
7	.307	2.790	93.515						
8	.274	2.487	96.002						
9	.199	1.811	97.814						
10	.128	1.162	98.976						
11	.113	1.024	100.000						

The rotated solution using varimax in Table 4.8 indicate a presence of strong loadings on both factors with slight variations, where factor 1 explained a percentage variance of 33.133 and factor 2 explained a percentage variance 29.705 with a cumulative percentage variance of 62.838.

Table 4.9: Structure factor loading coefficient of BCM after rotation

	Factor	
Variables	1	2
BCM4 Reduces delays and encourages completing work on time	.792	
BCM2 Encourages collaboration and cooperation	.739	.439
BCM1 Ensures support, commitment and loyalty of project stakeholders	.731	.441
BCM3 Reduces project stakeholders' conflict	.702	.507
BCM10 Keeps everyone up to date	.630	.307
BCM5 Reduces costs and encourages completing work within budget	.544	.345
BCM9 Enhances specified level of environmental performances	.387	.785
BCM8 Enhances the achievement of user expectations		.749
BCM6 Improves the specified level of quality	.512	.727
BCM7 Ensures adherence to health and safety procedures		.613
BCM11 Allows project stakeholders to take decisions	.491	.558

The results from Table 4.9, support the use of two separate subscales instead of the postulated BCM scales established from literature synthesis. Renaming the new subscales within their factors was therefore, considered for further interpretation.

Renaming of the derived factors

From the results, this study established two factors, suggested by Mentula (2015) study on project communication in two case organisation. Methula (2015), highlighted the benefits of communication based on the analysis of two perspectives namely: organisation and

communication as well as project and communication. From an organizational standpoint, Methula (2015), pointed out that when communication is managed well in organizations, it can build strong relationships, set clear expectations and institute feedback. In the same study, it was further highlighted that Richard (2015) explained that when communication is directed on individual requirements and offers information feedback it enhances confidence and loyalty which are important elements of creating solid relationships. So, from Methula (2015) viewpoint, Ragusa (2010) study, further underpinned organizational outcomes to be commitment, trust, loyalty, buying in, motivation, reduction of the potential for misunderstandings, discrepancies and conflict. Henceforth, since the variables in factor 1 corresponded with rationalization of organisation and communication, factor 1 was then renamed organizational communication benefits. In relation to project communication, Methula (2015), highlighted (Campbell (2009) opinion that projects were virtually always succeed when communication was strong among project employees and customers. Furthermore, a citation by Johannessen *et al*., (2011) in Methula (2015) study revealed that project communication was associated with the classical value of time, cost and quality where if it functioned efficiently was recognized to be the most important factor for achieving results. In relation to project communication Muszyńska (2017) accentuated that project communication ensures that realization of tasks is possible in scope and manages project risks and responds to them appropriately. Furthermore, the Project Management Institute (PMI), (2013) report discovered that improving communication not only maximizes success, but also minimizes risk, such as health and safety opined by Chan *et al*., 2000 to be growing with great importance. Factor 2 was renamed project communication benefits. In conclusion, two themes were found to be tailored with communication management practices benefits, namely: organizational communication benefits and project communication benefits as shown in table 4.10 below:

Table 4.10: Factors and measures for benefits of using communication management practices

Measure	Factor	Label
• Reduces delays and encourages completing work on time • Encourages collaboration and cooperation • Ensures support, commitment and loyalty of project stakeholders • Reduces project stakeholders' conflict • Keeps everyone up to date • Reduces costs and encourages completing work within budget	**Organizational communication benefits**	**OCB**
• Enhances specified level of environmental performances	**Project communication benefits**	**PCB**

Measure	Factor	Label
• Enhances the achievement of user expectations • Improves the specified level of quality • Ensures adherence to health and safety procedures • Allows project stakeholders to take decisions		

Reliability

The results for benefits of communication management practices scale indicated 0.927 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70. Moreover, the two factors, were further investigated indicating a good measure of 0.925 for Organizational communication benefit and 0.924 for project communication benefit factor consecutively.

4.3 Communication management practices

4.3.1 Information communication technology (ICT)

As shown in Table 4.12, from the 9 items subjected to PAF, items were correlated above 0.30 coefficient mark. The MSA, for anti-image correlation matrix diagonal (Appendix D) was above 0.60 except for ICT 2 that indicated a slump in correlation and anti-image correlation, hence implying little or no relationship with other items. Communalities at extraction (Appendix D) further indicated items above 0.30, with ICT 2 continuing trend of poor distribution. Therefore, it was decided that ICT2 to be eliminated from further analysis. More re-runs, were conducted and the result indicated that the items met the 0.30 coefficient. For MSA, all anti-image correlation was larger than 0.70, signifying consistency of all items.

Table 4.11 shows the KMO value was 0.784, exceeding the proposed value of 0.60 and the Barlett's test of Sphericity attained statistical significance at $P < 0.05$, supporting the factorability.

Table 4.11: Measure of sampling adequacy - ICT

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.784
Bartlett's Test of Sphericity	Approx. Chi-Square	138.912
	Df	28
	Sig.	.000

Two factors with eigenvalue above 1 (3.632 and 1.083), were extracted explaining a percentage variance of 45.397 and 13.535 of 58.931 total percentage variance as shown in Table 4.13. A

further inspection on the scree plot figure (Appendix D) indicated a presence of a clear break after the second factor, hence both factors were kept for more research.

Table 4.12: Correlation - ICT

Correlation for information communication technology (ICT)

	Variables	ICT1	ICT3	ICT4	ICT5	ICT6	ICT7	ICT8	ICT9
Correlation	ICT1 Telephones with voicemail services are used	1.000	.336	.197	.362	.330	.203	.323	.124
	ICT3 Video conferencing facilities are used	**.336**	1.000	.444	.451	.471	.436	.376	.552
	ICT4 Internet and intranet is consistently available	.197	**.444**	1.000	.326	.319	.482	.418	.515
	ICT5 Social media communication is used e.g. WhatsApp chatting platform	**.362**	**.451**	**.326**	1.000	.414	.273	.397	.325
	ICT6 Building information modelling (BIM) software is appropriately adopted	**.330**	**.471**	**.319**	**.414**	1.000	.390	.563	.252
	ICT7 Computer Aided Design (CAD) software is appropriately adopted	.203	**.436**	**.482**	.273	**.390**	1.000	.238	.407
	ICT8 Virtual offices support software and portals is available	**.323**	**.376**	**.418**	**.397**	**.563**	.238	1.000	.459
	ICT9 Project management software is used e.g. Construction Computer Software (CCS)	.124	**.552**	**.515**	**.325**	.252	**.407**	**.459**	1.000

Table 4.13: Percentage variance explained - ICT

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**3.632**	**45.397**	**45.397**	**3.110**	**38.876**	**38.876**	**1.921**	**24.018**	**24.018**
2	**1.083**	**13.535**	**58.931**	**.548**	**6.850**	**45.726**	**1.737**	**21.709**	**45.726**
3	.759	9.486	68.417						
4	.692	8.652	77.069						
5	.613	7.660	84.730						
6	.546	6.824	91.554						
7	.417	5.215	96.768						
8	.259	3.232	100.000						

The rotated solution using varimax indicated in Table 4.13, interpreted a presence of almost even distribution on both factors where factor one explained a percentage variance of 24.018 and factor 21.709 with a cumulative percentage variance of 45.726, therefore suggesting that the items are closely related.

Table 4.14: Structure factor loading coefficient of ICT after rotation

	Factor	
Variables	1	2
ICT9 Project management software is used e.g. Construction Computer Software (CCS)	.787	
ICT4 Internet and intranet is consistently available	.646	.256
ICT3 Video conferencing facilities are used	.566	.456
ICT7 Computer Aided Design (CAD) software is appropriately adopted	.514	.276
ICT6 Building information modelling (BIM) software is appropriately adopted		.709
ICT8 Virtual offices support software and portals is available	.373	.554
ICT5 Social media communication is used e.g. WhatsApp chatting platform	.299	.538
ICT1 Telephones with voicemail services are used		.516

The results in Table 4.14, supported the use of two separate ICT practices, disregarding the postulated ICT theoretical practice. Renaming the new practices was therefore considered for further interpretation.

Renaming of the derived factors

The renaming of the output of the results was guided by the study of Rimmington (2015), on the impact of information and communication technology on construction projects. Based on Kraemer *et al*., (1990) reasoning, Rimmington (2015) discovered that information communication technology is interpreted differently in construction. Information technology

is understood as essential for storage of information, but its use does not mean communication has taken place. On the other hand, communication element of technology is understood as the actual hardware to perform a basic information processing task. So, from this outlook, two themes based on the hypothesized initial theme (information communication technology) were detached to establish new themes based on the two factors derived, namely: Information technology and communication technology as explicitly tabulated by Rimmington (2015), p.1368. So, Factor 1 was renamed to information technology, since most items seemed to relate to services that do not clearly indicate communication has taken place as Rimmington (2015) study had highlighted. Furthermore, to substantiate Rimmington (2015) understanding, Čulo *et al*., (2010), p.9, study clearly tabulated communication techniques and descriptions of communication technology to be emails, interoffice memos, instant messaging, project status meetings, telephone or video conferencing, internet and intranet boards, walkabouts. So, from this discussion factor 2 was renamed communication technology based on most items in factor 2 of Table 4.14 corresponding Čulo *et al*., (2010) rationale. Furthermore, this study found it necessary to explain that although, five items loaded in both factors as shown in Table 4.14, the allocation of the items was determined by the high strength in loading. For instance, ICT4, ICT3 and ICT 7 weighed highly on factor 1 whereas ICT8 and ICT 5 weighed highly on factor 2. Conclusively, information technology and communication technology used to describe the two practices established from analysis as illustrated below:

Table 4.15: Information and communication technology (ICT)

Measure	Factor	Label
• Project management software is used e.g. Construction Computer Software (CCS) • Internet and intranet are consistently available • Video conferencing facilities are used • Computer Aided Design (CAD) software is appropriately adopted	**Information technology**	**IT**
• Building information modelling (BIM) software is appropriately adopted • Virtual offices support software and portals is available • Social media communication is used e.g. WhatsApp chatting platform • Telephones with voicemail services are used	**Communication technology**	**CT**

Reliability

The results for information and communication technology practices scale indicated 0.822 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70. Likewise, the two factors indicated a good measure of 0.792 for information technology factor and 0.801 for communication technology factor consecutively.

4.3.2 Communication skills and competence (CSC)

From Table 4.16, five items subjected to PAF, a correlation above 0.30 was found in the items, excluding CSC 5 which indicated low correlation. The MSA, for anti-image correlation matrix diagonal (Appendix E) the items showed the presence of a co-efficient diagonal above 0.60. The items indicated correlation as high as 0.70, therefore showing that items are coherent except for CSC5. CSC5 indicated low values and was eliminated. Further re-run was then conducted on the remaining four items and all items supported the correlation of 0.30 with MSA above 0.60. For communalities at extraction, the items were above 0.30 recommended threshold, therefore suggesting a common variance about 70%, which is acceptable.

The KMO value measure of sampling adequacy in Table 4.17 indicated was 0.736, above the indicated threshold of 0.60, and Bartlett's test of sphericity attained statistical significance at p=.000(<0.05), indicating factorability.

Table 4.16: Correlation - CSC

Correlation for communication skills and competences

	Variables	CSC1 Excellent verbal communication among project stakeholders	CSC2 Excellent written communication among project stakeholders	CSC3 Effective use of information communication technology among project stakeholders	CSC4 Proper interpretation of contractual matters is communicated
Correlation	CSC1 Excellent verbal communication among project stakeholders	1.000	.383	.581	.434
	CSC2 Excellent written communication among project stakeholders	**.383**	1.000	.495	.254
	CSC3 Effective use of information communication technology among project stakeholders	**.581**	**.495**	1.000	.521
	CSC4 Proper interpretation of contractual matters is communicated	**.434**	.254	**.521**	1.000

Table 4.17: Measure of sampling adequacy - CSC

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.736
Bartlett's Test of Sphericity	Approx. Chi-Square	59.484
	Df	6
	Sig.	.000

Table 4.18 shows one factor had an eigen value above 1 that is 2.351 that was extracted explaining the percentage variance of 58.778. Furthermore, the assessment of the scree plot (Appendix E) retained one factor with a distinct break point after the first factor. The varimax rotation revealed no solution, implying that all items loaded into one factor for further investigation.

Table 4.18: Percentage variance explained - CSC

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.351**	**58.778**	**58.778**	**1.875**	**46.879**	**46.879**
2	.749	18.733	77.511			
3	.532	13.290	90.802			
4	.368	9.198	100.000			

Attempts to omit and re-run the analysis, excluding the items with low correlation as mentioned above, further supported no solution after rotation. It was then decided the above illustrated original solution be kept, signifying that the use of CSC items as postulated in literature review is adequate. Communication skills and competence was accepted as a factor.

Reliability

The results for communication skills and competence scale indicated 0.750 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70.

4.3.3 Communication planning (CP)

From Table 4.19, the items showed correlation coefficient above 0.30. The MSA, (Appendix F) anti-image correlated slope (above 0.60) showed a presence of all items higher than 0.75. Communalities at extraction (Appendix F) revealed that the items are higher than 0.50.

Therefore, this indicated a common variance of 50%, which is good. CP7 did not meet the recommended communality threshold. However, it was not removed from the analysis, since it had no impact on correlations.

The KMO value measure of sampling adequacy in Table 4.20 was 0.841, above the suggested threshold of 0.60 with the Bartlett's test of sphericity achieved statistical significance at p=.000(<0.05), indicating factorability.

Table 4.19: Correlation -CP

Correlation for communication plan								
	Variables	CP1	CP2	CP3	CP4	CP5	CP6	CP7
Correlation	CP1 Communication requirements of the project team are critically analyzed in the project	1.000	.549	.570	.660	.602	.515	.355
	CP2 Communication technology is used to deliver information	**.549**	1.000	.518	.562	.630	.777	.397
	CP3 the organization critically determines the objectives of communication	**.570**	**.518**	1.000	.518	.455	.444	.479
	CP4 Proper channels of information delivery are established in the organization	**.660**	**.562**	**.518**	1.000	.699	.531	.333
	CP5 Every personnel is accountable for the information they are required to send.	**.602**	**.630**	**.455**	**.699**	1.000	.642	.482
	CP6 the organization clearly identifies the recipient of the information to be sent	**.515**	**.777**	**.444**	**.531**	**.642**	1.000	.310
	CP7 the organization determines communication frequency to project stakeholders	**.355**	**.397**	**.479**	**.333**	**.482**	**.310**	1.000

Table 4.20: Measure of sampling adequacy - CP

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.841
Bartlett's Test of Sphericity	Approx. Chi-Square	212.110
	Df	21
	Sig.	.000

One factor was extracted showing an eigen value above 1 that is 4.189 that was extracted explaining the percentage variance of 59.842% as shown in Table 4.21. Further investigation on the scree plot figure (Appendix F) maintained the presence a clear break point after first factor. Hence, one factor was retained for investigation.

Table 4.21: Percentage variance explained - CP

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**4.189**	**59.842**	**59.842**	**3.754**	**53.630**	**53.630**
2	.823	11.755	71.596			
3	.658	9.405	81.001			
4	.540	7.713	88.714			
5	.339	4.840	93.554			
6	.249	3.560	97.115			
7	.202	2.885	100.000			

The varimax extraction solution, indicated no solution after rotation, even after attempts that omitted of CP7 and a re-run. This then suggested that there is no presence of separate scales in comparison to the initial theoretical observation., Hence the use of CP scale and retaining communication plan as factor.

Reliability

The results for communication planning (CP) scale indicated 0.884 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70.

4.3.4 Teamwork (TMK)

As shown in Table 4.22, the five items showed correlation coefficient of 0.30 and above. For MSA (Appendix G), all items showed a presence of anti-image correlation (above 0.6), with items as high as 0.65 indicating suitability for factor analysis. Communalities at extraction indicated that the items were above the 0.30 mark, excluding TMK2 and TMK3 that appeared to be low. However, they were not excluded because the items correlated and the common variance between these items was 30%, which is acceptable.

The KMO value measure of sampling adequacy in Table 4.23 was 0.691, exceeding the recommended threshold of 0.6 and with the Bartlett's test of sphericity reached statistical significance at p=0.000(<0.05), indicating factorability.

Table 4.22: Correlation - TMK

Correlation for teamwork						
	Variables	TMK1	TMK2	TMK3	TMK4	TMK5
Correlation	TMK1 There is effective communication and coordination within the project stakeholders	1.000	.413	.312	.527	.274
	TMK2 Decentralization of information among project stakeholders is effective	**.413**	1.000	.214	.346	.387
	TMK3 Conducive working relationship between project stakeholders	**.312**	.214	1.000	.222	.467
	TMK4 Group work effort enhances the quality of communication	**.527**	**.346**	.222	1.000	.334
	TMK5 Strong inter-department alliance in the project enables communication to flow efficiently	.274	**.387**	**.467**	**.334**	1.000

Table 4.23: Measure of sampling adequacy - TMK

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.691
Bartlett's Test of Sphericity	Approx. Chi-Square	57.444
	Df	10
	Sig.	.000

Table 4.24: percentage variance explained - TMK

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.405**	**48.094**	**48.094**	**1.769**	**35.379**	**35.379**
2	.941	18.817	66.911			
3	.703	14.051	80.962			
4	.561	11.221	92.184			
5	.391	7.816	100.000			

One factor was extracted with an eigen value above 1 that is 2.405 and that was extracted explaining a percentage variance of 48.094 as shown in Table 4.24. Further inspection on the scree plot figure in Appendix G showed retaining the factor with a distinct break point after the first factor. For extraction, varimax rotation, could not indicate the results because the items loaded on one factor. Even after several attempts to eliminate the items with low communalities, the solution remained constant. Therefore, the analysis of result supported the use of TMK scale which is teamwork as the appropriate factor.

Reliability

The results for teamwork scale indicated 0.723 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70.

4.3.5 Clear channels within the organization structure (COS)

As shown in Table 4.25, the items examined indicated positive correlation above 0.30, signifying existence of a relationship between them. The MSA, (Appendix H) anti-image correlation diagonal (above 0.30) indicated positive strength with the items higher than 0.75, ranging between 0.75 and 0.80. Communalities at extraction (Appendix H), observed the items to be above 0.30, ranging from 0.30 to 0.45, indicating 45% common variance amongst items, which is acceptable. However, items COS1 and COS3 were low, but due to the evident strong correlation with other items, they were retained.

The KMO value measure of sampling adequacy in Table 4.26 was 0.783, above the suggested threshold of 0.60 with the Bartlett's test of sphericity statistical significance at p=.000(<0.05), indicating factorability

Table 4.25: Correlation - COS

Correlation clear channels within organization structure (COS)						
	Variables	COS1	COS2	COS3	COS4	COS5
Correlation	COS1 Organizational and operational processes are in place	1.000	.466	.264	.442	.405
	COS2 Roles and responsibilities of project stakeholders are clearly defined	**.466**	1.000	.478	.590	.465
	COS3 There are clearly marked communication channels from superior to subordinates	.264	**.478**	1.000	.289	.437
	COS4 The line of authority is clearly specified for the project tasks to be accomplished.	**.442**	**.590**	.289	1.000	.453
	COS5 Clear determination and limits of who will communicate with whom and who will receive which information	**.405**	**.465**	**.437**	**.453**	1.000

Table 4.26: Measure of Sampling adequacy - COS

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.783
Bartlett's Test of Sphericity	Approx. Chi-Square	77.249
	Df	10
	Sig.	.000

One factor was extracted that had eigen value above 1 of 2.730 that was extracted explaining the percentage variance of 54.610 as shown in Table 4.27. Further investigation on the scree

plot figure (Appendix H) maintained the presence a clear break point after first factor. Hence, one factor was retained for investigation.

Table 4.27: Percentage variance explained - COS

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.730**	**54.610**	**54.610**	**2.197**	**43.935**	**43.935**
2	.786	15.729	70.338			
3	.582	11.642	81.981			
4	.546	10.914	92.895			
5	.355	7.105	100.000			

The interpretation of varimax extraction solution was not achieved because all items loaded on one factor, even after re-run attempts to remove the items with low communalities, the results still specified no solution after rotation. This, then supported the predicted use of COS scale of clear channels within the organization structure as a factor.

Reliability

The results for clear channels within the organization structure scale indicated 0.781 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70.

4.3.6 Project Briefing (PB)

From Table 4.28, the nine items correlated with each other with a presence of coefficients above 0.30. In Appendix J of the PB scale, the MSA, showed that the items met the anti-correlation diagonal (above 0.60) indicating positive strength. PB3, PB5 and P9 showed low correlation, therefore they were omitted. Communalities at extraction (Appendix J) showed all remaining items had a common variance ranging from 0.30 to as high as 0.80 indicating 80% chance of relation between items, which is appropriate.

The KMO value measure of sampling adequacy in Table 4.29 was 0.797 exceeding the recommended threshold of 0.60. The Bartlett's test of sphericity statistical significance reached p=.000(<0.05), indicating factorability.

Table 4.28: Correlation -PB

Variables		PB1 A brief provides proper definition of client requirements	PB2 A brief provides proper analysis of client requirements	PB4 the changes to brief are properly managed	PB6 Project risk are properly communicated	PB7 There is constant interaction amongst project stakeholders	PB8 There is constant knowledge sharing amongst project stakeholders
Correlation	PB1 A brief provides proper definition of client requirements	1.000	.715	.513	.330	.264	.383
	PB2 A brief provides proper analysis of client requirements	**.715**	1.000	.482	.315	.227	.283
	PB4 the changes to brief are properly managed	**.513**	**.482**	1.000	.308	.292	.493
	PB6 Project risk are properly communicated	**.330**	**.315**	**.308**	1.000	.580	.436
	PB7 There is constant interaction amongst project stakeholders	.264	.227	.292	**.580**	1.000	.371
	PB8 There is constant knowledge sharing amongst project stakeholders	**.383**	.283	**.493**	**.436**	**.371**	1.000

Table 4.29: Measure of Sampling Adequacy - PB

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.744
Bartlett's Test of Sphericity	Approx. Chi-Square	112.792
	Df	15
	Sig.	.000

Two factors had eigen value above 1 quantified as 3.007 and 1.134 extracted with percentage variance of 50.118 and 18.907 explaining 69.024 overall percentage variances indicated in Table 4.30. A scree plot figure in Appendix J showed a presence of a clear break point after the second factor supporting consistency.

Table 4.30: Percentage variance explained - PB

Factor	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %	Rotation Sums of Squared Loadings Total	% of Variance	Cumulative %
1	**3.007**	**50.118**	**50.118**	**2.574**	**42.892**	**42.892**	**1.816**	**30.269**	**30.269**
2	**1.134**	**18.907**	**69.024**	**.733**	**12.217**	**55.108**	**1.490**	**24.839**	**55.108**
3	.719	11.978	81.002						
4	.474	7.893	88.895						
5	.393	6.557	95.452						
6	.273	4.548	100.000						

Table 4.31: Structure factor coefficient of PB after rotation

Variables	Factor 1	2
PB1 A brief provides proper definition of client requirements	.847	
PB2 A brief provides proper analysis of client requirements	.778	
PB4 the changes to brief are properly managed	.559	.338
PB6 Project risk are properly communicated		.744
PB7 There is constant interaction amongst project stakeholders		.709
PB8 There is constant knowledge sharing amongst project stakeholders	.349	.503

The varimax solution, supported two separate scales evenly distributed with four items on each factor, hence disregarding the postulated use of project briefing (PB) factor scale.

Renaming of the derived factors

Consideration of the renaming the subscales as presented from the results in Table 4.31 was adopted from Khosrowshahi (2015) study on enhanced pro-structured approach to client design interface. In the study Khosrowshahi (2015) referenced Alharthi *et al.,* (2014) argument that client capabilities to undertake roles such a risk management, requirement management reflects the way the project brief is developed. So, from this standpoint, the two factors were renamed as; factor 1, project brief requirement management and project brief risk management. From a project brief requirement management perspective, Khosrowshahi (2015) further cited Kamara *et al.,* (2000) on examining clients' requirements with concurrent engineering view of construction process and proposed a collaborative approach to developing the definition, analysis and translation of client requirements. Although there is no clear explanation of project brief risk management in Khosrowshahi (2015), findings from a related study by Othman (2005), it is explained that because brief development can add risk to a project, well established

risk management is an appropriate tool to manage dynamic brief development. It is further explained that because of the dynamic nature of clients and different internal and external brief development drivers, risk management should be a continuing activity throughout the project life cycle (Othman 2005). Based on this understanding, the initial factor found on both factors was then described as project brief requirement management and project brief risk management as described in Table 4.32. Notably, for analysis interpretation PB4 and PB8 appear in both factors and the rate of the loadings of each item determines in which factor each item should be retained. The criteria for retaining the action items were based on where each item is highly loaded. For example, PB 4 loaded highly on factor 1 as per Table 4.31, so it was retained in that specific factor as illustrated in Table 4.32 below:

Table 4.32: Project briefing (PB)

Measure	Factor	Label
• A brief provides proper definition of client requirements • A brief provides proper analysis of client requirements • The changes to brief are properly managed	**Project Brief requirement management**	**PBREM**
• Project risk are properly communicated • There is constant interaction amongst project stakeholders • There is constant knowledge sharing amongst project stakeholders	**Project Brief risk management**	**PBRIM**

Reliability

The results for project briefing (PB) practices scale indicated 0.798 internal consistency, representing good reliability above the acceptable Cronbach alpha value of 0.70. The additional subscales found indicated a good measure of 0.800 for project brief requirement management factor and 0.703 project brief risk management factor consecutively.

4.3.7 Context of environment (CE)

As shown in Table 4.33, for suitability of the context of environment factor, the items correlated above 0.30 threshold, except for CE3. For MSA in Appendix K, the items correlated (above 0.60) anti-image diagonal indicating positive association ranging from 0.65 to 0.75, indicating adequate relationship between items. However, communalities at extraction (Appendix K), showed CE2 and CE4 to be above the recommended threshold.

The KMO value measure of sampling adequacy in Table 4.34 was 0.683, above the suggested measure of 0.60, The Bartlett's test of sphericity attained statistical significance at p=.000(<0.05), indicating factorability.

Table 4.33: Correlation - CE

	Variables	CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	CE2 There are good interpersonal relationships among project stakeholders	CE4 Conflicts are resolved from previous communication episodes	CE5 Project stakeholders of different cultures are accommodated
Correlation	CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	1.000	.372	.312	.328
	CE2 There are good interpersonal relationships among project stakeholders	**.372**	1.000	.547	.260
	CE4 Conflicts are resolved from previous communication episodes	**.312**	**.547**	1.000	.301
	CE5 Project stakeholders of different cultures are accommodated	**.328**	.260	**.301**	1.000

Table 4.34: Measure of Sampling Adequacy - CE

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.683
Bartlett's Test of Sphericity	Approx. Chi-Square	39.326
	df	6
	Sig.	.000

Result in Table 4.35 show that one factor had eigenvalue above 1 that is 2.071 and variance of 51.783%. The scree test in Appendix K showed support of retaining this factor with a distinct break point after the first factor. To aid interpretation, the varimax rotation indicated no solution after rotation.

Table 4.35: Percentage variance explained - CE

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**2.071**	**51.783**	**51.783**	**1.479**	**36.973**	**36.973**
2	.817	20.416	72.199			
3	.671	16.774	88.973			
4	.441	11.027	100.000			

The results of the output, therefore supported retaining the theoretical context of environment scale.

Reliability

The Cronbach alpha standardized coefficients for CE is 0.686. The factor CE includes items CE1, CE2, CE4, and CE5. According to Pallant (2007 & 2013) and Briggs *et al.*, (1986) in such cases, it may be appropriate to report the mean inter-item correlation that should be within the range of 0.2 to 0.4. From the rationale, output from the analysis showed most items met that stipulated range as indicated in Table 4.36, therefore, achieving the internal reliability.

Table 4.36: Inter – Item correlation - CE

Inter-Item Correlation Matrix

Variables	CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	CE2 There are good interpersonal relationships among project stakeholders	CE4 Conflicts are resolved from previous communication episodes	CE5 Project stakeholders of different cultures are accommodated
CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	1.000	.372	.312	.328
CE2 There are good interpersonal relationships among project stakeholders	**.372**	1.000	.547	.260
CE4 Conflicts are resolved from previous communication episodes	**.312**	**.547**	1.000	.301
CE5 Project stakeholders of different cultures are accommodated	**.328**	**.260**	**.301**	1.000

It is worth noting that a re-run was conducted on the items, using Alpha if deleted criterion to decide which items should be eliminated. A re-run focusing on CE2 and CE4 with communalities at extraction in Appendix K were found to be adequate. Although the Alpha if deleted on CE4 was above the final Alpha value, internal inconsistency was met at .704. Georgia (n.d) attributed such occurrences to findings that even though the internal consistency

of 0.70 has been found to be reliable and a criterion for publishing the measure outcome, numerous factors should be considered before disregarding low reliability. Field (2006), advocated that when dealing with psychological constructs, because of the diversity of constructs, low reliability should be realistically expected. However, for the level of this study, detailed discussion on this rationale was not considered. It was decided that since the items met the inter item correlation matrix requirement, the remaining items in CE should be considered reliable.

Prior, to the investigation of the hypothesized relationship between communication management practices and projects success, the observed variables postulated to measure project success as an underlying variable were also subjected to factor analysis interpreted hereunder:

4.3.8 Project outcome (PO)

All five items were found have a positive correlation above 0.30 indicating good relationship between items as shown in Table 4.37. In relation to the MSA, in Appendix L, all the items correlated above 0.60 anti-image diagonal reaching as high as 0.80. This result further signifies an adequate association amongst the items. Communalities result at extraction, showed positive strength to all items with common variance of 50% ranging from 0.40 to 0.50.

The KMO value measure of sampling adequacy in Table 4.38 was 0.768, above the recommended measure of 0.70, The Bartlett's test of sphericity reached statistical significance at p=0.000(<0.05), indicating factorability.

Table 4.37: Correlation - PO

Correlation for project outcome (PO)

Variables		PO1	PO2	PO3	PO4	PO5
Correlation	PO1 Scope of works of the project was achieved	1.000	.469	.513	.657	.531
	PO2 Project was within time	**.469**	1.000	.597	.380	.524
	PO3 Project was within budget	**.513**	**.597**	1.000	.504	.446
	PO4 Project risks minimized i.e. occupational accidents	**.657**	**.380**	**.504**	1.000	.654
	PO5 Quality of works of the project was achieved	**.531**	**.524**	**.446**	**.654**	1.000

Table 4.38: Measure of Sampling Adequacy - PO

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.768
Bartlett's Test of Sphericity	Approx. Chi-Square	126.888
	Df	10
	Sig.	.000

The result in Table 4.39 indicates that one factor had Eigenvalue above 1 of 3.112 and the variance of 62.250. The scree test in Appendix L showed support of retaining one factor with a clear break point after the first factor

Table 4.39: Percentage variance explained - PO

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	**3.112**	**62.250**	**62.250**	**2.648**	**52.955**	**52.955**
2	.731	14.624	76.874			
3	.512	10.249	87.123			
4	.397	7.941	95.064			
5	.247	4.936	100.000			

To validate further interpretation, the varimax rotation indicated no presence of solution after the rotation, since one factor was extracted. This confirms the use of PO scale as conceptualized in the literature, therefore retaining project success as a factor.

Reliability

Project success reported a good measure of internal consistency with Cronbach alpha coefficient of 0.848. This was above the recommend cutoff point of 0.70.

During the evaluation of survey results, one item (stakeholders' personality) indicated in appendix I was eliminated from the hypothesis for indicating signs of low correlations, low measure of sampling adequacy and negative strength of communalities at extraction as well as reliability, even after several re-runs. This study found that the inconsistency is due to ratio of subject to items, where in this instance in the questionnaire, the item described as stakeholder's personality (SP), had three cases, hence limiting the accomplishment of factor analysis. The reasoning behind such circumstances is explained by Pallant 2013; 2007 and Tebachnick *et al*., 2001 to be due to the requirement for factor analysis to at least have 5 cases for each item of which stakeholders' personality did not meet.

The factors of communication management practices hypothesized in chapter two varied with empirical results. Some of the factors emerged with new structure of factors as stated hereunder.

Table 4.40 indicates the variances and final summary of factors and their measures. Thus, answering objective number three that dwelt in identifying communication management practices and providing the empirical context of the main objective of this study.

Table 4.40: Factors of communication management practices and measures/actions

Old Name and code	New Factors	New Codes	Measures
Information communication technology (ICT)	Information technology	IT	• Project management software is used e.g. Construction Computer • Video conferencing facilities are used • Computer Aided Design (CAD) software is appropriately adopted • Computer Aided Design (CAD) software is appropriately adopted • Building information modelling (BIM) software is appropriately • Virtual offices support software and portals is available • Social media communication is used e.g. WhatsApp chatting • Telephones with voicemail services are used
	Communication technology	CT	
Communication skills and competence	Communication skills and competence	CSC	• Excellent verbal communication among project stakeholders • Excellent written communication among project stakeholders • Effective use of information communication technology among project stakeholders • Proper interpretation of contractual matters is communicated • Project team members have excellent listening skills
Communication planning	Communication planning	CP	• Communication requirements of the project team are critically analyzed in the project • Communication technology is used to deliver information • Proper channels of information delivery are established in the organization

Old Name and code	New Factors	New Codes	Measures
Teamwork	Teamwork	TMK	• Every personnel are accountable for the information they are required to send. • The organization clearly identifies the recipient of the information to be sent • There is effective communication and coordination within the project stakeholders • Conducive working relationship between project stakeholders • Group work effort enhances the quality of communication
Clear channels within organization structure	Clear channels within organization structure	COS	• Strong inter-department alliance in the project enables communication to flow efficiently • Organizational and operational processes are in place • Roles and responsibilities of project stakeholders are clearly defined • There are clearly marked communication channels from superior to subordinates • The line of authority is clearly specified for the project tasks to be accomplished.
Project briefing	Brief requirement management	BREM	• Clear determination and limits of who will communicate with whom and who will receive which information • A brief provides proper definition of client requirements • A brief provides proper analysis of client requirements
	Brief risk management	BRIM	• Project stakeholders are constantly updated on the progress and status of the project • The changes to brief are properly managed • Project risk are properly communicated • There is constant interaction amongst project stakeholders • Adequate time is provided for project briefing
Context of environment	Context of environment	CE	• A brief provides adequate translation of client requirements • Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements

Old Name and code	New Factors	New Codes	Measures
			• Project stakeholders of different cultures are accommodated • Conflicts are resolved from previous communication episodes • There are good interpersonal relationships among project stakeholders

4.3.9 Chapter summary

In this chapter the conceptualized items/measures of challenges of implementing communication management practices, benefits of using communication management practices and communication management practices new factors emerged. However, project outcome did not suggest any new factors.

The challenges of implementing communication management practices emerged with three factors that comprised of personal interaction difficulties, personal behavioral problems and personal cultural problems differing from the initial theory. Similarly, the benefits of using communication management practices were measured by two factors as opposed to one. The factors found were organizational communication benefits and project communication benefits.

From the underlying communication management practices, it was found that communication management practices are measured by nine factors versus the eight factors postulated. The nine factors found were*:* information technology, communication technology, communication skills and competence, communication planning, teamwork, clear channels within organization structure, project brief requirement management, project brief risk management and context of environment. Finally, project performance outcomes related to project outcome remained unchanged with project outcome kept as initially theorized in the literature review. The empirical results were then subjected to further analysis and the results are presented in chapter five. The results of the relationship between the factors of communication management practices and project outcome are also presented in subsequent chapter. Analysis was based on descriptive statistics from questionnaire survey and inferential statistics.

CHAPTER FIVE

FINDINGS

5.0 Introduction

The results from chapter four of this research classified factors of challenges in the practice of communication management and factors of benefits in communication management practices as well as factors of communication management practices. Henceforth this chapter presents and discusses predominant factors with the aim of providing answers and rationale to the specific research questions based on questionnaire survey conducted using descriptive statistics.

5.1 Challenges of implementing of communication management practices in construction projects

In the literature review it was found important to evaluate the challenges of communication management in construction projects. The objective was to determine which aspects contribute towards problems of managing communication in construction projects. From this category a question was asked with regards to participants level of understanding on the challenges of implementing communication management faced in construction projects they were engaged in. As shown in Table 5.1, personal behavioral problems recorded an overall mean (M) of 3.23 with standard deviation (SD) of 0.863, tailed by personal interaction difficulties (M=3.18, SD=0.726) and personal cultural problems recording a low of M=3.12, SD=1.019. The mean scores were between 2.61 and 3.40 suggests that the respondents are neutral. They do not agree or disagree with these three factors stifling the implementation of communication management practices. However, personal cultural problems attained standard deviation above 1, suggesting that the respondents had varied opinion on the measures defining personal cultural problems.

Table 5.1: Mean score on challenges of communication management practices

Factors	N	Minimum	Maximum	Mean	Std. Deviation	Rank
Personal behavioral problems (PBP)	66	1.00	5.00	3.2323	.86349	1
Personal interaction difficulties (PID)	66	1.20	5.00	3.1848	.72600	2
Personal cultural problems (PCP)	65	1.00	5.00	3.1231	1.01946	3
Valid N (listwise)	65					

5.2 Benefits of using communication management practices in construction projects

Based on the related literature review on benefits of using communication management, the empirical results identified two factors. The respondents were questioned towards the extent they agree on the benefits of using communication management practices. Table 5.2 shows a

mean score of 3.99 with standard deviation of 0.690 for organisation communication benefits and for project communication benefits recording (MS=3.87, SD=0.664). The mean values were in the range of 3.41 and 4.20 suggesting that, the respondents agreed that implementing communication management practices is beneficial to the project. The standard deviations were above 0.5 suggesting that the respondents had different opinion on the factors related to benefits of communication management practices.

Table 5.2: Mean score on benefits of communication management practices

Factors	N	Minimum	Maximum	Mean	Std. Deviation	Rank
Organizational communication benefits (OCB)	66	1.67	5.00	3.9965	.69082	1
Project communication benefits (PCB)	66	1.80	5.00	3.8758	.66450	2
Valid N (listwise)	66					

5.3 Communication management practices in construction projects

Based on the survey results on communication management practices, the survey participants were questioned on which communication management practices contribute substantially for better implementation or execution of construction projects. Empirical findings established nine factors underlying the communication management practices that contribute to better implementation of construction projects. Based on the highest to the lowest ranking using the overall mean value, the rankings are shown in Table 5.3, were project brief risk management (MS=4.01, SD=0.516) ranked 1st, communication skills and competence (MS=3.98, SD=0.556), project brief requirement management (MS=3.97, SD=0.555), clear channels within organisation structure (MS=3.95, SD=0.602), teamwork(MS=3.94,SD=0.485), communication planning (MS=3.90, SD=0.627), context of environment(MS=3.77, SD=0.543), information technology (MS=3.64, SD=0.697) and communication technology (MS=3.47, SD=0.747). Although, project brief risk management was ranked first and communication technology ranked ninth, the opinions were varied for each practice based on the dispersion as the standard deviation were tilting towards 0.5. However, the respondents agreed that project brief risk management had influence on project outcome. Furthermore, the other practices were also deemed to influence project outcome as their overall mean were in the band of 3.41 to 4.20.

Table 5.3: Mean score on communication management practices

Factors	N	Minimum	Maximum	Mean	Std. Deviation	Rank
Project brief risk management (BRIM)	63	3.00	5.00	4.0159	.51650	1
Communication skills and competence (CSC)	65	2.25	5.00	3.9859	.55679	2

Factors	N	Minimum	Maximum	Mean	Std. Deviation	Rank
Project brief requirement management (BREM)	64	2.00	5.00	3.9714	.55520	3
Clear channels within organization structure (COS)	65	2.00	5.00	3.9590	.60237	4
Teamwork (TMK)	65	2.60	5.00	3.9497	.48574	5
Communication planning (CP)	65	2.00	5.00	3.9019	.62732	6
Context of environment (CE)	64	2.00	5.00	3.7708	.54311	7
Information technology (IT)	65	1.50	5.00	3.6487	.69714	8
Communication technology (CT)	65	1.50	5.00	3.4756	.74764	9
Valid N (listwise)	63					

5.4 Project outcome

In the literature review section, project performance outcomes related to project outcome were identified and instituted upon attributes that are stated in the survey to establish which outcomes were influenced by communication management practices. As indicated in Table 5.4, all respondents agreed that project outcome were influenced by communication management practices as the mean score was MS=3.79. However, the dispersion of responses suggest that the respondents had different views parting to the performance outcome related to communication management practices as the SD was tilting towards 1.00 at 0.697.

Table 5.4: Mean score on project performance outcome

Factor	N	Minimum	Maximum	Mean	Std. Deviation
PO Project outcome	66	1.00	5.00	3.7977	.69705
Valid N (listwise)	66				

5.5 Relationship of communication management practices and project outcome

Before the study of the nature of the relationship between the two variables, scatter plot was applied to define whether a linear relationship exists between variables. Figure 5.1 illustrates the plot matrix made up of variables that are utilized in the study. Based on Figure 5.1, there was no positive linear relationship amongst the variables. Hence, the non-parametric test of Spearman's rank order correlations was used to analyze the relationship of factors of communication management practices and project outcome.

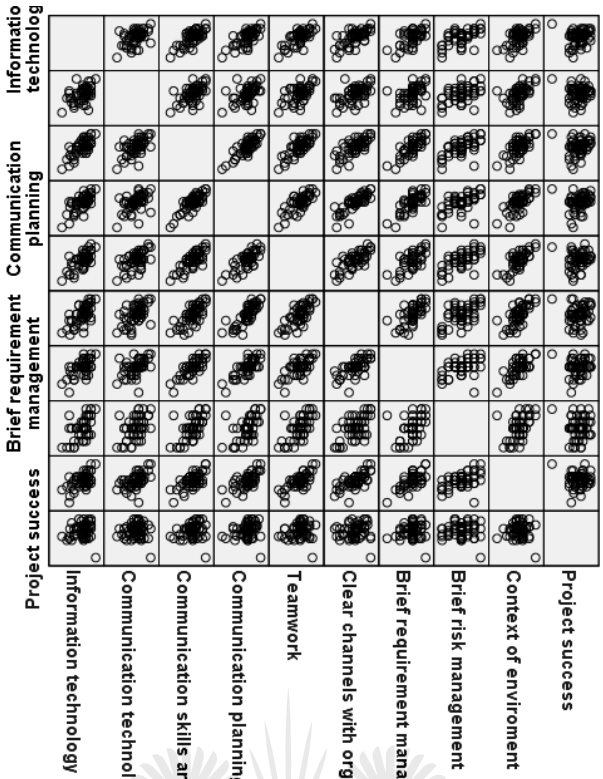

Figure 5.1: Scatterplot matrix

Based on the result in Table 4.40 the concluded factors of communication management practices, all factors (IT, CT, CSC, CP, COS, TMK, PBREM, PBRIM and CE) were tested to determine if a relationship exists with project outcome (PO). It was discovered that six of the nine practices do not have a relationship with project outcome. Only three factors of communication management practices have, but rather weak (0.20 -0.39) positive correlation with project outcome. These practices were: information technology (IT), communication planning (CP) and clear channels with an organization structure (COS). The results are presented hereunder.

5.5.1 Relationship between information technology and project outcome

The result in Table 5.5 indicates that the calculated Spearman's rho statistics, suggest that the p value of 0.037<0.05. This indicates significant relationship between information technology and project outcome, hence rejecting the null hypothesis. Further, the R-value is 0.259 (+ve)

for information technology and project outcome and indicates that there is a small positive correlation.

$H_{01:}$ There is no relationship between information technology and project outcome

$H_{1:}$ There is a relationship between information technology project outcome

Table 5.5: Correlation between information technology and project outcome

Variables			IT Information technology	PO Project outcome
Spearman's rho	IT Information technology	Correlation Coefficient	1.000	.259*
		Sig. (2-tailed)	.	.037
		N	65	65
	PO Project outcome	Correlation Coefficient	.259*	1.000
		Sig. (2-tailed)	.037	.
		N	65	66

*. Correlation is significant at the 0.05 level (2-tailed).

5.5.2 Relationship between communication technology and project outcome

The results in Table 5.6 indicate that the calculated Spearman's statistic, suggest that the p value is 0.573>0.05. This indicates that there is no significant relationship between communication technology and project outcome, hence accepting the null hypothesis, and rejecting the alternative hypothesis. Further the R-value is 0.071(+ve) for communication technology and project outcome indicates that there is no correlation.

$H_{02:}$ There no relationship between communication technology and project outcome

$H_{2:}$ There is a relationship between communication technology and project outcome

Table 5.6: Correlation between communication technology and project outcome

Variables			PO Project outcome	CT Communication technology
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.071
		Sig. (2-tailed)	.	.573
		N	66	65
	CT Communication technology	Correlation Coefficient	.071	1.000
		Sig. (2-tailed)	.573	.
		N	65	65

5.5.3 Relationship between communication skills and competence and project outcome

The results in Table 5.7 indicate that the calculated Spearman's statistic, suggest that the p value is 0.072>0.05. This indicates that there is no significant relationship between communication skills and competence and project outcome, hence accepting the null hypothesis, and rejecting the alternative hypothesis. Further the R- value is 0.225(+ve) for communication skills and competence and project outcome indicates that there is no correlation

H_{03}: There is no relationship between communication skills or competence and project outcome

H_{3}: There is a relationship between communication skills or competence and project outcome

Table 5.7: Correlation between Communication skills and competence and project outcome

Variables			PO Project outcome	CSC Communication skills and competence
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.225
		Sig. (2-tailed)	.	.072
		N	66	65
	CSC Communication skills and competence	Correlation Coefficient	.225	1.000
		Sig. (2-tailed)	.072	.
		N	65	65

5.5.4 Relationship between communication planning and project outcome

The results in Table 5.8 indicate that calculated Spearman's statistic, suggest that the p value is 0.016<0.05. This indicates that there is a significant relationship between communication planning and project outcome, reject the null hypothesis. Further, the R-value is 0.297(+ve) for communication planning and project outcome indicating a small positive correlation.

H_{04}: There is no relationship between communication planning and project outcome

H_{4}: There is a relationship between communication and project outcome

Table 5.8: Correlation between communication planning and project outcome

Variables			PO Project outcome	CP Communication planning
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.297*
		Sig. (2-tailed)	.	.016
		N	66	65
	CP Communication planning	Correlation Coefficient	.297*	1.000
		Sig. (2-tailed)	.016	.
		N	65	65

*. Correlation is significant at the 0.05 level (2-tailed).

5.5.5 Relationship between teamwork and project outcome

H5: Teamwork is a vital factor of communications management on project outcome. The results in Table 5.9 indicate that the calculated Spearman's statistic, suggest that the as p value is 0.069>0.05. This indicates that there is no significant relationship between teamwork and project outcome, hence, accepting the null hypothesis, and rejecting the alternative hypothesis. Further, the R-value is 0.227(+ve) for teamwork and project outcome indicates that there is no correlation.

H_{05}: There is no relationship between teamwork and project outcome

H_5: There is a relationship between teamwork and project outcome

Table 5.9: Correlation between teamwork and project outcome

Variables			PO Project outcome	TMK Teamwork
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.227
		Sig. (2-tailed)	.	.069
		N	66	65
	TMK Teamwork	Correlation Coefficient	.227	1.000
		Sig. (2-tailed)	.069	.
		N	65	65

5.5.6 Relationship between clear channels within organisation structure and project outcome

The results in Table 5.10 indicate that the calculated Spearman's statistic, suggest the p value is 0.033<0.05. This indicates that there is a significant relationship between clear channels within organisation structure and project outcome and rejects the null hypothesis. Further, the R-value is 0.265(+ve) for clear channels within organization structure and project outcome indicating a small positive correlation.

H_{06}: There is not relationship between clear channels within organisation structure and project outcome

H_6: There is a relationship between clear channels within organisation structure and project outcome

Table 5.10: Correlation between Clear channels within the organization structure and project outcome

Variables			PO Project outcome	COS Clear channels within organization structure
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.265*
		Sig. (2-tailed)	.	.033
		N	66	65
	COS Clear channels within organization structure	Correlation Coefficient	.265*	1.000
		Sig. (2-tailed)	.033	.
		N	65	65

*. Correlation is significant at the 0.05 level (2-tailed).

5.5.7 Relationship between project brief requirement management and project outcome

The results in Table 5.11 indicates that the calculated Spearman's statistic, suggest that the p value is 0.347>0.05. This indicates that there is no significant relationship between project brief requirement management and project outcome hence accepting the null hypothesis and rejecting the alternative hypothesis. Further, the R-value is 0.120(+ve) for brief requirement management and project outcome that indicates there is no correlation.

H_{07}: There is not relationship between project brief requirement management and project outcome

H_7: There is a relationship between project brief requirement management and project outcome

Table 5.11: Correlation between project brief requirement management and project outcome

Variables			PO Project outcome	PBREM Project brief requirement management
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.120
		Sig. (2-tailed)	.	.347
		N	66	64
	PBREM Brief requirement management	Correlation Coefficient	.120	1.000
		Sig. (2-tailed)	.347	.

Variables		PO Project outcome	PBREM Project brief requirement management
	N	64	64

5.5.8 Relationship between project brief risk management and project outcome

The results in Table 5.12 indicate that calculated Spearman's statistic, suggest that the p value is 0.507>0.05. This indicates that there is no significant relationship between project brief risk management and project outcome, hence accepting the null hypothesis, and rejecting the alternative hypothesis. Further, the R-value is .085(+ve) for project brief requirement management and project outcome and indicates that there is no correlation.

H_{08}: There is no relationship between project brief risk management and project outcome

H_{8}: There is a relationship between project brief risk management and project outcome

Table 5.12: Correlation between project brief risk management and project outcome

Variables			PO Project outcome	PBRIM project brief risk management
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	.085
		Sig. (2-tailed)	.	.507
		N	66	63
	PBRIM project brief risk management	Correlation Coefficient	.085	1.000
		Sig. (2-tailed)	.507	.
		N	63	63

5.5.9 Relationship between context of environment and project outcome

The results in Table 5.13 indicates the calculated Spearman's statistic, suggest that the p value is 0.800>0.05. This indicates that there is no significant relationship between context of environment and project outcome, hence accepting the null hypothesis, and rejecting the alternative hypothesis. Further, the R-value is 0.032(-ve) for context of environment and project outcome and that there is no correlation.

H_{09}: There is no relationship between context of environment and project outcome

H_{9}: There is a relationship between context of environment and project outcome

Table 5.13: Correlation between context of environment and project outcome

Variables			PO Project outcome	CE Context of environment
Spearman's rho	PO Project outcome	Correlation Coefficient	1.000	-.032
		Sig. (2-tailed)	.	.800
		N	66	64
	CE Context of environment	Correlation Coefficient	-.032	1.000
		Sig. (2-tailed)	.800	.
		N	64	64

5.6 Chapter summary

Chapter five findings on the prevalent factors based on the specific research questions of this study were discussed. Nine practices were determined from the PAF and these factors were used for further analysis to test hypotheses of the relationship and strength of factors related to communication management practices and project outcome. Spearman's rank order correlation aided in determining the relationship of communication management practices' factors and project outcome. From the analysis, a model based on the relationships was established. In the next chapter, findings are discussed.

CHAPTER SIX
DISUSSION

6.0 Introduction

Findings from chapter five responded to the specific research questions of this dissertation. Descriptive and inferential statistics were used for the analysis of the responses from the questionnaire survey. In this chapter, the findings will be discussed relative to the research objectives and study hypotheses.

6.1 Evaluate the challenges of implementing communication management practices faced in the construction industry in Eswatini (Swaziland)

In the literature review section, it was revealed that the implementation of communication management practices is a challenge in the construction industry. Fourteen measures were identified that negatively affect the execution of communication management practices in construction projects, this were: limited availability of information (CCM1), limited access to selected communication technology (CCM2), imposing a technology that is inappropriate to the project (CCM3), poor listening skills of personnel (CCM4), unclear and delayed instructions (CCM5), language difficulties (CCM6), poor writing skills of personnel (CCM7), personal prejudice (CCM8), preconceived and unwillingness to change beliefs (CCM9), misalignments of project stakeholder's visions (CCM10), distance between the construction headquarters and construction sites (CCM11), unfriendliness and rigidness between project stakeholders (CCM12), hostile past encounters between personnel (CCM13), different moods and feelings of employees (CCM14) and diverse cultures between project stakeholders (CCM15). However, from analysis of the data, it was found that these aspects were guided by three underlying constructs: personal interaction difficulties (PID), personal behavioral problems (PBP) and personal cultures problems (PCP). The findings of items on challenges of implementing communication management practices were neutral on whether these items stifled the implementation of communication management practice. The items namely: hostile past encounters between personnel (CCM13), different moods and feelings of employees (CCM14) unfriendliness and rigidness between project stakeholders (CCM12) and diverse cultures between project stakeholders (CCM15) aligned with the construct of personal behavioral problems (PBP) were found to be the most common challenge faced by Eswatini stakeholders. These were found to be in accordance with Louw *et al.*, (2005) and Gamble *et al.*, (1998) understanding on how the historical, social, psychological and cultural occur in

context of environment (Kleim, 2008; Naidoo, 2011 and Mnkandla, 2013) that could have a negative impact on an interpersonal communication. Where the hostile past encounters between personnel (CCM13) aligns with the historical context, different moods and feelings of employees (CCM14) with psychological context, unfriendliness and rigidness between project stakeholders (CCM12) with social context and diverse cultures between project stakeholders CCM15 with cultural context. Furthermore, Mitkus (2013) accentuated that psychological defenses of parties could result in unsuccessful communication. This then suggest that all four items within personal behavioral problems are a challenge not peculiar to Eswatini construction projects.

6.2 Assess the benefits of communication management practices in construction projects of Eswatini

Twelve (12) items were identified from extant literature as benefits of using communication management practices. These 12 items were: ensures support, commitment and loyalty of project stakeholders (BCM1), encourages collaboration and cooperation (BCM2), reduces project stakeholder's conflicts (BCM3), allows the project team members to take decisions (BCM4), reduces delays and encourages completing work on time (BCM5), reduces costs and encourages completing work within budget (BCM6), improves the specified level of quality (BCM7), ensures adherence to health and safety procedures (BCM8), enhances the achievement of user expectations (BCM9), specified level of environmental performances (BCM10), keeps everyone up to date (BCM11) and allows project stakeholders to take decisions (BCM12). However, the empirical studies showed that the advantages of using communication management practices are determined by two factors. The factors comprise: organizational communication benefits include reduces delays and encourages completing work on time (BCM5), encourages collaboration and cooperation (BCM2), ensures support, commitment and loyalty of project stakeholders (BCM1), reduces project stakeholder's conflicts (BCM3), keeps everyone up to date (BCM11) and reduces delays and encourages completing work on time (BCM5). Project communication benefits including improves the specified level of quality (BCM7), enhances the achievement of user expectations (BCM9), improves the specified level of quality (BCM7), ensures adherence to health and safety procedures (BCM8) and allows project stakeholders to take decisions (BCM12).The findings from these factors established that the items aligned with organizational communication benefits seemed to be more significant in Eswatini projects. This then suggests that the six

items attribute to the explanation by PMI, (2013) that project management success is greatly based on communication capabilities of an organisation. Further accentuates, Mentula (2015) rationale that organizational communication must be considered because organizations create an environment that affects projects. Moreover, these organizations can structure their operations differently and these structures could either make communication easier in a project situation or can hamper it.

6.3 Determine the communication management practices that would contribute to better implementation of construction projects in Eswatini

Findings from the literature review postulated forty-eight items measuring eight possible practices related to communication management illustrated in Table 4. These aspects comprised of information communication technology (ICT), communication skills and competence (CSC), communication planning (CP) teamwork (TMK), Channels within organization structure (COS), stakeholder's personality (SP), project briefing (PB) and context of environment (CE). The analysis of data found nine factors as opposed to eight as conceptualized from literature. They are information technology (IT), communication technology (CT), communication skills and competence (CSC), communication planning (CP), teamwork (TMK), project brief requirement management (PBREM), project brief risk management (PBRIM) and context of environment (CE). Based on further analysis, the results revealed that the respondents agreed that all the nine practices will contribute to better construction project implementation or execution. However, project brief risk management was established as dominant communication management practice that includes project risk are properly communicated (PB6), there is constant interaction amongst project stakeholders (PB7), there is constant knowledge sharing amongst project stakeholders (PB8).

The three items within the construct further concur with the findings of Chandra *et al*., (2011) about a well-defined objective that explains the expected outcome of the project to be an important attribute of communication management. Furthermore, Aulich (2013) advocates that preparing a clear project scoping brief encourages effective communication. Correspondingly, a stance from Othman (2005) further inspires and discovered that the project brief performance feedback enhances effective communication when continued to be undertaken throughout the project cycle. This then indicates that Eswatini construction stakeholders coincide with the global changes of risk management associated with project briefing. Studies in countries such

the United Arab Emirates and United Kingdom focus on value and risk management protocols for dynamic brief development in construction as the way forward to understanding client's requirements to design and construction teams for achieving client satisfaction.

6.4 Determine the relationship of communication management practices and project in the construction industry of Eswatini (Swaziland)

From the analysis of factors related to communication management practices and project outcome. Spearman's rank rho correlations were used to test the relationship. Three factors from the nine null postulations were disregarded and the alternative postulations were accepted. Positively and significantly a correlation was observed between three communication management practices and project outcome, that is: information technology (IT) that comprises: project management software is used e.g. construction Computer software (CCS) , internet and intranet are consistently available, video conferencing facilities are uses and computer aided design (CAD), communication planning (CP) that includes: communication requirements of the project team are critically analyzed in the project, communication technology is used to deliver information, the organization critically determines the objectives of communication, proper channels of information delivery are established in the organization, every personnel is accountable for the information they are required to send, the organization clearly identifies the recipient of the information to be sent and the organization determines communication frequency to project stakeholders. Finally, clear channels with organization structure (COS) that encompass organizational and operational processes are in place, roles and responsibilities of project stakeholders are clearly defined. there are clearly marked communication channels from superior to subordinates, the line of authority is clearly specified for the project tasks to be accomplished and clear determination and limits of who's communicating with whom and who's going to receive which information.

The findings corroborate with the findings of Muszyńska, (2015) on strategic and informational communication management practice category to be significant in communication management in project teams. The strategic category includes clear lines and responsibilities established up front and incorporation of high-quality communication planning as communication management practices. The informational category indicates shared cyberspace/project expertise centre i.e. websites and project-surveillance software. Emails were also included. It can be then suggested that the three-factor model of communication management practices in Eswatini (Swaziland) construction projects is consistent with project

team communication management practices in Italy. However, the analysis of the three-factor model relationship to project outcome was not studied, but only cited from White and Fortune who in their empirical study on practices in project management established a list of critical success factors for a project and clear communication channels was number 6 factor on the list. Other studies such as literature from Čulo (2010) have cited the significance of communication plan to project success. Molwus (2014) expounded that communication planning is mandatory and important to make sure good solutions and inclusion during the project. Furthermore, studies by Chassiakos (2007) explained the best practices used in active use of information technology in Canada and Jordan construction industry. From the findings, the study established that information technology (IT) acceptance in line with those surveyed means improved quality of work, work carried out more quickly, better economic control, enhanced communication more quickly and easily accessed. Chassiakos (2007) further referenced that information technology (IT) is necessary for delivering efficiency and improved project delivery in the construction industry. This then suggest similar studies have been conducted globally and, in a sense, the three-factor model established in this study may play a major part in project outcome.

6.5 Develop a model that depicts the relationship of communication management practices and project outcome in the construction industry of Eswatini (Swaziland)

Literature review findings on communication management identified communication management practices that affect project outcome in construction projects, but with limited studies that clearly depict a model showing the relationship of the communication management practices and project outcome. Therefore, implying that a distinct picture of the relationship of the communication management practices and project outcome is needed to provide information and train industry professionals to implement communication management. This study then found that in order to carry out communication management effectively is dependent upon understanding the relationship based on an information model representing structure and meaning of information (Molwus 2014). The graphical presentation enables construction stakeholders to easily understand and follow the communication management practices that affect project outcome.

The model development was executed using analysis results in chapter 5 that indicated acceptance of the existence of significant relationship between three communication

management practices and five project outcomes. The relationship drawn from empirical studies found that information technology, communication planning and clear channels within organization structure have a relationship with project outcome that were: scope of works is achieved, quality of project is achieved, project risks minimized i.e. occupational accidents, project was within time and project was within budget.

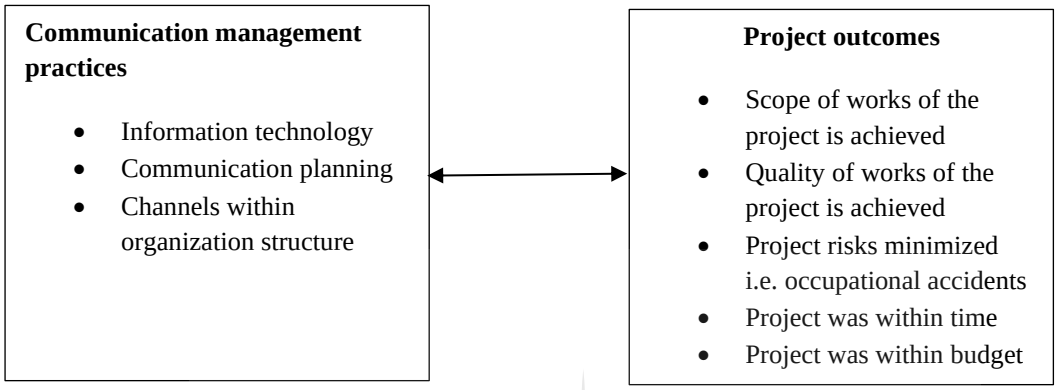

Figure 6.1: illustrates the model of the relationship between the communication management practices and project outcome.

6.5 Chapter summary

Personal interaction difficulties, personal behavioral problems and personal cultures problems were found to be challenges of implementing communication management practices with personal behavioral problems as the most significant, but with indistinct opinions on the factors that retrain implementation of communication management practices. The benefits of implementing communication management practices were organizational communication benefits and project communication benefits. The benefits related organizational communication benefits to be important, but with participants having different opinions relating to the benefits of communication management practices. While the communication management practices were information technology, communication technology communication skills and competence, communication planning, teamwork, project brief requirement management, project brief risk management and context of environment. For the communication management practices project brief requirement ranked as priority, but other practices were also considered to impact construction projects. Furthermore, the findings found that information technology, clear channels within organization's structure and communication planning have a significant relationship with project outcome. The significance of the findings is illustrated in Figure 6.1. The outcome of this analysis presents the validation of this chapter.

Such findings provide insight on the contribution of communication in identifying which factor to look for in reducing bottlenecks in construction projects before they happen. Moreover, provides a set of communication strategies that require attention to enhance project outcome. The next chapter presents the conclusion of overall research findings and recommendations.

CHAPTER SEVEN
CONCLUSION AND RECOMMENDATIONS

7.0 Introduction

This chapter summarizes the specific research objectives set out in chapter 1. The research presented is focused understanding the influence of communication management practices and project outcome. In addition, propose a model that illustrates the relationship of construction management practices and project outcome. The conclusions and recommendations are presented in this chapter with a section of recommendations for future research. A short outline of the specific research objectives is presented in the following manner:

Objective 1: To evaluate challenges of implementing communication management practices faced in construction projects

To evaluate the challenges of implementing communication management practices in construction projects. A literature review in chapter two revealed problems that derail communication management practices implementation. The findings from the empirical analysis revealed that the challenges of communication management practice were a three-model factor and not a one factor model as theoretically conceptualized. These challenges are personal interaction difficulties, personal behavioral problems and personal cultural problems. Furthermore, it was established that the respondents were neutral with regard of these challenges stifling communication management practices implementation. However, despite this outcome the industry stakeholders should be aware of these challenges and ensure they can overcome them when they are experienced in the construction projects in Eswatini.

Objective 2: To determine benefits of using communication management practices in the construction projects

The evaluation of the data revealed that the benefits of employing communication management practice comprised of organizational communication benefits and project communication benefits. Based on analysis of various organisation that partook in the survey, the use of communication management practices led to the organizational communication benefits and project communication benefits. It can therefore be suggested that when the communication practices are used, communication within the organization and the project itself are enhanced. The survey results indicate that consultants, contractors and allied professionals shared an understanding that organization and the project and communication process are inextricably

related process. Such finding in Eswatini construction demonstrates that professionals in different organizations of the construction industry are aware of the global development in communication such as recent studies by Husain (2013) that showed communication positively correlates with organisation outputs like organizational commitment performance, organisation citizenship behaviors and job satisfaction.

Objective 3: To determine the communication management practices in construction projects

Eight communication management practices which were measured with 48 actions/items were identified from extant literature review. However, analysis using principal axis factoring (PAF) revealed nine practices. These practices were: information technology, communication technology, communication skills and competence, communication planning, teamwork, clear channels with organization structure, project brief requirement management, project brief risk management and context of environment. It is interesting to note that the respondents who were industry stakeholders in Eswatini construction industry agreed that all the empirical communication management practices were critical for better implementation of construction projects. Project brief risk management is the most dominant communication management practices for better implementation of construction projects. This finding aligns with Muszyńska (2015) that communication is known to influence risk and a well-planned communication is needed to timely recognize risks and respond to them quickly. These draws an emphasis to construction stakeholders on the significance of this finding not to be taken for granted. Further, results suggested that communication skills and competence, project brief requirement management, clear channels with organization structure were critical for project implementation. Teamwork, communication planning, context of environment also follow suit in 5th, 6th and 7th position respectively. Finally, information technology and communication technology viewed as least practices for better implementation of construction projects.

Objective 4: To determine a relationship of communication management practices and project outcome in construction projects

This objective was set out to determine the relationship of communication management practices and project outcome. Results found in objective 3 were then used to determine the relationship of the communication management practices and project outcome. In order to achieve the relationships, Spearman rho correlation was used. Findings revealed that three

communication management practices are associated with project outcome and they consist of information technology, communication planning and clear channels within the organization structure. Communication technology, communication skills and competence, teamwork, brief requirement management, brief risk management and context environment were found not to have a relationship with project outcome. The finding that project brief risk management has no relationship with project outcome is a shift from the view that respondents deemed it significant communication management practice for better implementation of construction project. However, as per the results of the correlation analysis. the stakeholders should still implement the other communication management practices for improved project outcome in Eswatini construction industry.

Objective 5: To develop a model that depicts the relationship of communication management practices and project outcome in construction projects

Investigation on communication management revealed that understanding of communication management practices that affect project outcome with representation was needed. The objective has been focused on information needs and using the model as a guiding tool for knowledge and understanding for construction practitioners and other relevant stakeholders. Chapter 6 shows the information model of the relationship between communication management practices and project outcome. Findings from the previous objectives were conversant to the development of the model. The communication management practices consisted of three factors: information technology (IT), communication planning (CP) and clear channels within organization structure (COS). Each of these with activities underlying their structure based on the relationship among communication management practices in chapter 4 as well as the relationship with project outcome in chapter 5. This identification through representation of a model provides a guideline to construction stakeholders for understanding on what communication management practices affect project outcome in construction projects.

7.1 Conclusion and recommendation

In conclusion the ultimate objective of this research was to determine the relationship of communication management practices and project outcome. The main objective was achieved based on the spearman's rho correlation parameter. The implication being that the ability to determine the relationship model will provide awareness of the role of communication

management practices to project outcome in construction projects in Eswatini. The results from the specific objectives show the status of communication management practice in Eswatini construction industry. The outcome of this research study was found necessary to provide knowledge to construction stakeholders about communication management in the industry. Henceforth, conclusions drawn from this research are as follows:

- There are important factors associated with problems in the field of communication management practice in construction projects. However, in the Eswatini construction industry the core challenges are not viewed as a problem in implementing communication management practices. Despite their impartial response, attention is still required on these analyzed challenges in any project in Eswatini (Swaziland) in order to implement the communication management practices effectively. This can help to address and solve the encountered problems with communication as well as avoid them.
- There are important factors related to benefits of communication management practices in Eswatini construction projects that were realized and need to be taken into consideration. The benefits of using communication management practices ensures that the organisation and the project are being undertaken.
- There were nine practices associated with communication management in Eswatini (Swaziland) construction projects. Knowledge of these practices brings into light valuable insight into views and experiences of stakeholder's communication undertaking in construction projects of Eswatini. This knowledge is expected to serve as a guide in forming and addressing operating strategies to improve communication management status quo in construction projects and the performance outcome of construction projects.
- There are three factors associated with communication management practices found to have a relationship with project outcome. These practices were: information technology (IT), communication planning (CP) and channel within the organization structure (COS). From the findings, a relationship model was developed. The aim of the study was to ensure the stakeholders of Eswatini construction industry are equipped and implement communication management practices in their future projects to prevent conflicts from taking place.
- The development of the model is intended to ensure information needs of construction stakeholders on communication management practices and project outcome are

addressed. It is hoped that the depiction of the relationship of communication management practices and project outcome will provide a basis for understanding which tools could enhance communication management practice in construction projects.

7.2 Recommendation for future research

During the research process of documenting results, the following recommendations were discovered for future research:

- The proposed relationship model needs to be employed in an actual construction project to offer a practical and well-defined knowledge of the communication management practices and their impact on project outcome.
- Multiple regression analysis should be undertaken in future to ascertain the extent of the influence of the communication management practice on project outcome. The current model only shows the relationships of communication management practices and project outcome.
- A more extensive empirical research and comparison in other developing countries needs to be conducted to test the nine practices presented in this research so that a comprehensive model communication management practices and project outcome can be developed.

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Appendix A: Research Questionnaire

Section A – Background Information

This section of the questionnaire refers to the background or bibliographical information of the respondent. Although I am aware of the sensitivity of the questions in this section, the information will allow me to compare groups of respondents. Once again, I assure you that your response will remain anonymous. Your co-operation is appreciated.

1. What is your age group?

Younger than 21	1
21-30	2
31-40	3
41-50	4
51-60	5
Older than 60	6

2. What type of organization do you belong to?

Consultants' organization	1
Allied professionals' organization	2
Contractors' organization	3
Other……	4

3. What is your professional status?

Architect	1
Quantity surveyor	2
Civil engineer	3
Electrical engineer	4
Mechanical engineer	5
Construction manager	6
Project manager	
Other…….	7

4. What is your education qualification?

High school and below	1
Diploma	2
Bachelors	3
Postgraduate	4

5. What are your years of experience in construction projects?

Less than 5 years	1
5-10 years	2
10-15 years	3
15-20 years	4
More than 20 years	5

Sections (B, C, D, E and F), please indicate your answers by crossing the appropriate number in the 5- point Likert type scale under the appropriate section: 1=Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 =Strongly Agree (SA).

Section B

This section of the questionnaire explores possible communication management practices implementation challenges that construction projects may face in Eswatini.

6. Regarding your experience in the construction industry, to what extent do you agree with each communication management practices challenges stated below faced in construction projects you are involved in?

Code	Challenges of Communication management practices	SD	D	N	A	SA
CCM1	Limited availability of information	1	2	3	4	5
CCM2	Limited access to selected communication technology	1	2	3	4	5
CCM3	Imposing a technology that is inappropriate to the project	1	2	3	4	5
CCM4	Poor listening skills of personnel	1	2	3	4	5
CCM5	Unclear and delayed instructions	1	2	3	4	5
CCM6	Language difficulties	1	2	3	4	5
CCM7	Poor writing skills of personnel	1	2	3	4	5
CCM8	Personal prejudice	1	2	3	4	5
CCM9	Preconceived and unwillingness to change beliefs	1	2	3	4	5
CCM10	Misalignments of project stakeholder's visions	1	2	3	4	5
CCM11	Distance between the construction headquarters and construction sites	1	2	3	4	5
CCM12	Unfriendliness and rigidness between project stakeholders	1	2	3	4	5
CCM13	Hostile past encounters between personnel	1	2	3	4	5
CCM14	Different moods and feelings of employees	1	2	3	4	5
CCM15	Diverse cultures between project stakeholders	1	2	3	4	5

Section C

This section of the questionnaire recommends certain benefits of using communication management practices in construction projects.

7. To what extent do you agree with each of the following benefits of communication management practices in construction projects.

Code	Benefits of communication management practices	SD	D	N	A	SA
BCM1	Ensures support, commitment and loyalty of project stakeholders	1	2	3	4	5
BCM2	Encourages collaboration and cooperation	1	2	3	4	5
BCM3	Reduces project stakeholder's conflicts	1	2	3	4	5
BCM4	Allows the project team members to take decisions	1	2	3	4	5
BCM5	Reduces delays and encourages completing work on time	1	2	3	4	5
BCM6	Reduces costs and encourages completing work within budget	1	2	3	4	5
BCM7	Improves the specified level of quality	1	2	3	4	5
BCM8	Ensures adherence to health and safety procedures	1	2	3	4	5
BCM9	Enhances the achievement of user expectations	1	2	3	4	5
BCM10	Enhances specified level of environmental performances	1	2	3	4	5
BCM11	Keeps everyone up to date	1	2	3	4	5
BCM12	Allows project stakeholders to take decisions	1	2	3	4	5

Section D

This section of the questionnaire proposes communication management practices that could contribute to successful construction projects.

8. To what extent would you agree that the following communication management practices will have a significant contribution to better project implementation or execution of construction projects?

1=Strongly Disagree (SD), 2 = Disagree (D), 3 = Neutral (N), 4 = Agree (A), 5 =Strongly Agree (SA).

Code	Communication management practices	SD	D	N	A	SA
	Information communication technology (ICT)					
ICT 1	Telephones with voicemail services are used	1	2	3	4	5
ICT 2	Email communication is used	1	2	3	4	5
ICT 3	Video conferencing facilities are used	1	2	3	4	5
ICT 4	Internet and intranet are consistently available	1	2	3	4	5
ICT 5	Social media communication is used e.g. WhatsApp chatting platform	1	2	3	4	5
ICT 6	Building information modelling (BIM) software is appropriately adopted	1	2	3	4	5
ICT 7	Computer Aided Design (CAD) software is appropriately adopted	1	2	3	4	5
ICT8	Virtual offices support software and portals is available	1	2	3	4	5
ICT9	Project management software is used e.g. Construction Computer Software (CCS)	1	2	3	4	5
	Communication skills and competence (CSC)					
CSC1	Excellent verbal communication among project stakeholders	1	2	3	4	5
CSC2	Excellent written communication among project stakeholders	1	2	3	4	5
CSC3	Effective use of information communication technology among project stakeholders	1	2	3	4	5
CSC4	Proper interpretation of contractual matters is communicated	1	2	3	4	5
CSC5	Project stakeholders have excellent listening skills	1	2	3	4	5
	Communication planning (CP)					
CP1	Communication requirements of the project team are critically analyzed in the project	1	2	3	4	5
CP2	Communication technology is used to deliver information	1	2	3	4	5
CP3	The organization critically determines the objectives of communication	1	2	3	4	5
CP4	Proper channels of information delivery are established in the organization	1	2	3	4	5
CP5	Every personnel are accountable for the information they are required to send.	1	2	3	4	5
CP6	The organization clearly identifies the recipient of the information to be sent	1	2	3	4	5
CP7	The organization determines communication frequency to project stakeholders	1	2	3	4	5
	Teamwork (TMK)					
TMK 1	There is effective communication and coordination within the project stakeholders	1	2	3	4	5
TMK 2	Decentralization of information among project stakeholders is effective	1	2	3	4	5
TMK 3	Conducive working relationship between project stakeholders	1	2	3	4	5
TMK 4	Group work effort enhances the quality of communication	1	2	3	4	5
TMK 5	Strong inter-department alliance in the project enables communication to flow efficiently	1	2	3	4	5
	Clear organization structure (COS)					
COS1	Organizational and operational processes are in place	1	2	3	4	5
COS2	Roles and responsibilities of project members are clearly defined	1	2	3	4	5
COS3	There are clearly marked communication channels from superior to subordinates	1	2	3	4	5
COS4	The line of authority is clearly specified for the project tasks to be accomplished.	1	2	3	4	5
COS5	Clear determination and limits of who will communicate with whom and who will receive which information	1	2	3	4	5
	Stakeholders Personality (SP)					

SP1	Attitudes are evaluated to develop specific communication methods	1	2	3	4	5
SP2	Behavioral styles of communicators are evaluated	1	2	3	4	5
SP3	Individual perceptions are evaluated	1	2	3	4	5
	Project briefing (PB)					
PB1	A brief provides proper definition of client requirements	1	2	3	4	5
PB2	A brief provides proper analysis of client requirements	1	2	3	4	5
PB3	A brief provides adequate translation of client requirements	1	2	3	4	5
PB4	The changes to brief are properly managed	1	2	3	4	5
PB5	Adequate time is provided for project briefing	1	2	3	4	5
PB6	Project risk are properly communicated	1	2	3	4	5
PB7	There is constant interaction amongst project team members	1	2	3	4	5
PB8	There is constant knowledge sharing amongst project team members	1	2	3	4	5
PB9	Project stakeholders are constantly updated on the progress and status of the project	1	2	3	4	5
	Context of the project environment (CE)					
CE1	Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	1	2	3	4	5
CE2	There are good interpersonal relationships among project stakeholders	1	2	3	4	5
CE3	Healthy mental wellbeing of project stakeholders is evaluated	1	2	3	4	5
CE4	Conflicts are resolved from previous communication episodes	1	2	3	4	5
CE5	Project stakeholders of different cultures are accommodated	1	2	3	4	5

Section E

This section of the questionnaire proposes outcomes of effective communication management practices.

9. To what extent do you agree with each of the following statements related to the project outcomes of communication management practices that you have specifically been involved in?

Code	Project outcomes	SD	D	N	A	SA
PO1	Scope of works of the project was achieved	1	2	3	4	5
PO2	Project was within time	1	2	3	4	5
PO3	Project was within budget	1	2	3	4	5
PO4	Project risks minimized i.e. occupational accidents	1	2	3	4	5
PO5	Quality of works of the project was achieved	1	2	3	4	5

Thank you for your co-operation in participating to this survey to improve the delivery of construction projects using communication management. Once again, your anonymity is assured, and your time is sincerely appreciated.

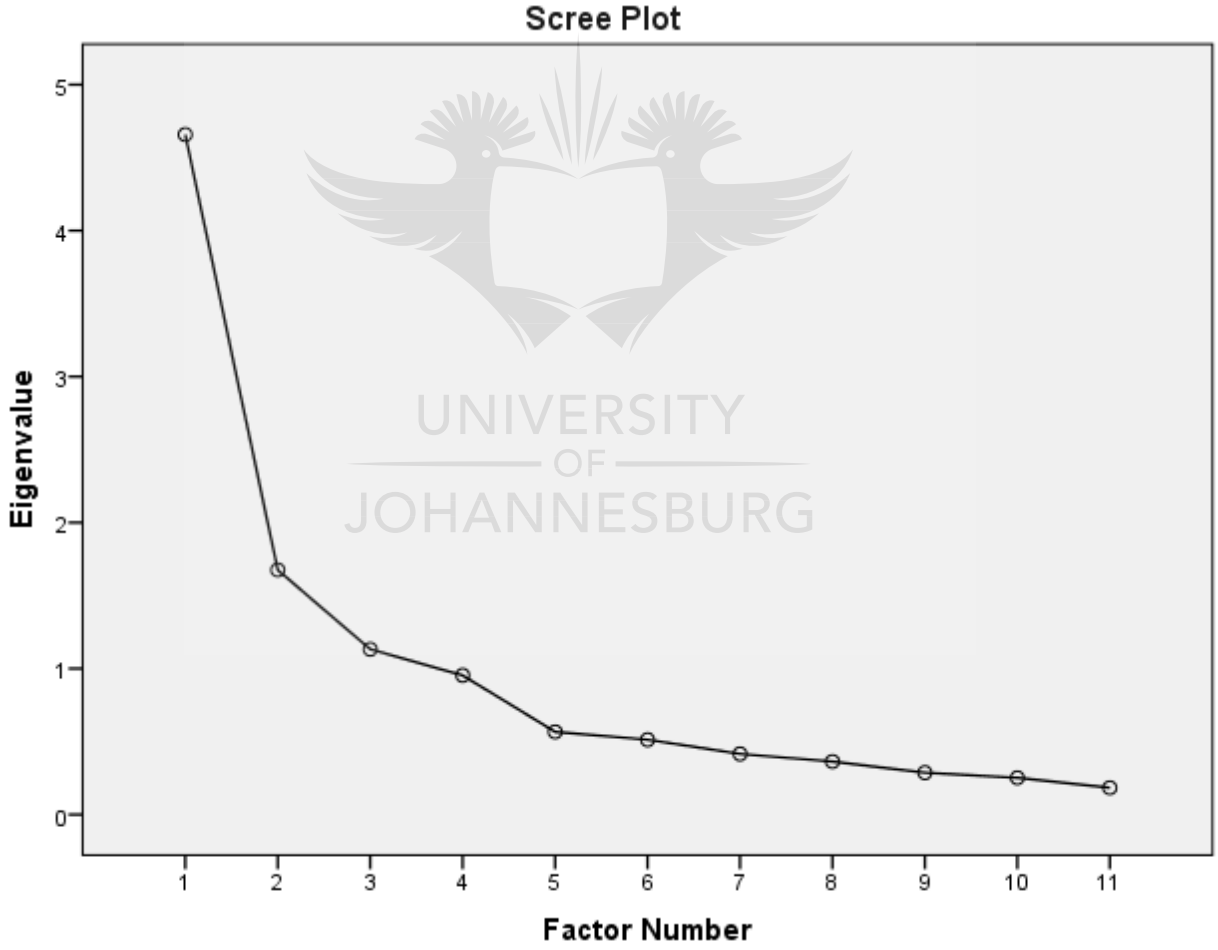
Appendix B Anti-Image Correlation for Challenges of Implementing Communication Practices

		CCM4	CCM5	CCM6	CCM7	CCM8	CCM9	CCM10	CCM12	CCM13	CCM14	CCM15
Anti-image Correlation	CCM4 Poor listening skills of personnel	.747[a]	-.409	-.059	-.265	-.231	-.177	.245	-.168	-.042	.216	-.161
	CCM5 Unclear and delayed instructions	-.409	.862[a]	-.002	.070	-.150	.056	-.058	-.048	-.071	-.019	-.123
	CCM6 Language difficulties	-.059	-.002	.777[a]	-.458	-.267	.161	-.088	.109	-.003	.000	-.282
	CCM7 Poor writing skills of personnel	-.265	.070	-.458	.778[a]	.009	-.016	-.137	.024	.115	-.169	.084
	CCM8 Personal prejudice	-.231	-.150	-.267	.009	.867[a]	-.139	-.236	.117	-.016	-.026	.088
	CCM9 Preconceived and unwillingness to change beliefs	-.177	.056	.161	-.016	-.139	.780[a]	-.562	-.084	-.004	.021	-.029
	CCM10 Misalignment of project stakeholder 's visions	.245	-.058	-.088	-.137	-.236	-.562	.766[a]	.018	-.266	.079	-.085
	CCM12 Unfriendliness and rigidness between personnel	-.168	-.048	.109	.024	.117	-.084	.018	.833[a]	-.424	-.060	-.147
	CCM13 Hostile past encounters between personnel	-.042	-.071	-.003	.115	-.016	-.004	-.266	-.424	.763[a]	-.530	.138
	CCM14 Different moods and feelings of personnel	.216	-.019	.000	-.169	-.026	.021	.079	-.060	-.530	.745[a]	-.425
	CCM15 Diverse cultures between project personnel	-.161	-.123	-.282	.084	.088	-.029	-.085	-.147	.138	-.425	.819[a]

Appendix B Communalities for Implementing Communication Management Practices

	Initial	Extraction
CCM4 Poor listening skills of personnel	.539	.454
CCM5 Unclear and delayed instructions	.433	.367
CCM6 Language difficulties	.540	.602
CCM7 Poor writing skills of personnel	.471	.467
CCM8 Personal prejudice	.495	.557
CCM9 Preconceived and unwillingness to change beliefs	.541	.666
CCM10 Misalignment of project stakeholder 's visions	.626	.709
CCM12 Unfriendliness and rigidness between personnel	.498	.513
CCM13 Hostile past encounters between personnel	.670	.773
CCM14 Different moods and feelings of personnel	.623	.646
CCM15 Diverse cultures between project personnel	.509	.516

Appendix B Scree Plot For Challenges of Communication Management Practices



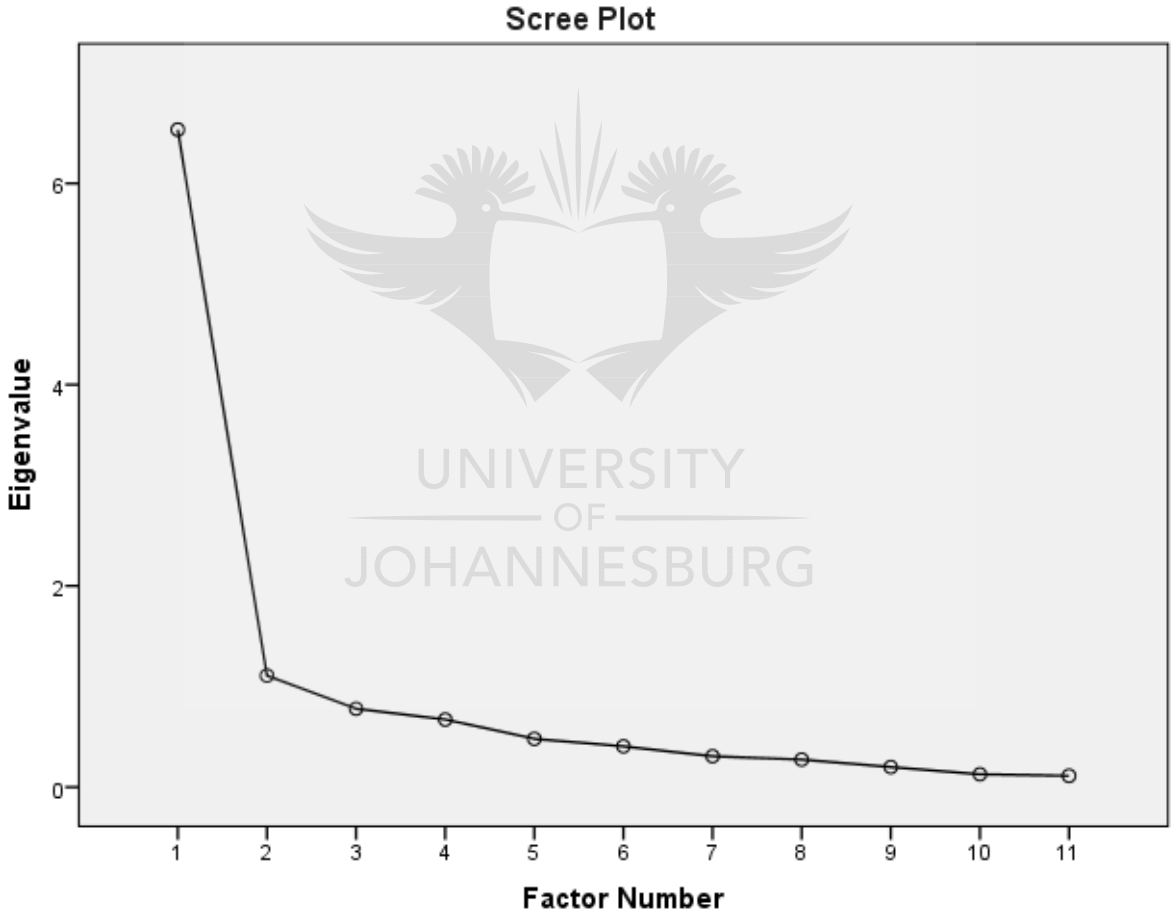
Appendix C Anti Image Correlation Benefits of Communication Management Practices

		BCM1	BCM2	BCM3	BCM4	BCM5	BCM6
Anti-image Correlation	BCM1 Ensures support, commitment and loyalty of project stakeholders	.874[a]	-.541	-.037	-.022	-.097	-.395
	BCM2 Encourages collaboration and cooperation	-.541	.875[a]	.073	-.269	-.220	.169
	BCM3 Reduces project stakeholders' conflict	-.037	.073	.874[a]	-.541	-.100	-.155
	BCM4 Reduces delays and encourages completing work on time	-.022	-.269	-.541	.763[a]	-.126	.239
	BCM5 Reduces costs and encourages completing work within budget	-.097	-.220	-.100	-.126	.863[a]	-.354
	BCM6 Improves the specified level of quality	-.395	.169	-.155	.239	-.354	.868[a]
	BCM7 Ensures adherence to health and safety procedures	.276	.016	.225	-.333	-.141	-.314
	BCM8 Enhances the achievement of user expectations	.062	-.261	-.333	.305	.153	-.088
	BCM9 Enhances specified level of environmental performances	-.014	-.171	-.227	.180	.209	-.263
	BCM10 Keeps everyone up to date	-.062	-.071	-.045	-.317	.285	-.239
	BCM11 Allows project stakeholders to take decisions	-.092	-.020	-.180	.046	-.009	-.056

Appendix C Communalities for Benefits of Communication Management Practices

	Initial	Extraction
BCM1 Ensures support, commitment and loyalty of project stakeholders	.791	.729
BCM2 Encourages collaboration and cooperation	.771	.739
BCM3 Reduces project stakeholders' conflict	.771	.750
BCM4 Reduces delays and encourages completing work on time	.691	.643
BCM5 Reduces costs and encourages completing work within budget	.565	.416
BCM6 Improves the specified level of quality	.803	.791
BCM7 Ensures adherence to health and safety procedures	.569	.438
BCM8 Enhances the achievement of user expectations	.583	.597
BCM9 Enhances specified level of environmental performances	.722	.766
BCM10 Keeps everyone up to date	.570	.492
BCM11 Allows project stakeholders to take decisions	.552	.552

Appendix C Scree Plot for Benefits of Communication Management Practices



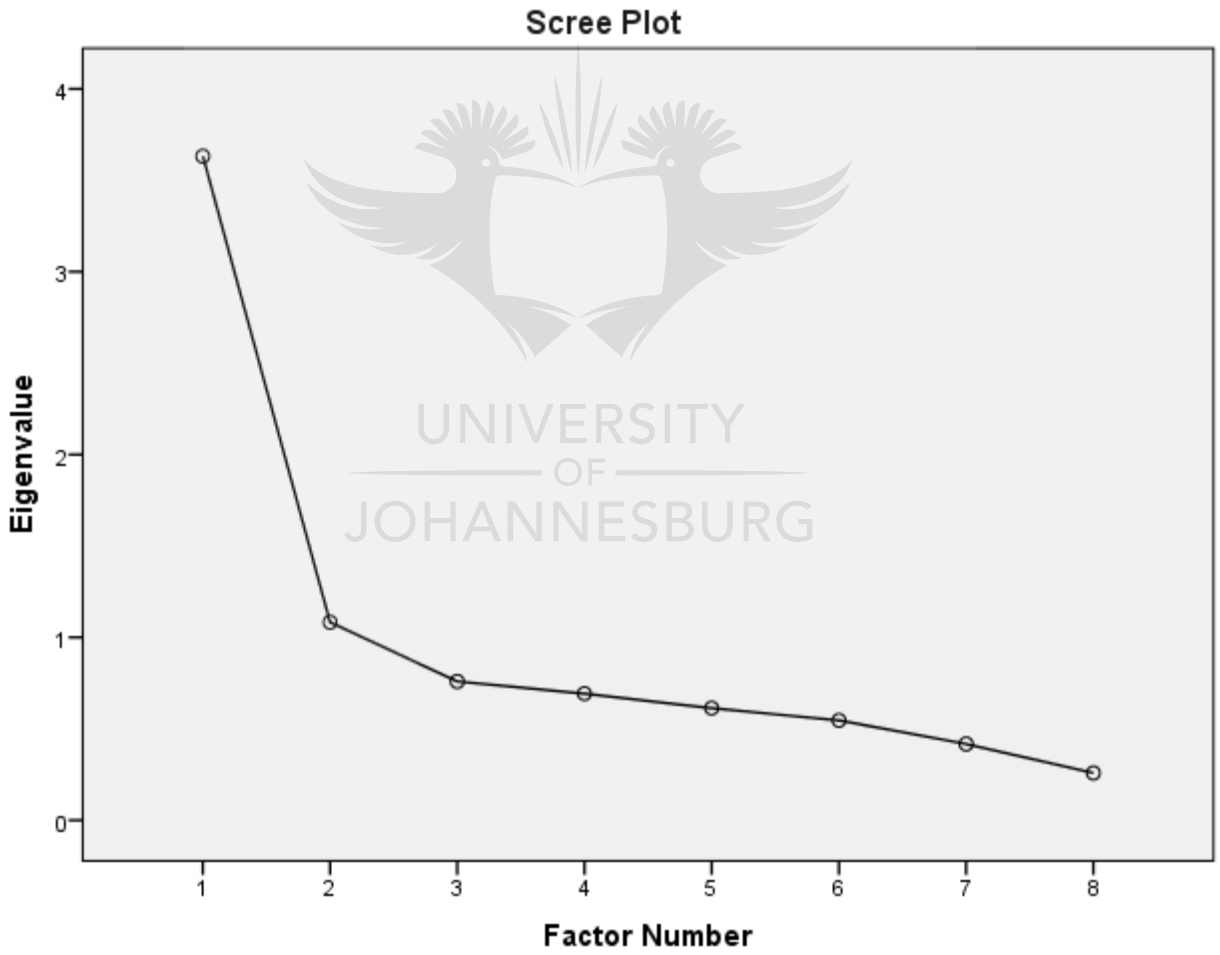
Appendix D Anti-Image Correlation for Information Communication Technology

		ICT1	ICT3	ICT4	ICT5	ICT6	ICT7	ICT8	ICT9
Anti-image Correlation	ICT1 Telephones with voicemail services are used	.810[a]	-.182	-.002	-.194	-.041	-.054	-.166	.162
	ICT3 Video conferencing facilities are used	-.182	.808[a]	-.093	-.181	-.270	-.100	.120	-.394
	ICT4 Internet and intranet is consistently available	-.002	-.093	.855[a]	-.064	.039	-.303	-.185	-.221
	ICT5 Social media communication is used e.g. WhatsApp chatting platform	-.194	-.181	-.064	.900[a]	-.132	-8.671E-5	-.104	-.050
	ICT6 Building information modelling (BIM) software is appropriately adopted	-.041	-.270	.039	-.132	.726[a]	-.257	-.465	.230
	ICT7 Computer Aided Design (CAD) software is appropriately adopted	-.054	-.100	-.303	-8.671E-5	-.257	.795[a]	.182	-.177
	ICT8 Virtual offices support software and portals is available	-.166	.120	-.185	-.104	-.465	.182	.720[a]	-.341
	ICT9 Project management software is used e.g. Construction Computer Software (CCS)	.162	-.394	-.221	-.050	.230	-.177	-.341	.723[a]

Appendix D Communalities for Information Communication Management

	Initial	Extraction
ICT1 Telephones with voicemail services are used	.221	.277
ICT3 Video conferencing facilities are used	.492	.529
ICT4 Internet and intranet is consistently available	.399	.483
ICT5 Social media communication is used e.g. WhatsApp chatting platform	.312	.379
ICT6 Building information modelling (BIM) software is appropriately adopted	.473	.563
ICT7 Computer Aided Design (CAD) software is appropriately adopted	.354	.340
ICT8 Virtual offices support software and portals is available	.483	.446
ICT9 Project management software is used e.g. Construction Computer Software (CCS)	.485	.641

Appendix D Scree Plot for Information Communication Technology



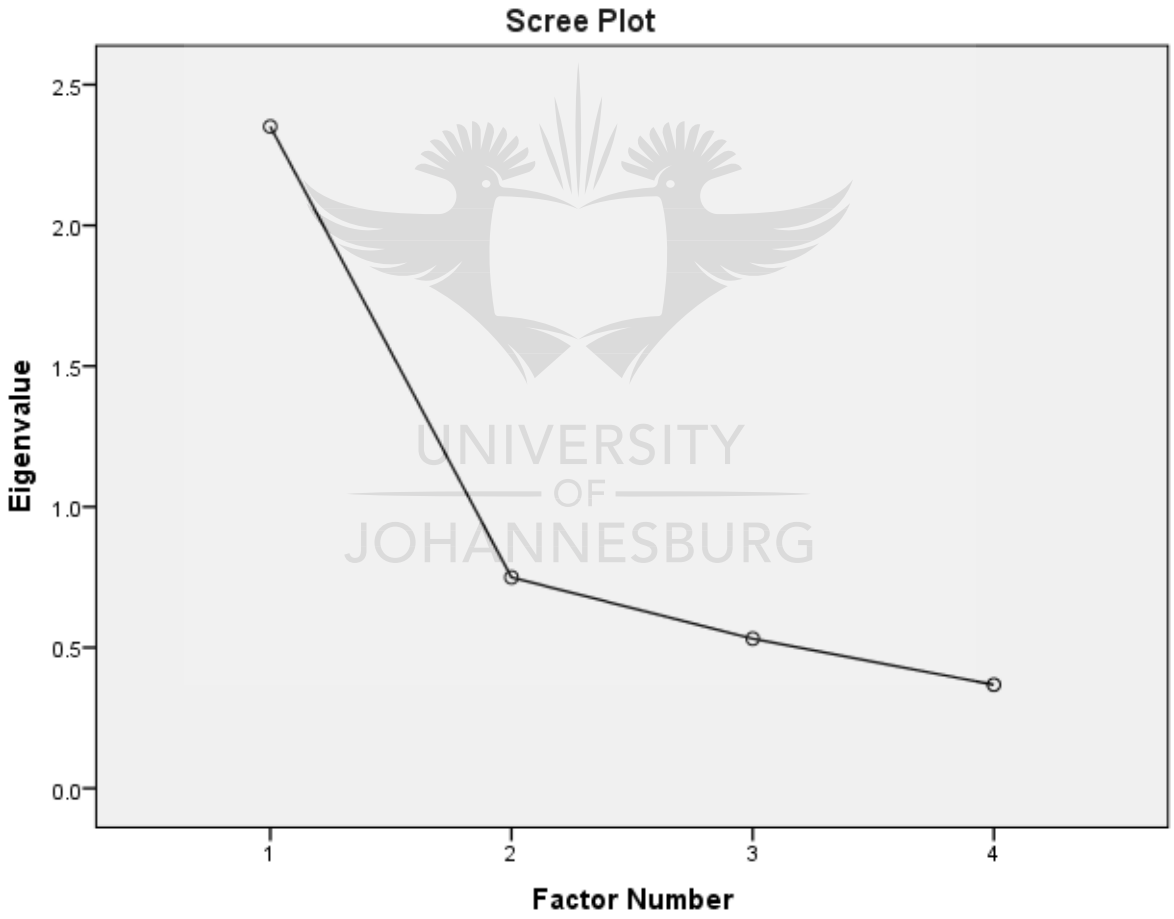
Appendix E Anti-Image for Communication Skills and Competence

		CSC1 Excellent verbal communication among project stakeholders	CSC2 Excellent written communication among project stakeholders	CSC3 Effective use of information communication technology among project stakeholders	CSC4 Proper interpretation of contractual matters is communicated
Anti-image Correlation	CSC1 Excellent verbal communication among project stakeholders	.771[a]	-.139	-.380	-.192
	CSC2 Excellent written communication among project stakeholders	-.139	.762[a]	-.349	.032
	CSC3 Effective use of information communication technology among project stakeholders	-.380	-.349	.685[a]	-.354
	CSC4 Proper interpretation of contractual matters is communicated	-.192	.032	-.354	.763[a]

Appendix E Communalities for Communication Skills and Competence

	Initial	Extraction
CSC1 Excellent verbal communication among project stakeholders	.374	.482
CSC2 Excellent written communication among project stakeholders	.259	.284
CSC3 Effective use of information communication technology among project stakeholders	.497	.771
CSC4 Proper interpretation of contractual matters is communicated	.298	.338

Appendix E Scree Plot for Communication Management Skills and Competence



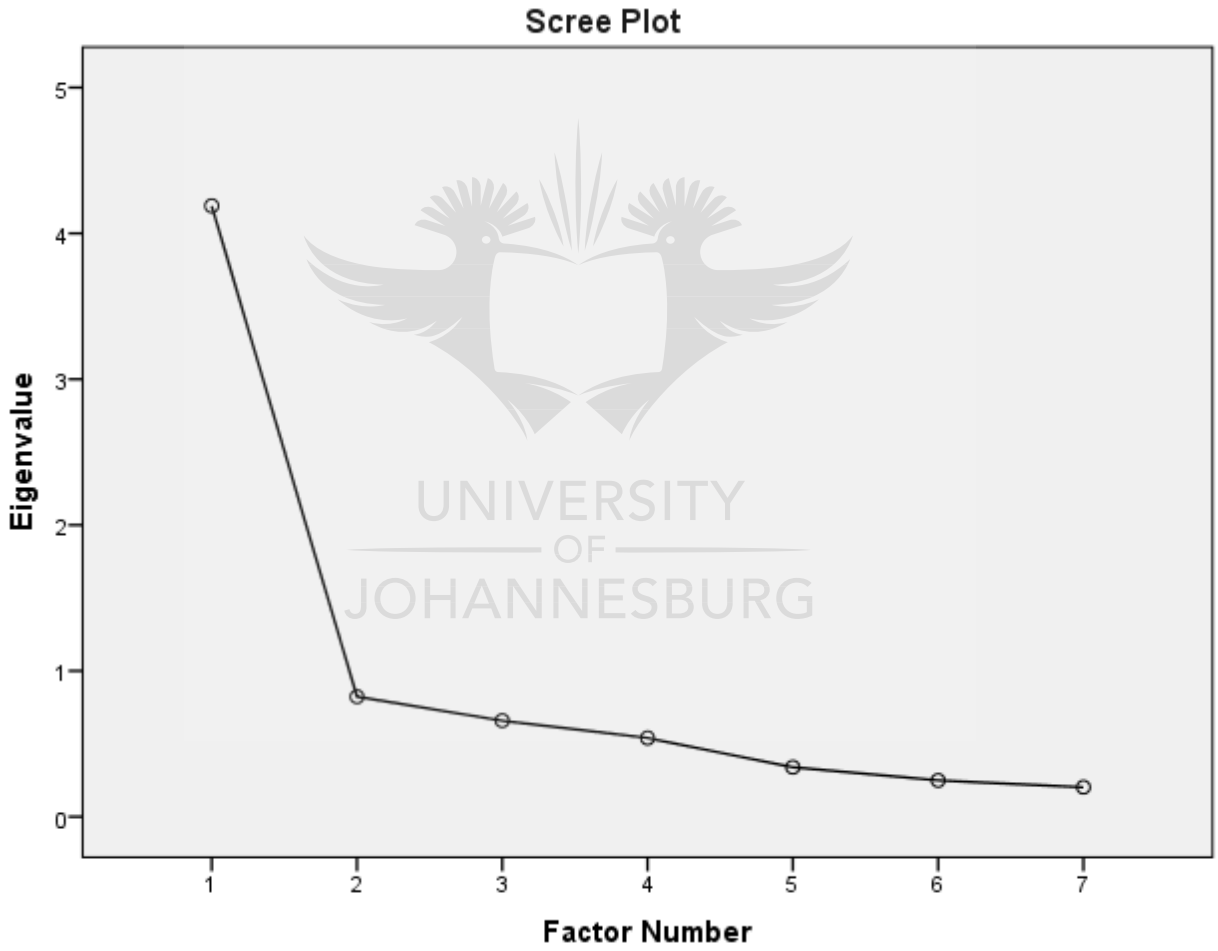
Appendix F Anti-Image Correlation for Communication Plan

		CP1	CP2	CP3	CP4	CP5	CP6	CP7
Anti-image Correlation	CP1 Communication requirements of the project team are critically analyzed in the project	.898[a]	-.072	-.279	-.315	-.147	-.044	.014
	CP2 Communication technology is used to deliver information	-.072	.834[a]	-.144	-.078	-.083	-.597	-.110
	CP3 the organization critically determines the objectives of communication	-.279	-.144	.856[a]	-.175	.125	-.039	-.323
	CP4 Proper channels of information delivery are established in the organization	-.315	-.078	-.175	.852[a]	-.425	.017	.117
	CP5 Every personnel is accountable for the information they are required to send.	-.147	-.083	.125	-.425	.839[a]	-.272	-.323
	CP6 the organization clearly identifies the recipient of the information to be sent	-.044	-.597	-.039	.017	-.272	.806[a]	.121
	CP7 the organization determines communication frequency to project stakeholders	.014	-.110	-.323	.117	-.323	.121	.793[a]

Appendix F Communalities for Communication Plan

	Initial	Extraction
CP1 Communication requirements of the project team are critically analyzed in the project	.540	.563
CP2 Communication technology is used to deliver information	.667	.646
CP3 the organization critically determines the objectives of communication	.462	.440
CP4 Proper channels of information delivery are established in the organization	.599	.596
CP5 Every personnel is accountable for the information they are required to send.	.650	.677
CP6 the organization clearly identifies the recipient of the information to be sent	.649	.569
CP7 the organization determines communication frequency to project stakeholders	.339	.263

Appendix F Scree Plot for Communication Plan



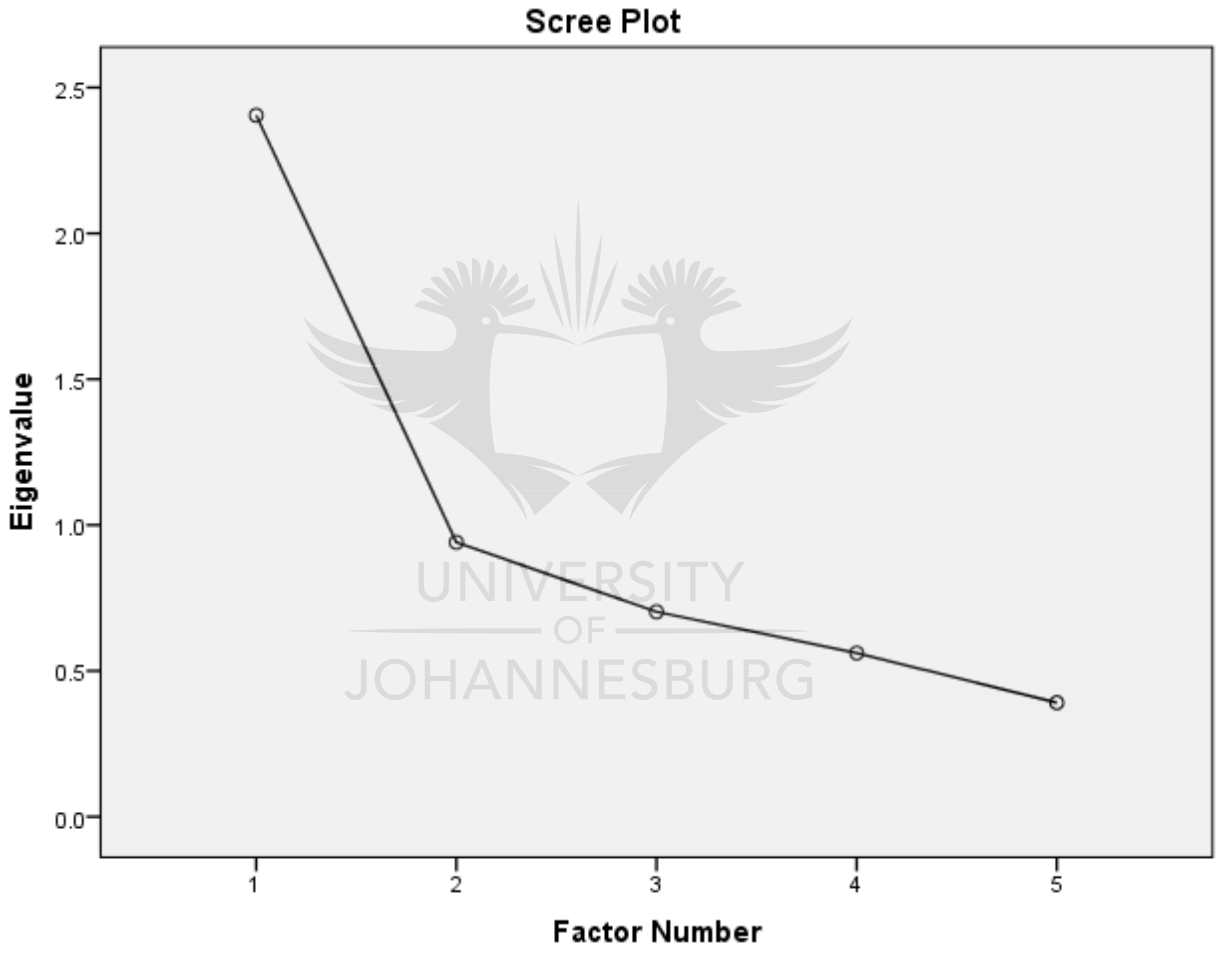
Appendix G Anti-Image Correlation for Teamwork

		TMK1	TMK2	TMK3	TMK4	TMK5
Anti-image Correlation	TMK1 There is effective communication and coordination within the project stakeholders	.674[a]	-.268	-.205	-.429	.050
	TMK2 Decentralization of information among project stakeholders is effective	-.268	.754[a]	.034	-.100	-.275
	TMK3 Conducive working relationship between project stakeholders	-.205	.034	.663[a]	.025	-.406
	TMK4 Group work effort enhances the quality of communication	-.429	-.100	.025	.709[a]	-.186
	TMK5 Strong inter-department alliance in the project enables communication to flow efficiently	.050	-.275	-.406	-.186	.666[a]

Appendix G Communalities for Teamwork

	Initial	Extraction
TMK1 There is effective communication and coordination within the project stakeholders	.367	.447
TMK2 Decentralization of information among project stakeholders is effective	.260	.333
TMK3 Conducive working relationship between project stakeholders	.256	.241
TMK4 Group work effort enhances the quality of communication	.323	.389
TMK5 Strong inter-department alliance in the project enables communication to flow efficiently	.329	.359

Appendix G Scree Plot for Teamwork



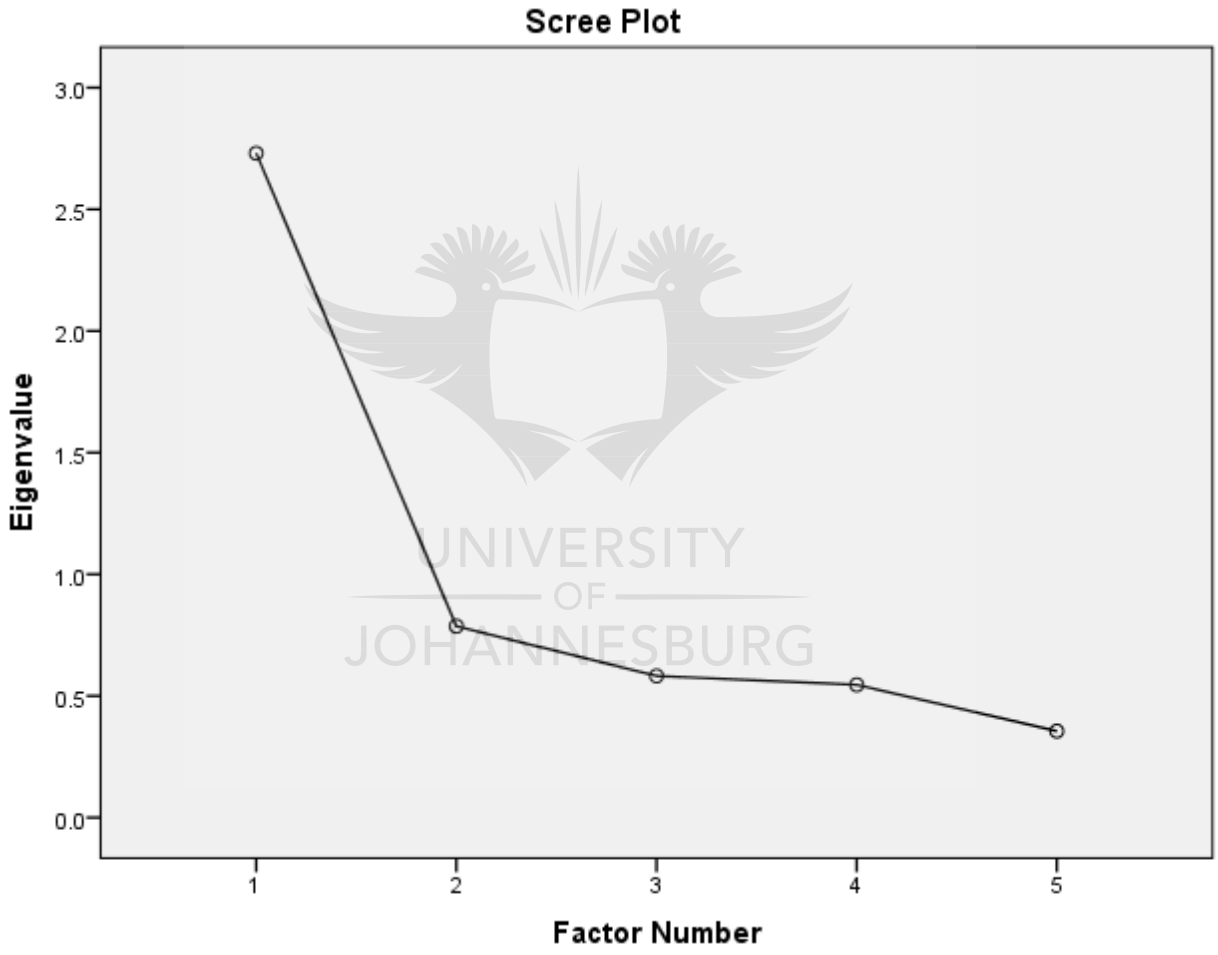
Appendix H Anti-Image Correlation for Clear Channels with Organization Structure

		COS1	COS2	COS3	COS4	COS5
Anti-image Correlation	COS1 Organizational and operational processes are in place	.848[a]	-.217	.003	-.185	-.186
	COS2 Roles and responsibilities of project stakeholders are clearly defined	-.217	.750[a]	-.326	-.413	-.108
	COS3 There are clearly marked communication channels from superior to subordinates	.003	-.326	.754[a]	.062	-.278
	COS4 The line of authority is clearly specified for the project tasks to be accomplished.	-.185	-.413	.062	.766[a]	-.214
	COS5 Clear determination and limits of who will communicate with whom and who will receive which information	-.186	-.108	-.278	-.214	.821[a]

Appendix H Communalities for Clear Channels Within the Organisation Structure

	Initial	Extraction
COS1 Organizational and operational processes are in place	.288	.347
COS2 Roles and responsibilities of project stakeholders are clearly defined	.489	.646
COS3 There are clearly marked communication channels from superior to subordinates	.290	.290
COS4 The line of authority is clearly specified for the project tasks to be accomplished.	.412	.479
COS5 Clear determination and limits of who will communicate with whom and who will receive which information	.347	.435

Appendix H Scree Plot for Clear Channels Within the Organisation Structure



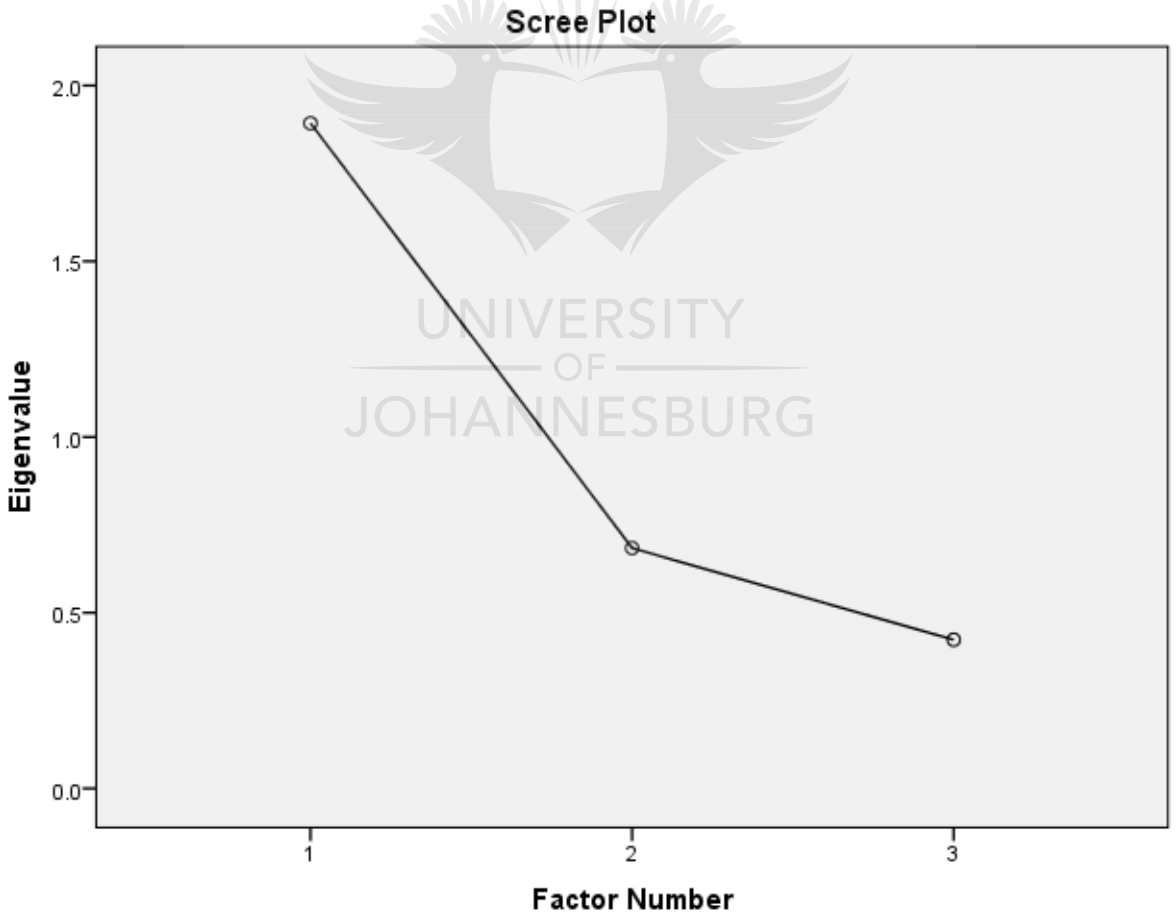
Appendix I Anti-Image Correlation for Stakeholders Personality

		SP1	SP2	SP3
Anti-image Correlation	SP1 Attitudes are evaluated to develop specific communication methods	.684[a]	-.088	-.379
	SP2 Behavioral styles of communicators are evaluated	-.088	.639[a]	-.461
	SP3 Individual perceptions are evaluated	-.379	-.461	.590[a]

Appendix I Communalities for Stakeholders Personality

	Initial	Extraction
SP1 Attitudes are evaluated to develop specific communication methods	.231	.284
SP2 Behavioral styles of communicators are evaluated	.293	.363
SP3 Individual perceptions are evaluated	.390	.790

Appendix I Scree plot For Stakeholders Personality



Appendix J Anti-Image Correlation for Project Briefing

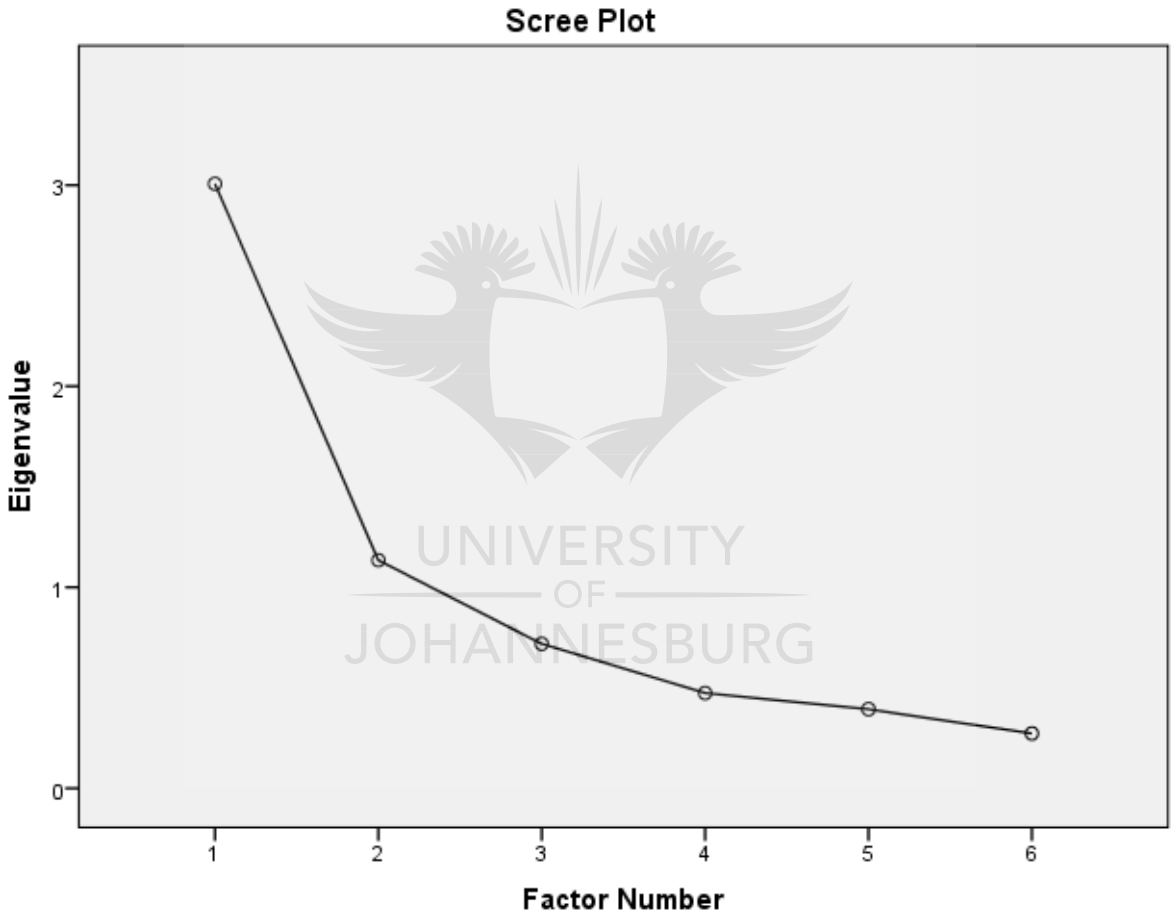
		PB1 A brief provides proper definition of client requirements	PB2 A brief provides proper analysis of client requirements	PB4 The changes to brief are properly managed	PB6 Project risk are properly communicated	PB7 There is constant interaction amongst project stakeholders	PB8 There is constant knowledge sharing amongst project stakeholders
Anti-image Correlation	PB1 A brief provides proper definition of client requirements	.720[a]	-.611	-.180	-.036	-.027	-.144
	PB2 A brief provides proper analysis of client requirements	-.611	.692[a]	-.198	-.113	.021	.095
	PB4 The changes to brief are properly managed	-.180	-.198	.826[a]	.019	-.077	-.339
	PB6 Project risk are properly communicated	-.036	-.113	.019	.733[a]	-.484	-.232
	PB7 There is constant interaction amongst project stakeholders	-.027	.021	-.077	-.484	.729[a]	-.106
	PB8 There is constant knowledge sharing amongst project stakeholders	-.144	.095	-.339	-.232	-.106	.791[a]

Appendix J Communalities for Project Briefing

Communalities

	Initial	Extraction
PB1 A brief provides proper definition of client requirements	.564	.758
PB2 A brief provides proper analysis of client requirements	.538	.632
PB4 The changes to brief are properly managed	.395	.426
PB6 Project risk are properly communicated	.413	.596
PB7 There is constant interaction amongst project stakeholders	.359	.520
PB8 There is constant knowledge sharing amongst project stakeholders	.354	.374

Appendix J Scree Plot for Project Briefing



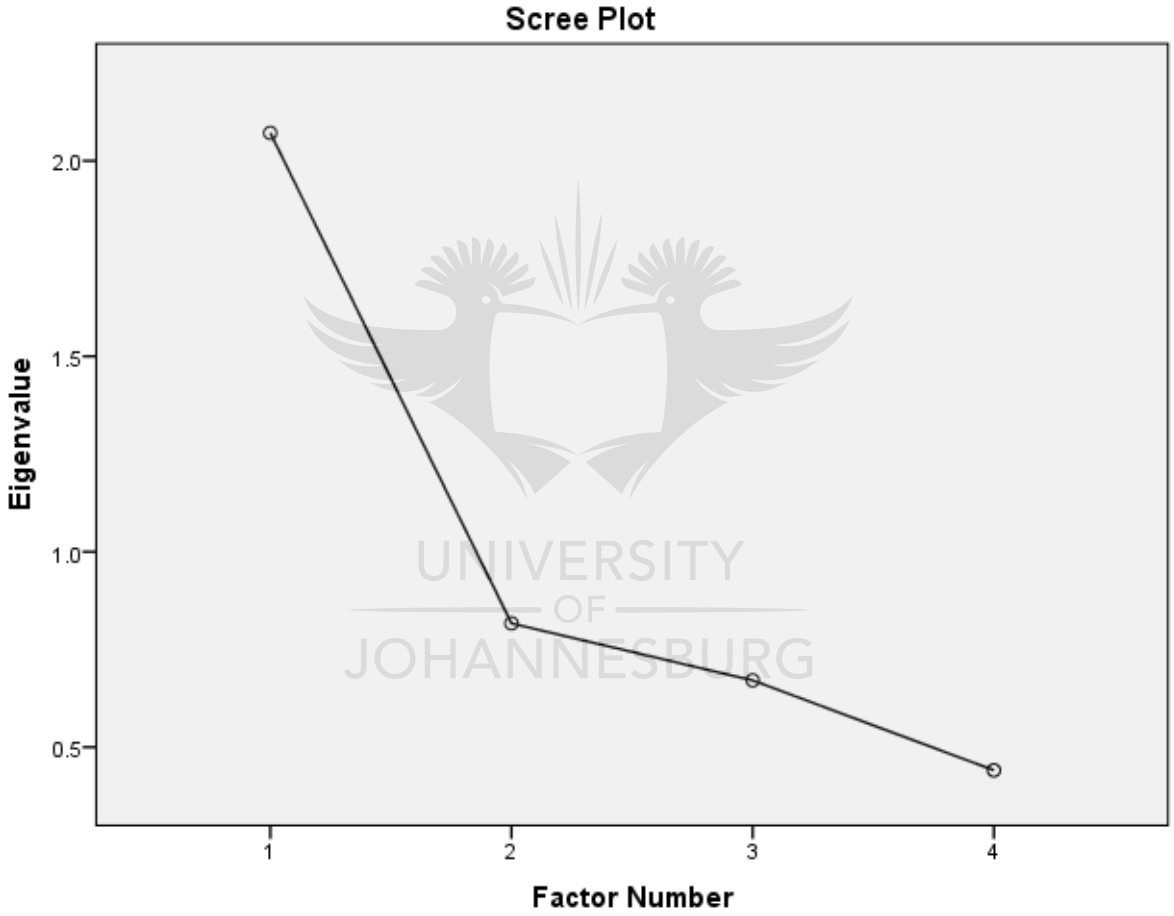
Appendix K Anti-Image Correlation for Context of Environment

		CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	CE2 There are good interpersonal relationships among project stakeholders	CE4 Conflicts are resolved from previous communication episodes	CE5 Project stakeholders of different cultures are accommodated
Anti-image Correlation	CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	.743[a]	-.231	-.095	-.237
	CE2 There are good interpersonal relationships among project stakeholders	-.231	.644[a]	-.472	-.058
	CE4 Conflicts are resolved from previous communication episodes	-.095	-.472	.653[a]	-.167
	CE5 Project stakeholders of different cultures are accommodated	-.237	-.058	-.167	.752[a]

Appendix K Communalities for Context of Environment

	Initial	Extraction
CE1 Areas of communicating are favorable i.e. circular vs linear meeting seating arrangements	.203	.276
CE2 There are good interpersonal relationships among project stakeholders	.347	.520
CE4 Conflicts are resolved from previous communication episodes	.333	.486
CE5 Project stakeholders of different cultures are accommodated	.154	.197

Appendix K Scree Plot for Context of Environment



Appendix L Anti-Image Correlation for Project Outcome

		PO1	PO2	PO3	PO4	PO5
Anti-image Correlation	PO1 Scope of works of the project was achieved	.830[a]	-.173	-.148	-.435	-.066
	PO2 Project was within time	-.173	.727[a]	-.446	.173	-.340
	PO3 Project was within budget	-.148	-.446	.797[a]	-.226	.037
	PO4 Project risks minimized i.e. occupational accidents	-.435	.173	-.226	.719[a]	-.470
	PO5 Quality of works of the project was achieved	-.066	-.340	.037	-.470	.776[a]

Appendix L Communalities for Project Outcome

	Initial	Extraction
PO1 Scope of works of the project was achieved	.501	.572
PO2 Project was within time	.463	.432
PO3 Project was within budget	.459	.483
PO4 Project risks minimized i.e. occupational accidents	.587	.601
PO5 Quality of works of the project was achieved	.519	.560

Appendix L Scree Plot for Project Outcome