The Effects of the Project Managers' Skills on Construction Productivity

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THE EFFECTS OF THE PROJECT MANAGERS' SKILLS ON CONSTRUCTION PRODUCTIVITY

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The Effects of the Project Managers' Skills on Construction Productivity,

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ABSTRACT

Purpose: This study aims to determine the influence of the project managers' skills on construction productivity. The importance of construction productivity, management factors that influence construction productivity, the essential qualities and skills of a project manager, and the tools and techniques used by the project manager to influence construction productivity are studied. The empirical study will support the hypothesis and questions of this research.

Significance of the study: Project managers' could use the study's list of factors that influence construction productivity as a guideline to identify possible risks, and the study's information on the effective leadership styles for improvement of construction productivity as a guide to developing the people-management skills pertained to these styles. Employers could use the identified project managers' skills to make determinations for appointments of project managers'. Educational institutes could also sue the study's findings as an indication of material to be incorporated into project management training manuals. Professional bodies could use the information to further research and develop supportive project management guides to develop people skills.

Methodology: The study used a quantitative research approach that tests a hypothesis or theory to determine whether the hypothesis is true. A structured questionnaire made up of closed-ended questions was distributed, via the Survey Monkey platform, to construction individuals working in the South African construction industry.

Findings: The main findings of the study showed that the project managers' skills affect construction productivity. Incompetent supervising and management, poor leadership skills, lack of labor and skills and experience, and poor communication is indicated as the main factors that influence productivity. The project managers' main skills affecting construction productivity include communication and leadership skills. Communication, leadership, and time management skills are the main project managers' skills to improve construction productivity. The respondents' two leadership styles that would maintain and improve construction productivity are charismatic and supportive leadership. The

respondents also indicated that they prefer to be managed by charismatic and supportive leadership.

Keywords: Construction, Productivity, Project Management, Project Managers' Skills, Productivity Factors

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CHAPTER ONE: THE STUDY'S FRAMEWORK

1.1 INTRODUCTION

The aim of this study is to determine the influence of the project managers' skills on construction productivity by researching the importance of construction productivity, the factors which influence construction productivity in specific with reference to management factors, the essential qualities and skills of a project manager, and the tools and techniques which can be used by the project manager to influence construction productivity. The empirical study will support the hypothesis and questions of this research.

1.2 BACKGROUND

Project management is defined by the PMBOK (2013:5) as applying knowledge, skills, tools, and techniques to project activities to meet project requirements. Comley (2018:38) defines project management as applying skills that allow you to plan and execute the construction works on site, monitor the construction activities, control the works to suit the plan, and complete the projects within the allocated time frames and budget. Therefore, it is imperative to state that project management is a complex area that requires a significant number of specialised skills to manage a project.

The characteristics of a project should also be defined to understand what the project managers' involvement during projects is. Watt (2014) states that each project is unique and temporary, as it has a definite beginning and end date and is completed when the project objectives are achieved or no longer viable.

The project management concept is simplified by the PMBOK (2013:86), which identifies ten knowledge areas of project management as project integration-, project scope-, project time, project quality, project human resources, project communications, project risk, project procurement- and project stakeholder management. The areas are then categorised into five different process groups, namely initiating, planning, executing, monitoring and controlling, and closing (PMBOK, 2013:5).

Even though the five process groups, as described by the PMBOK (2013:5), sound practical and easy, the parameters differ from project to project. The three basic parameters, according to Burke (2010:43), are time, cost, and quality control. The PMBOK (2013:6) adds scope, resources, and risk parameters. These six parameters will differ on each project, as no project is a duplicate. The relationship among these factors is such that, if any one of these factors changes, at least one other factor is likely to be affected (PMBOK, 2013:6).

Kerzner and Belack (2010) described project management's goal as meeting the triple constraints of time, cost, and performance while maintaining good customer relationships. It is difficult to measure whether a project is successful by only referring to the triple constraint triangle. The triangle has broadened in modern society, with criteria, such as the environmental impact and the building's organizational use, also determining whether the project was successful for the long-term use (Radujković & Sjekavica, 2017:608).

Cooke-Davies (2002:185) indicates that there are different criteria used to measure the success or failure of a project. Takim and Akintoye (2002:545) identified seven key performance indicators as construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with products, and client satisfaction with service. Takim and Akintoye (2002:545) also identified safety, profitability, and productivity as three company performance indicators, which must be used during procurement, the building process, and result orientations to indicate whether the project performance is successful.

Since the reconstruction of towns and buildings after the Second World, studies have been conducted to improve construction workers' performance (Olomolaiye, Jayawardane, & Harris, 1998:1). The practice was to increase the construction worker's remuneration in order to increase the project performance, but it was soon realised that other factors, such as the management of the construction workers, also affect the projects' level of productivity (Olomolaiye, Jayawardane & Harris, 1998).

Productivity is a complex concept that can be interpreted in different contexts. The English Oxford Learner's Dictionaries (2019) define productivity as the effectiveness of productive effort, as measured in terms of the rate of output per unit of input. Bierman, Marnewick,

and Pretorius (2016:37-38) add to the definition that productivity can improve if either the output increases with the input staying constant or if the input decreases and the output remains constant, while describing that productivity will improve if the quantity of labour used stays constant whilst the project performance increase, or if the quantity of labour used decrease when the project performance remains constant.

1.3 PROBLEM FORMULATION

Project management in the construction field is a specialised area. Many construction professionals become project managers after gaining years of construction management experience. Successful candidates in this field require extensive knowledge and experience.

For a project manager to positively influence construction productivity, a unique balance must be achieved according to the project needs. Some project managers walk into projects with strict time and cost constraints set by professionals or consultants before project implementation. The project manager then needs to do whatever possible to meet these targets, which in some cases seems impossible to do even before the project has started.

Therefore, there is no predetermined standard for successful project management, but rather a project-specific approach determined by the project constraints and resources available. However, certain traits in a project manager can positively influence the successful outcome of a project and subsequently affect construction productivity.

The factors influencing labour productivity vary from country to country. The internal factors affecting project productivity include management, technology, and labour (Olomolaiye, Jayawardane, & Harris, 1998:9-10), and external factors include the nature of the industry, the client, weather, and the level of economic development, which influence the project productivity (Olomolaiye, Jayawardane, & Harris, 1998:8-9). Project productivity is, therefore, sensitive to change in any of these factors.

Kazaz, Ulubeyli, Acikara, & Er (2016:28) researched the factors affecting labour productivity and noted that construction projects significantly contribute to national economies, especially in developing countries, such as South Africa.

In South Africa, the construction industry contributed to 3.77% of the economic value in 2018. The South African economy showed a promising Gross Domestic Product (GDP) results released on 03 September 2019, indicating a 3.1% growth for quarter two of the year 2019; however, a negative -1.6% growth result in the same quarter for the construction industry (South African Market Insights, 2019). This 0.9% contraction in the final quarter of 2018 is supported by the unemployment rate, which increased to 29%. Due to the major impact the COVID-19 pandemic had on our domestic economy, the South African Reserve Bank expected the GDP to contract by a further 7% in 2020.

The South African economy has faced many challenges since the 2009 world recession. The below timeline in Table 1.1 reflects the challenges from 2009 to 2020.

Table 1.1: Timeline of challenges the South African economy faced from 2009 to 2020

2009	• Infrastructure preparations for the FIFA World Cup Soccer 2010 • Jacob Zuma is elected as President of South Africa. • The South African economy goes into recession
2010	• FIFA World Cup Soccer Project surge however most stadium construction projects experienced cost overruns and project delays.
2011	• Two ministers are accused of corruption. • Marikana Massacre
2012	• ANC Youth Leader charged with money laundering in a tender award.
2013	• President Jacob Zuma is critized for a R2-million upgrade to his home, Nkandla.
2014	• ANC wins election as ruling party.
2015	• ANC anounces plans to re-distrbute farms causing investment uncertainty • International allegations over FIFA World Cup 2010 construction bribery.
2016	• Corruption in paying governmental departments • Eskom power woes • Weakening of rand • Labour shortages • Supreme court rules the President violated the constitution when he used public money for improvements to his home, Nkandla.
2017	• Respected Minister of Finance, Pravin Gordhan, is dismissed by President Zuma. • South Africa's credit rating is dropped to junk status.
2018	• SABC suffers a net loss of R482m and applies for government bail out. • President Zuma resigns under the corruption charges. • New President, Cyril Ramaphosa, is appointed. • Construction company, Basil Read, goes bankrupt. • Construction companies, NMC and Liviero Group, goes into voluntary liquidation.
2019	• Construction Mafia Movements disrupt construction developments and causes panic. • Construction company, Group Five, goes into business rescue. • South African Airlines (SAA) goes into business rescue. • Eskom load-shedding in second half of 2019 contributing to a posisble recession. • In October 2019, Denel, the state arms manufacturer, reports a R1.7bn nett loss
2020	• Construction company Esor goes bankrupt after two years in business rescue. • COVID-19 pandemic and Lockdown construction restrictions

Source: Own Contribution (2020)

It is evident from the above timeline that South Africa faced many political and economic challenges over the past decade. Many of these challenges contribute to the challenges, which were faced in the construction industry, causing investment uncertainty and decreased government infrastructure-spending.

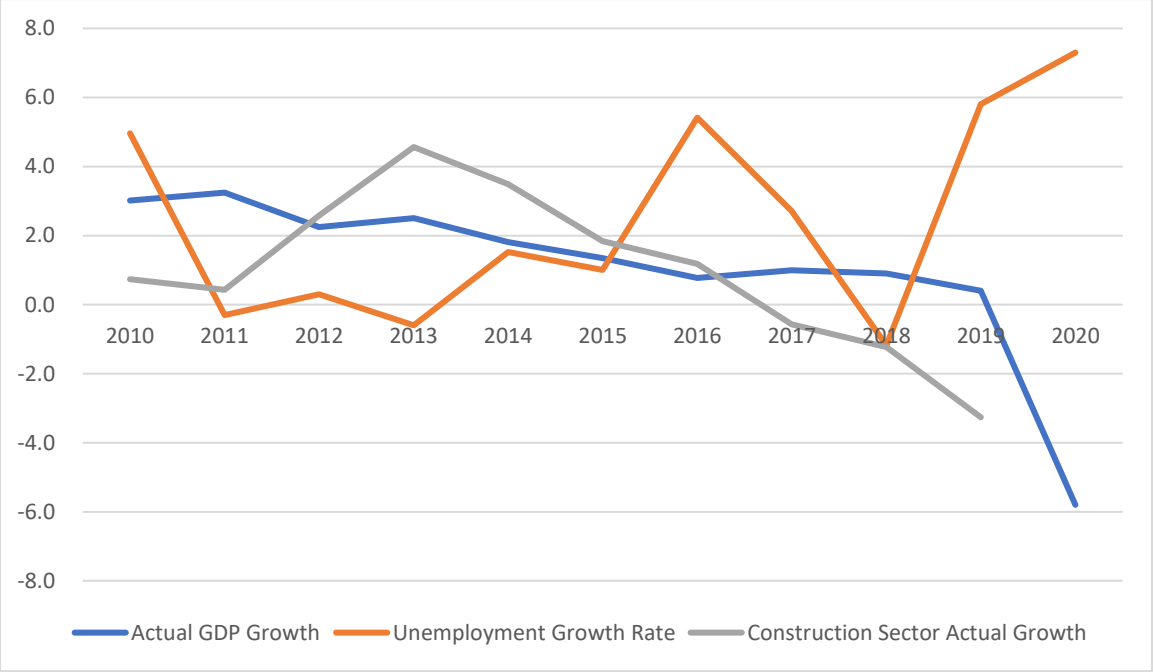

Figure .1: South African Actual GDP (Gross Domestic Product) growth rate in comparison with Construction Sector Actual Growth and Unemployment Growth Rate from the year 2010 to 2020, South Africa's GDP (2020)

The above chart creates a visual representation of how fluctuations in the GDP reflect in the Construction Sector Growth rates and Unemployment Growth rates. It indicates that as the economic growth rates decrease, the construction sector growth rates decrease, and unemployment rates increase. The expected GDP growth rate and unemployment rates are forecasted to reach an all-time low in December 2020.

The South African economy, and in particular, the construction sector, is under immense pressure because of political instability, corruption, movements, such as the “construction mafia”, decreased government infrastructure expenditure, and the current COVID-19 pandemic. Many companies have been limited to any activity during the lockdown, as per government regulations, and had to defer to staff's retrenchment to ensure expenditure is limited. Other companies had to access government loans, as retrenchment remedies could still not save finances.

Therefore, it is even more appealing than project managers utilise their skills and capabilities to achieve the desired productivity levels and avoid cost overruns and time delays, which can be detrimental to any company.

Because companies are focused on keeping desirable profit margins in a declining economy, companies give more attention to construction productivity. The better the construction productivity, the higher the probability of achieving desired profit margins.

Therefore, it is important to maximise the results of construction projects by performing in adherence to the three company performance indicators and the seven key performance indicators (Takim & Akintoye, 2002:545) and to continually evaluate the project results against these indicators.

The KPMG Global Construction Project Survey interviewed more than 100 organizations worldwide, with yearly revenue of $250m to $5bn, and they reported that only 25% of their large projects, between the years 2013 to 2015, finished on time and within budget (Venter, 2015). They reported a shortage of talent, with 45% lacking project managers and a shortage of leadership skills (Venter, 2015). The cause of the poor performance of projects must be established to avoid projects being abandoned because poor performance can be recoverable (Kerzner & Belack, 2010:115). The survey concluded that 69% of the respondents identified the contractor's poor performance as the motivation for project underperformance (Venter, 2015).

The project time is controlled by assigning accountability clearly and effectively managing risk (Dinsmore & Cooke-Davies, 2006). The project cost is controlled by controlling the scope and maintaining a performance measurement baseline, which means time, cost, and technical progress are monitored simultaneously (Dinsmore & Cooke-Davies, 2006). In this study, the researcher will confirm the importance of construction productivity and how the project manager influence construction productivity.

There are many uncertainties that imply a risk when starting a project; Hillson (2009) states that not all uncertainties are risky, but all risks are uncertain. Some uncertainties do not affect project objectives, meaning they are not a risk. But other uncertainties affect

project objectives and therefore need to be managed by the project manager (Hillson, 2009).

Adebowale and Smallwood (2018:1) studied the challenges contributing to poor productivity in the South African construction sectors, such as workers with inadequate skills, a lack of leadership, political unrest, contractors not having sufficient project planning experience, and the low level of education.

Because of the unique nature of the challenges that South Africa face, not many studies have been conducted focusing on the improvement of construction productivity as a remedy to South African construction firms. Many articles describe the economic and political challenges South Africa faces, but few remedies are given to help the remaining construction companies excel in the current environment. The project managers' skills could be used as a remedy to obtain the desired cost and time deliverables by optimizing construction productivity levels.

This study will address the influence project managers' skills have on construction productivity.

1.4 PROBLEM STATEMENT

Construction companies and developments are dependent on project successes. The project manager plays a crucial role in managing all critical elements which influence the project outcome. Project managers do not utilise their skills and capabilities to achieve maximum productivity levels and thereby waste cost and time, which can be detrimental to any company in the current economic environment.

The project manager must indirectly influence construction productivity in its management capacity. There is no specific standard that can be followed, but rather a combination of managing techniques that must be identified for each project's needs. In unsuccessful projects, the project managers and stakeholders neglected important elements that later became liabilities that cause risk.

The lack of effective project management results in poor levels of productivity. The lack of the project managers' utilising their skills, experience, ability to adapt and manage the

constant shift towards project deliverables, such as the required level of productivity, are presumed to form the main reason for this study.

1.5 RESEARCH QUESTION

1. What is the importance of construction productivity to companies?
2. What project management skills could improve construction productivity?
3. How do project managers' skills, leadership styles, knowledge, and experience influence construction productivity?
4. How do the project managers' skills improve construction productivity?
5. What type of management leadership styles would improve construction productivity?

1.6 HYPOTHESIS

1. Project managers’ influence construction productivity at every stage of the project life cycle, even though they do not directly manage construction labour.
2. Each construction project has unique objectives and constraints. The project manager must adapt to the unique project management approach to reach the project objectives whilst also satisfying the human factor.
3. The project managers’ skill set, leadership style, and experience are important to manage a project's productivity by referring to past similar projects where the acceleration of the program or eliminating elements was implemented.
4. The knowledge and experience levels of a project manager will ultimately affect the productivity of a project.

1.7 OBJECTIVES

The objectives of the study are as follows:

1. To identify the project managers’ skills that influence construction productivity.
2. To determine how the project managers' skills, leadership styles, knowledge, and experience influence the human factor of construction productivity.

3. To determine which project managers' skills improve construction productivity.
4. To determine which project managers' leadership styles would improve construction productivity.

1.8 IMPORTANCE OF THE STUDY

This theoretical importance of this study is to introduce the importance of construction productivity, the factors affecting construction productivity, as well as skills and capabilities of the project manager as a remedy to achieve the maximum construction productivity levels in a South African industry, which is in a critical and dire stance.

This study's practical significance allows project managers and construction firms in South Africa to identify measures that can be taken to accelerate and manage construction productivity. Existing theories and tools, which can be used to effectively manage project productivity, will also be given for their implementation.

The project stakeholders will be able to understand the importance of construction productivity and identify factors affecting construction productivity with a view of improving the productivity of projects.

The research outcomes can be used by any construction company in South Africa as a tool to focus their actions and thoughts on practical ways in which maximum productivity can be achieved by making use of the project managers' skills. Human resource departments of construction companies can use the scale of important skills and qualities when appointing project managers' in positions where construction productivity is critical.

1.9 SCOPE

To support the hypothesis, a literature study is done on relevant publications worldwide to determine the importance of construction productivity and factors affecting construction productivity. The literature study will further include the management factors, which influence construction productivity, important qualities and skills of a project manager, and theories and tools available for the project manager to manage construction

productivity. The testing of the theories in the empirical study is limited to South Africa by questioning construction individuals and experts in the construction industry.

1.10 ASSUMPTIONS

We can assume that various project management techniques can be applied to the construction project manager's field, as project management goes far beyond the construction industry. This empirical study assumes that all respondents in their professional capacities will give credible information during the interview and questionnaire administration.

1.11 LIMITATIONS

The literature research is limited to construction project managers' skills, knowledge, and experience. The empirical study is limited to only construction professionals with a minimum of three years' experience, based in South Africa.

The challenges to this study would include many participants not actively working in the construction industry and who are therefore available. Many companies have put construction staff on skeleton schedules to ensure there are always replacements available should a COVID-19 positive case be recorded, and staff is placed in isolation.

1.12 RESEARCH METHODOLOGY OUTLINE

The below Table describes the Research Methodology used in this study:

Table 1.2: Research design and methodology

Research Methodology	A literature study is conducted on project management and construction productivity, with specific reference to project managers' skills and qualities and how they

	influence construction productivity. Existing tools and techniques available to project managers' to assist with construction productivity are also studied. A quantitative research approach was used to conduct a survey for the purpose of this study. Questionnaires were issued to purposively selected respondents to obtain reliable data.
Research Paradigm	A positivism paradigm was used for this study. The hypothesis is based on five questions, which is supported by the literature research and validated by the results of the quantitative research of this study.
Research Design	The study research design is based on quantitative research, based on the information obtained from structured questionnaires, to determine the relationships from construction experts' opinions, among the variables, which influence construction productivity.
Research Approach	The survey research method is used to determine the factors, which influence and improve construction productivity and the relationship the respondents believe there is between leadership styles and construction productivity.
Target Population	The target population for this study will be construction professionals working in South Africa. The participants will require a minimum of three years of experience in the construction industry and will be contacted through established working connections.
Sample Size	Seventy (70) construction individuals.
Sampling Method	In this study, purposive sampling was used, with construction individuals, such as project managers,

	construction consultants, labour-only subcontractors, general subcontractors, and specialised subcontractors.
Data Collection Instrument	The study research design is based on quantitative research, based on the structured questionnaire results to determine the relationships from construction professionals' opinions, among the variables that influence construction productivity.
Data Analysis	The empirical study results were captured by Survey Monkey and presented in Table format for ease of interpretation and visually illustrated in a graph format.
Ethical Consideration	Participants' and companies' details and their responses will be kept private and anonymous to maintain their confidentiality.

Source: (Own Contribution, 2020)

1.13 STRUCTURE OF THE DISSERTATION

The mini dissertation consists of the following chapters:

CHAPTER ONE: THE STUDY'S FRAMEWORK

This chapter discusses the background and problem formulation. It also provides the research questions, hypothesis, objectives, importance, limitations, and a brief research methodology of the study.

CHAPTER TWO: LITERATURE REVIEW

This chapter covers the importance of construction productivity, the parameters, which determine successful projects, and elements, including effective project management, which influence construction productivity. This chapter discusses literature from journals and textbooks defining the different factors, which will be used in the empirical study.

The chapter also covers the importance of a qualified and skilled project manager and the leadership and communicator's role, which the project manager has within

construction projects. The different leadership and communication are discussed, as well as their influence on construction productivity.

This chapter also covers the existing theories and tools, such as Maslow's Theory, Herberg's, and Douglas McGreggor Motivation Theory, and how they relate to managing and improving construction productivity. Team building and development implemented by the project manager are discussed to support effective leadership and increase productivity.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

This chapter explains and justifies how the empirical study will be done through the chosen research design and methodology by using a specific data collection instrument, which is suited for the purpose of the study.

CHAPTER FOUR: RESULT PRESENTATION AND ANALYSIS

This chapter presents the findings of the empirical study. The results are coded into a tabled format and illustrated in graphs. Each of the results of a question is analysed and discussed concerning the findings of the literature review.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

A conclusion is drawn from the literature and empirical research findings, where recommendations are given for future studies pertaining to the stated topic.

1.14 CONCLUDING REMARKS

The researcher introduced the purpose and outline of this study. The problem formulation is used to support the problem statement. The research questions were raised from onsite experience on high-speed projects where project teams had to work together to ensure that the level of construction productivity was maintained and, in some cases, increased. The hypothesis is tested by the literature and empirical study throughout this dissertation. The next chapter is divided into four parts and contains the literature information obtained in this study.

CHAPTER TWO: LITERATURE REVIEW

AN OVERVIEW OF HOW THE PROJECT MANAGERS' SKILLS AFFECT CONSTRUCTION PRODUCTIVITY

2.1 INTRODUCTION

Kerzner and Belack (2010) define project management as an attempt to improve efficiency and effectiveness using resources by getting work to flow in a multidirectional way through an organization. Project management is also seen as applying knowledge, skills, tools, and techniques to project activities to achieve project requirements (Heagney, 2016:4).

The literature study will provide an overview of the importance of construction productivity, project management (Kerzner & Belack, 2010) and how skills, experience and knowledge, applied to efficiently manage construction, enables the researcher to define productivity as a parameter (Cambridge Dictionary, 2019: Online), which determines project success (Kerzner, 2006) and how it can be measured and managed (Peter Landau, 2017). By identifying the critical skills and tools, a project manager can use to manage productivity will support the theory that the knowledge and experience levels of a project manager will ultimately affect a project's productivity.

The literature review of this study addresses the secondary resources, such as journals, textbooks, government publications, newspapers, and articles to provide a background to the research, which has been done in construction productivity and the influence of the project managers' skills.

The project management concept is simplified by the PMBOK (2013:86), which identifies ten knowledge areas of project management: project integration, project scope, project time, project quality, project human resources, project communications, project risk, and project procurement, and project stakeholder management. The areas are then categorised into five (5) different process groups, which are also referred to as the project

process phases, namely initiating, planning, executing, monitoring and controlling, as well as closing (PMBOK, 2013:5).

The five (5) processes, as identified by the PMBOK, can be used to manage the ten (10) knowledge areas continuously.

Initiation of the project, including all related activities defined, would be the first step to take before a project or any project-related activities would occur (Heagney, 2016:17). The second step would be *planning*, which is critical to project success. It is believed that without a project plan, there would be no project control (Heagney, 2016:18). The third step would be *executing* the project plan. The execution of the project activities should be done according to the original project plan. Should there be any deviations or delays, corrective action or a revision of the project plan must be done to ensure the project moves forward (Heagney, 2016:18). The fourth step includes the *monitoring and control* of the execution of the project plan and is implemented by comparing where the project is, against where the project is supposed to be, and taking corrective action if the results are not satisfactory (Heagney, 2016:19). The fifth step is the *closing out* of the project and is done in the form of a project close-out report, which includes a project review with lessons learned (Heagney, 2016:19) to ensure future projects benefit from the experience gained.

There are also many other processes, similar to the PMBOK process, which has been developed, namely the Fayol's Management Process (Burke, 2012:65) and the Eastonian Process (Burke, 2012:66).

The Fayol's Management process consists of Planning, Organizing, Commanding, Directing, and Control, and was developed by Henri Fayol, a French industrialist in 1916 (Burke, 2012:65). The difference between the PMBOK process and Fayol's process is the initiation phase, which is not included in Fayol's process. The Eastonian Process was developed by David Easton and consisted of three phases, namely input, process, and output, and used by the PMBOK to explain each of the PMBOK process steps (Burke, 2012:66).

Project management would include the application and integration of all the knowledge areas (Heagney, 2016:4) by using the processes available to ensure successful delivery of the defined work scope.

The total work scope of a project consists of many activities. The activities are scheduled on a construction program included in the project management plan (Burke, 2012:69) that needs to be executed in a symphonic collaboration where all activities are well planned, executed, monitored, and controlled, and closed off (Burke, 2012:67). A project's definition is an activity with a defined start and end date (Kerzner & Belack, 2010:3). This rate is measured against project objectives set at project initiation. Kerzner (2006) gives the characteristics, which define a successful project in figure 2.1.

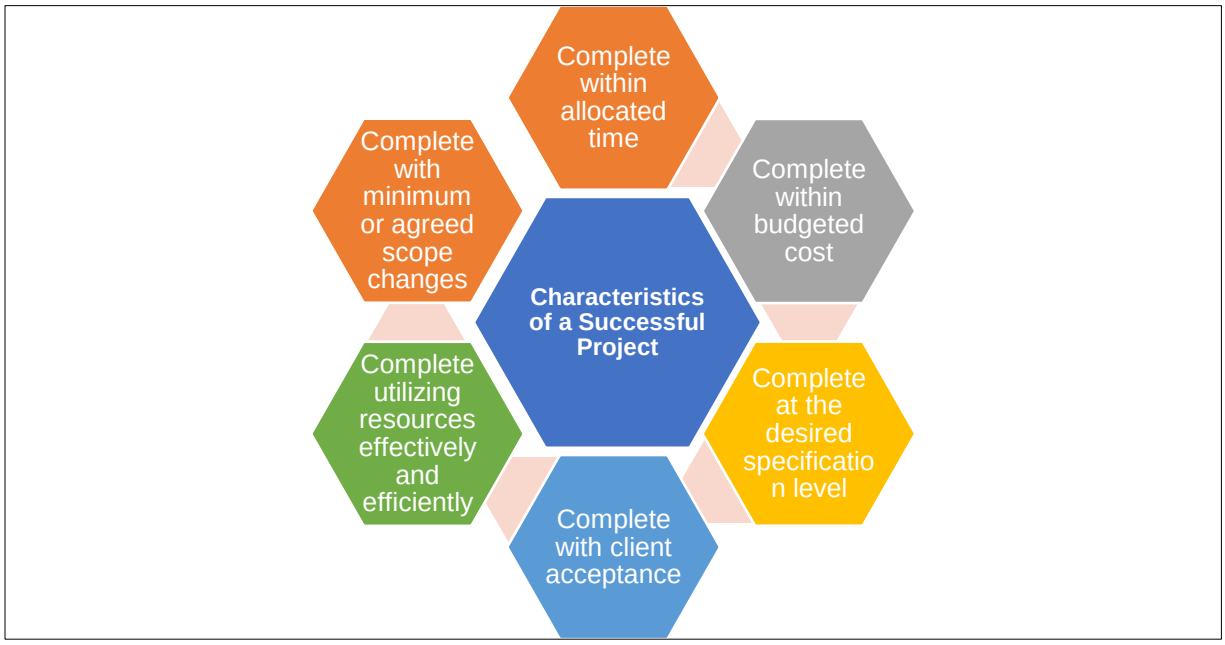

Figure 2.1: Characteristics that define a successful project

Source: (Kerzner, 2006)

Because of the unique nature of each project, the characteristics in figure 2.1 will vary. These characteristics are based on the project constraints or limitations, such as predetermined milestones, financial limitations, and quality specifications (Kerzner & Belack, 2010:3). A seventh constraint not listed in the figure is a project's ability to handle risk. Kerzner and Belack (2010:273) state that a good project manager must be able to manage project uncertainty and risk. Project risk management is planning, which needs

to be done to minimise the probability of activities going wrong and maximize the effects of opportunities (Knipe *et al.,* 2010:333). This process is highly constructive and allows for creativity (Knipe *et al.,* 2010:333).

There are many benefits an efficient and effective project management offers (Neybour, 2013), such as providing a roadmap that can be easily followed to project completion; improves end-user satisfaction; the strategies used for one project can be used for future projects; positive project results inspire and help project teams to perform more efficiently; promotes a greater competitive edge inside and outside the workplace; good performance leads to more opportunities; discover smarter directions you can immediately take; increases quality; increases efficient risk assessments, increase in project quality and better management, which lead to greater productivity.

Should project management be implemented effectively and efficiently, it can hold potential benefits for a project, such as that all activities will be accounted for, the need for reporting will be minimised, the time limits of schedule will be identified, risks will be identified early to allow for corrective action, estimating capabilities will improve and objectives, which may not be met or be exceeded at certain stages, will be identified (Kerzner, 2016).

In chapter one (1) the researcher discussed the need for effective project management to ensure satisfactory productivity levels on construction projects. The researcher also briefly discussed the importance of productivity on construction sites with the current challenges and uncertainties the construction industry of South Africa faces. Realistic and desirable profit margins are often at risk due to poor productivity. The following literature review will discuss the factors affecting construction productivity.

2.2 FACTORS AFFECTING CONSTRUCTION PRODUCTIVITY

2.2.1 The importance of construction productivity

The construction industry is one of the most important industries of a country, as it supports economic development (Dixit, Mandal, Thanikal and Saurabh, 2018:1). Loosemore's (2003) study (cited in Best & Meikle, 2015:157) characterises the global construction industry as highly competitive, disjointed, and cyclical and frequently operates on low-profit margins. Dixet *et al.* (2018:1) explore how improved construction productivity offers additional flow to the construction industry and, thereby, the economy.

Productivity is defined as the rate at which a country, company, etc. produces goods or services, usually judged concerning the number of people and the time taken to produce them (Cambridge Dictionary, 2019:). Productivity is a determining factor of every company's success and competitiveness (Enshassi *et al.,* 2013:175). Shehata and El-Gohary (2012:321) indicate that productivity can be defined in many ways. When used in construction, it usually refers to labour productivity, thus units of work placed or produced per man-hour.

In an article by Bierman, Marnewick, and Pretorius (2016:37) they state that the South African labour productivity levels are less efficient in comparison to its emerging market competitors and one of the lowest in the developing world. However, many international studies have come to identify low rates of productivity growth over the past decade (Dixet *et al.,* 2018:1). Many other countries have also reported on construction projects not finishing on time and within the allocated budgetary figures (Shahhosseini *et al.,* 2016:93; Al-Hazim et al., 2017:18; Ibironke & Elamah, 2011:1; Enshassi *et al.,* 2013:173).

Due to the challenges the construction industry face, contractors are trying to stay competitive in terms of profitability by using tools to survive and remain in the market, such as controlling construction productivity (Enshassi *et al.,* 2013:174).

Due to many factors, such as design-, budgetary- or program changes, it is not easy to control construction productivity. The Intergraph (2012) did a white paper on labour productivity and stated that an average of over 35 percent of all construction projects

would have a major change. Any change has a direct impact on productivity, which results in a risk that needs to be managed.

Productivity was researched on three main levels: industry level, project level, and activity level, from 2006 to 2017 (Dixet *et al.,* 2018:1). Lower productivity at the industrial level results in increased prices, which causes decreased sales and output (Yates, 2014:6). Lower productivity at corporate levels influences firms' profitability and survival, leading to company reorganizations, dissolutions, or bankruptcy (Yates, 2014:6). Higher productivity at a personal level could lead to personal self-fulfillment and career advancement due to employees contributing to corporate productivity goals (Yates, 2014:6).

For the purpose of this study, the two most important aspects of labour productivity during construction projects are the effectiveness in which labour is used and the work efficiency whilst doing what is required at a given time and place (AbouRizk & Dozzi, 1993:11).

Illustrated in figure 2.2 is an example of how a skilled-, semi-skilled- and unskilled tiller would affect productivity and thereby the labour cost.

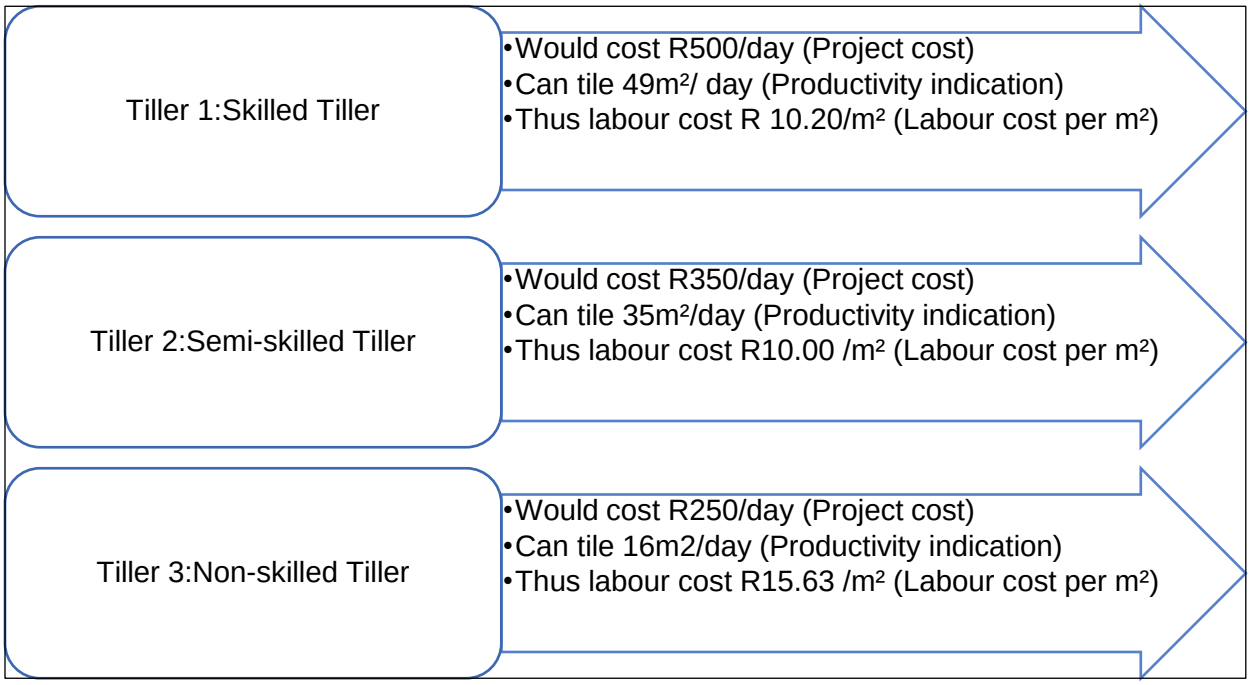

Figure 2.2: How the skills of a skilled-, semi-skilled- and unskilled tiller would affect productivity and labour cost

Source: (Researcher's construct, 2020)

As per figure 2.2, should a skilled tiller be used, labour for the day would cost the company R500 and include completion of 49 square metres of tiling. Thus, it costs the construction company R10.20 per square metre to use a skilled labour for tiling.

Should a semi-skilled tiller be used, labour for the day would cost the company R350 and include completion of 35 square metres of tiling. Thus, it costs the construction company R10.00 per square metre to use a skilled labour for tiling.

Should a non-skilled tiller be used, labour for the day would cost the company R250 and include completion of 16 square metres of tiling. Thus, it costs the construction company R15.63 per square metre to use a skilled labour for tiling. Besides, should the unskilled tiller damage or cause a human error on any of the work, the cost to redo the tiling would also have to be added.

Best and Meikle (2018:157) state that performance measures are used to determine if a process has obtained the desired results or objectives. Kerzner (2017:3) defines successful project management as achieving a continuous stream of project objectives.

The example in figure 2.2 can be used to explain this concept. The project manager might focus more on the program and would choose the skilled tiller, because his output per day is more than the semi-skilled- and unskilled tiller. However, the quantity surveyor would rather use the semi-skilled tiller as his labour cost per square metre is less. The client would want to use the unskilled tiller, as his daily rate is the lowest, but would not necessarily take into account his output for the day and the cost of rework should a mistake be made. Therefore, it is important that the project team must ensure each individual and professional objective is aligned with the project objectives in terms of the project parameters to ensure the team's priorities and interests are the same (Kerzner, 2017:154).

Thus, the productivity of labour influence both the profitability and survival of companies and is a crucial issue (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016:29). Productivity improvement processes can also be implemented. This will be discussed in section 2.4.

2.2.2 Elements affecting construction productivity

To successfully complete a project within the defined parameters, such as time and cost, the project manager must manage many inputs (Kazaz & Acikara, 2015:491). The labour force has the biggest influence on time and cost performance and is the most difficult to manage, as it is a variable project input. Kazaz and Acikara (2015:491) compare the meaning of labour productivity to project managers and craft workers in the Turkish construction industry. They found that even though the labour force have the biggest impact on construction productivity, their perception of increased productivity relates to the lack of equipment, materials, and tools on-site. Whilst the project managers' perception refers to a complex of factors, such as labour, experience, skills, leadership and competency, lack of labour experience, shortage of materials, labour supervision, lack of cooperation and communication and rework, to name a few (Kazaz & Acikara, 2015:491).

Shehata and El-Gohary (2012:324) state that the construction industry's main difficulties are the declining rate of productivity and a lack of productivity standards. Many factors are contributing to low levels of productivity.

Shehata and El-Gohary (2012:324) provide three areas of factors, which could affect productivity, namely, industry-related, management-related, and labour-related factors. Industry-related factors would include complex designs, building codes, and use of construction technology, regulatory laws, project characteristics, adverse weather conditions, and locality of projects (Shehata & El-Gohary, 2012:324). Management-related factors would include project planning and scheduling, project leadership, communication, and work motivation (Shehata & El-Gohary, 2012:324). Labour-related factors would include the skills of the workforce, motivation to work, and availability of skilled labour (Shehata & El-Gohary, 2012:325).

Most of the internal factors influencing construction productivity can be managed by the project manager. The different management styles (Shan, Goodrum, Goodrum, Zhai, Haas & Caldas, 2010:305), communication levels (Zulch, 2014:176), team-building

(Heagney, 2016:176; Shan *et al.,* 2010:310) and development (Heagney, 2016:182), implemented by the project manager, affect the outcomes of a project.

When project managers want a high level of productivity from their workers, they must have the ability to lead and direct (Adrian, 1987) all relevant parties, such as the engineers, architects, sub-contractors, and labourers.

Olomolaiye, Jayawardane, and Harris (1998:8) classified the factors, which influence productivity into two groups: internal and external. Internal sources of risks, such as market risks, project assumptions, technical activity, health, safety, and environmental risks, are created inside the project and can be managed by the project manager (Steyn & Nicholas, 2017:348). External risks such as governmental regulations, customer behaviors, interest rates, physical environment, labour availability, material shortages, senior management decisions, regarding project priorities and subcontractors' control over project work and resources, are created outside the project, and the project manager has limited control over them (Steyn & Nicholas, 2017:348).

Other factors which influence construction productivity as listed by Bierman, Marnewick, and Pretorius (2016:39) when they did their research regarding the factors affecting construction productivity in the South African civil industry, included material shortages, the lack of labour experience, incompetent supervising, work methods, late issue of drawings, poor project communication, unforeseen events taking place, poor site layout, as well as the constructability of work and rework.

Makulsawatudom and Emsley (2001:286-288) did an article on the factors which affect the productivity of the construction industry in Thailand, and they listed the lack of material, incomplete drawings, inspection delays, incompetent supervisors, periods of instructions, the lack of tools and equipment, poor communication, poor site conditions, change of orders, poor site layout and rework, as factors influencing construction productivity.

Social factors also affect labour productivity, and it has been proven by Halwatura (2015) that staff motivation is facilitated in the form of medical care, payment of overtime, social work activities, job security, overtime payment, employees' canteen, sufficient

supervision, accommodation subsidy, good communication, and belongingness. These factors directly impact staff morale and staff motivation, which in turn also influence construction productivity.

Langford *et al.* (1995:80) state that labour makes up for 40% of the total construction costs, which indicates that the productivity of labour is very important due to this large percentage.

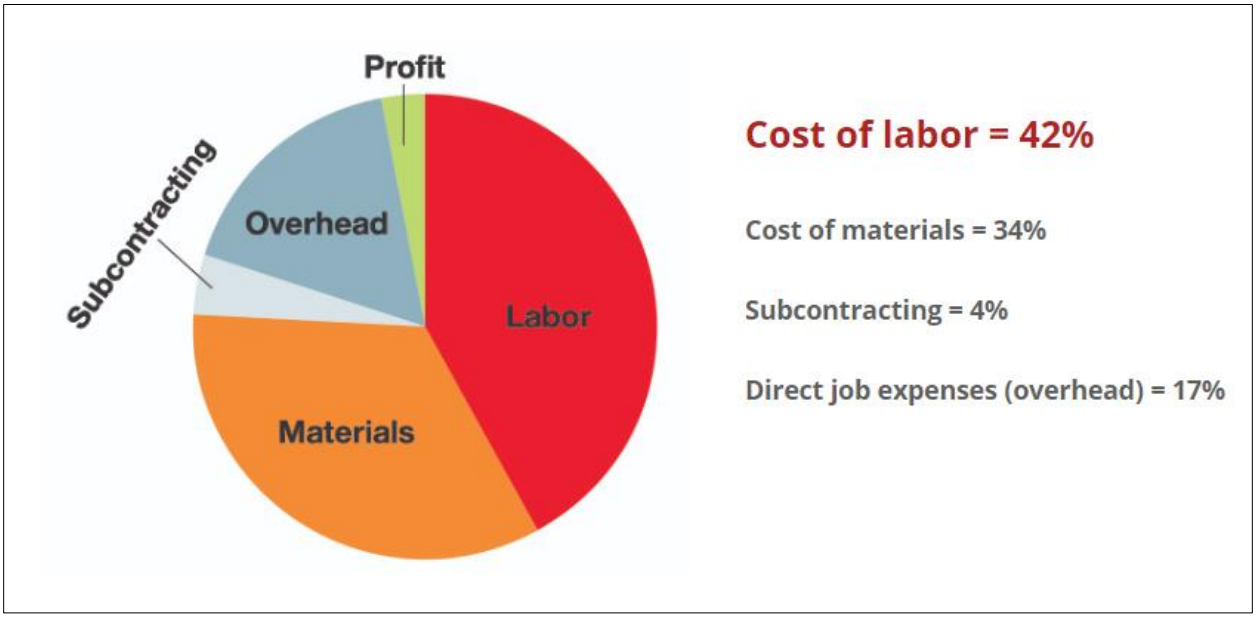

Figure 2.3: Illustration of the labour portion of electrical building cost

Source: (Springfield Electric Supply, 2019)

As labour costs make up such a significant amount of the total project costs, it is one of the main reasons why projects overrun their budgets.

Poor labour productivity will result in elements as per Intergraph (2012) in the visual illustration in figure 2.4.

Figure 2.4: Poor labour productivity will result in these elements

Source: (Intergraph, 2012)

Nektar (2019), as per figure 2.3, listed the main factors, which influence labour productivity as overtime being worked, moral and attitude, fatigue, trades conducted in confined spaces, joint and beneficial occupancy, adding work to planned sequences, absenteeism, mobilization, and demobilization at project sites, work errors and omissions, work suspension, reassignment of manpower, late team-assembly, inefficient team size, unplanned site access, project logistics, the effect of work changes, working in hazardous areas, season changes to daylight working hours, supervision changes, working on holidays, overstaffing, tool and equipment shortages, resource competition and unusual work schedules in remote areas.

2.2.3 Influence of effective project management on construction productivity

The PMBOK (2015:4) defines project management as:

> *"The application of knowledge, skills, tools, and techniques to project activities to meet the project requirements."*

The PMBOK identifies forty-seven (47) project management processes, which are grouped into ten (10) knowledge areas. The project processes and the knowledge areas provide a complete overview of project management's professional field (PMBOK, 2015:59).

The PMBOK identifies the ten (10) knowledge areas, which recognize the responsibilities of the project manager, namely project integration management, scope management; time management; cost management; quality management; human resource management; communications management; risk management; procurement management and stakeholder management (Heagney, 2016:19-22)

Rumane (2017:321) defines effective project management requirements as planning, measuring, evaluating, forecasting, and controlling all project parameters (quality, cost, time). These five processes are referred to as project management process groups and must all be implemented. Table 2.1 illustrate the interaction between the ten (10) knowledge areas and five (5) project management process groups.

Table 2.1: Basic interaction between the ten (10) knowledge areas and five (5) project management process groups

Knowledge Areas	Project Management Process Groups				
	Initiating Process Group	Planning Process Group	Executing Process Group	Monitoring and Controlling Process Group	Closing Process Group
4. Project Integration Management	4.1 Develop Project Charter	4.2 Develop Project Management Plan	4.3 Direct and Manage Project Work	4.4 Monitor and Control Project Work 4.5 Perform Integrated Change Control	4.6 Close Project or Phase
5. Project Scope Management		5.1 Plan Scope Management 5.2 Collect Requirements 5.3 Define Scope 5.4 Create WBS		5.5 Validate Scope 5.6 Control Scope	
6. Project Time Management		6.1 Plan Schedule Management 6.2 Define Activities 6.3 Sequence Activities 6.4 Estimate Activity Resources 6.5 Estimate Activity Durations 6.6 Develop Schedule		6.7 Control Schedule	
7. Project Cost Management		7.1 Plan Cost Management 7.2 Estimate Costs 7.3 Determine Budget		7.4 Control Costs	
8. Project Quality Management		8.1 Plan Quality Management	8.2 Perform Quality Assurance	8.3 Control Quality	
9. Project Human Resource Management		9.1 Plan Human Resource Management	9.2 Acquire Project Team 9.3 Develop Project Team 9.4 Manage Project Team		
10. Project Communications Management		10.1 Plan Communications Management	10.2 Manage Communications	10.3 Control Communications	
11. Project Risk Management		11.1 Plan Risk Management 11.2 Identify Risks 11.3 Perform Qualitative Risk Analysis 11.4 Perform Quantitative Risk Analysis 11.5 Plan Risk Responses		11.6 Control Risks	
12. Project Procurement Management		12.1 Plan Procurement Management	12.2 Conduct Procurements	12.3 Control Procurements	12.4 Close Procurements
13. Project Stakeholder Management	13.1 Identify Stakeholders	13.2 Plan Stakeholder Management	13.3 Manage Stakeholder Engagement	13.4 Control Stakeholder Engagement	

Source: PMBOK, 2015:60)

As per Table 2.1, the five (5) project management process groups can manage each of the knowledge areas. Project integration, for example, would include the development of

a project charter in the initiation phase; development of a project management plan in the planning phase; management of work in the execution phase; monitor and control work in the control/monitor phase and the development of a close-out report in the close-out phase. Each of the knowledge areas consists of deliverables in the form of activities directed by the project management process groups (Heagney, 2016:11).

Related activities, such as the scope management plan, construction program, human resource program, and resource program, to name a few, are communicated to the project team by the planning mechanism, including the activity type, required implementation method, and scheduled in the specific implementation order to ensure project objectives is met (Rumane, 2017:321).

Therefore, it can be qualified that effective project management of the ten (10) knowledge areas would support desirable construction productivity rates if the process groups are effectively implemented and controlled.

Kerzner (2017:3) identifies eight (8) potential benefits of effective project management namely, defined responsibilities of the deliverables of team members; minimal reporting requirements; time limits identified; identification of methodology for trade-off analysis; effective progress measurement; early problem identification; experience for estimating gained for future projects and without difficulty identifying the objectives which might not be reached or be exceeded.

Shehata and El-Gohary (2012:324) state that inefficient management of construction resources is one of the key contributors to low productivity. It is therefore critical that project team members familiarize themselves with the basic principles of effective project management. A study conducted by Professor John Adair suggested that a functional leader is an action-centered leader, which requires the leader to identify the task, build the team, and develop the individuals (Yemm, 2012:44).

Project management has to do with getting people to execute work, which is required to meet the project objectives (Heagney, 2016:27). The human factor in productivity would include construction workers or workforce and the rate at which they perform on-site to meet the project objectives. People are highly sensitive, easily discouraged, and highly

alert to poor leadership or indecision (Murray, 1980:2). Therefore, project managers should have strong technical backgrounds and people skills (Heagney, 2016:27).

For the project manager to implement effective project management, he or she needs the required specific skills, general management proficiencies, and the required knowledge, performance levels, and personal effectiveness (PMBOK, 2015:17).

2.3 IMPORTANT QUALITIES AND SKILLS FOR A PROJECT MANAGER

2.3.1 The importance of a qualified and skilled project manager

Project management in this study is focused on the project manager in the construction industry. Different projects have different levels of complexity. Each complexity level would require a specific set of skills to manage and deliver the project successfully. The complexity of a project, according to (Knipe et al., 2010:19), depending on the nature of the proposed work scope; the number of people involved; the number of resources available and required (time and capital), and the level of innovation (such as technology) involved. The project managers' skills must be matched with the project's complexity to prevent the loss of project control and project failure (Mouchi, Rotimi, and Ramachandra, 2011:89).

The project managers' role can be divided into two sections: the management and application of the primary project management functions as stipulated in the Project Management Book Of Knowledge (PMBOK) and the management and application of people, alternatively called human resource skills.

As set out in PMBOK and discussed in section 2.2.3, the primary skills are skills that can be taught and studied. Still, the people management skills are not always skills, which come naturally to project manager. Because all project's complexity differs, the project manager would have to be flexible in their human resource management approach.

Effective project management requires effective skills. The ten (10) knowledge areas of project management, as per section one (primary project management functions), are

widely discussed in textbooks and classrooms. Research has been conducted on people skills, such as the construction project manager as a communicator and leader, and the role of the project manager (Zulch, 2012; Burger, 2013; Cerff, 2015), but not a lot of research has been conducted to bring together the two defined section of skills. Because the project manager acts as the bonding medium, which holds a project and all its elements together (Zulch, 2014:175), it is important to provide a holistic overview of the skills required.

The inter-organizational structure and relationship with a client make the management of construction projects unique (Klippenberger, 2002:239). The project manager works in a hierarchy structure on-site whilst managing the project team. As illustrated in Figure 2.5, the project manager is not directly linked to the labour workforce but manages the workforce through the middle and lower level construction management.

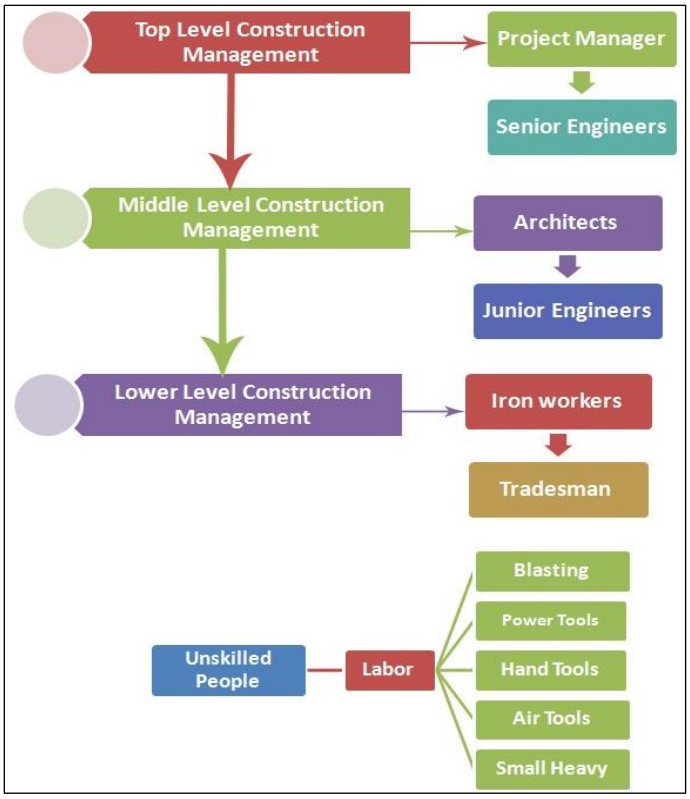

Figure 2.5: Typical construction project management hierarchy

Source: (Klippenberger, 2002:239)

As per Figure 2.5, the project manager indirectly controls construction productivity by using skills and implementing project management's primary principles. The project manager needs to manage and influence the middle management, who in their capacity then manage the lower level of management who would manage the construction labour, who is responsible for the physical activities delivered on the construction site.

The project manager in his role of the project leader and communicator would focus on team building and team development to ensure all projects do not walk the same path as the construction of the Sydney Opera House (Mouchi et al., 2011:89), which originally had a planned construction duration of four (4) years, but ended up only being completed after fourteen (14) years.

The project managers' role as a motivator will vary from project to project. (Langford et al., 1995:80) states that labour makes up for 40% of the total construction costs; thus, it can be noted that an increased level of productivity could lead to a reduction in the labour costs, which will have a saving effect on the total project cost. Therefore, it is important to ensure the project manager is comfortable with both the primary skills and people skills required to complete the project successfully.

2.3.2 The project manager as a leader

Leadership is defined as getting people to do something that you (Leader) believe should be done (Mouchi et al., 2011:91). Walker (2015:230) defines leadership as a way managers conduct themselves to get the best results from their managing people. Therefore, it is possible to state that "good people skills" is the primary skill expected from a project manager (Mouchi, 2011:91). This is because the tools and techniques defined by the PMBOK are necessary but not sufficient for project success (Heagney, 2016:175).

The project manager will use people skills to turn a group of people into a team. The project manager is a leader and has to get people effectively to follow their instructions (Mouchi et al., 2011:92).

There are many types of leadership styles. The project manager can apply these styles individually or use a selective combination to assess which styles the situation would

require (Zulch, 2014:174). Just as a chameleon would change its skin colour to adapt to its surroundings, just so must a project manager be able to adapt its leadership style to adapt to project circumstances (Heagney, 2016:189).

Better project leadership and efficient communication can be experienced if the project manager has an improved understanding of themselves and the project stakeholders (Heagney; 2016:186). Liikamaa (2015:683-685) developed a self-evaluation application for project managers consisting of thirty (30) personal competencies. The self-evaluation tool was tested on project managers, and the respondents had to evaluate themselves. Leadership was identified as the most important personal competency in a project manager (Liikamaa, 2015:685).

Management and leadership are not two different concepts. Walker (2015:231) defines management as "*working through others*." This creates the link that manages others into working toward a goal; some form of relevant leadership must be present.

2.3.2.1 Different types of leadership styles

Based on assessing the project environment or situation, the project manager may adopt a single leadership style or a combination depending on the most effective style (Zulch, 2014:173). Walker (2015:237) asserts this effort to be the key to successful leadership. The choice of project management leadership style must be based on both the company goals and workers as individuals Adrian (1987: 112), resulting in effective leadership.

The project manager manages and directs the lower levels of management by applying certain leadership qualities and styles, namely autocratic-, participative, democratic, and free-reign leadership, to name a few (Adrian, 1987:10). Each style has its own positive- and negative attributes, which directly affect construction productivity.

For this study, seven styles, namely autocratic, charismatic, transformational, laissez-faire, transactional, supportive, and democratic leadership, have been used. These styles could either be task-driven or people-driven (Walker, 2015:237).

Autocratic leadership is described as a leader who solicits very little input from their project team and prefers to make decisions by themselves (Walker, 2015:235). The

autocratic leader would have tight control over group activities and make all decisions without any input from the team (Klippenberger, 2002:16).

Charismatic leadership is described as the leader's' inspiration to the project team and the team seen as the leader's followers in an unequal relationship, which is very much like politicians (Walker, 2015:238). Walker (2015:238) describes this type of leader as an excellent communicator who can confidently describe aspirations and easily give inspirational speeches.

Transformational leadership is described as a leader who empowers followers by placing trust in followers and their skills, dedication, and commitment by challenging them to achieve a shared vision with the reward of a sense of involvement and achievement (Klippenberger, 2002:16).

Laissez-faire leadership is described as very low levels of participation by the leader in any form of activity (Klippenberger, 2002:16).

Transactional leadership is described as a relationship between the leader and the followers where responsibility is delegated. Clear goals and objectives are set, well communicated, and coordinated, and performance is rewarded in pay, bonuses, recognition, and praise (Klippenberger, 2002:94). Transactional leadership is focused on reward in the form of payment that differs from transformational leadership, rewarding in the sense of involvement and achievement.

Supportive leadership is described as a leader who takes into account the behavior and motivation of the followers by showing concerns for their needs and wants whilst offering rewards for performance, clear set goals, and objectives and removing obstacles that hinder performance (Klippenberger, 2002:92).

Democratic leadership is described as leadership, where group participation is emphasized, and the decisions would be based on the majority (Klippenberger, 2002:16).

The project manager will change the leadership style as the circumstances require. The project manager would be flexible in his approach (Heagney, 2016:188) because of the nature of the processes and the followers' maturity and organisational dependence

(Klippenberger, 2002:40). This type of leadership can be referred to as Situational Leadership and is illustrated in Figure 2.6.

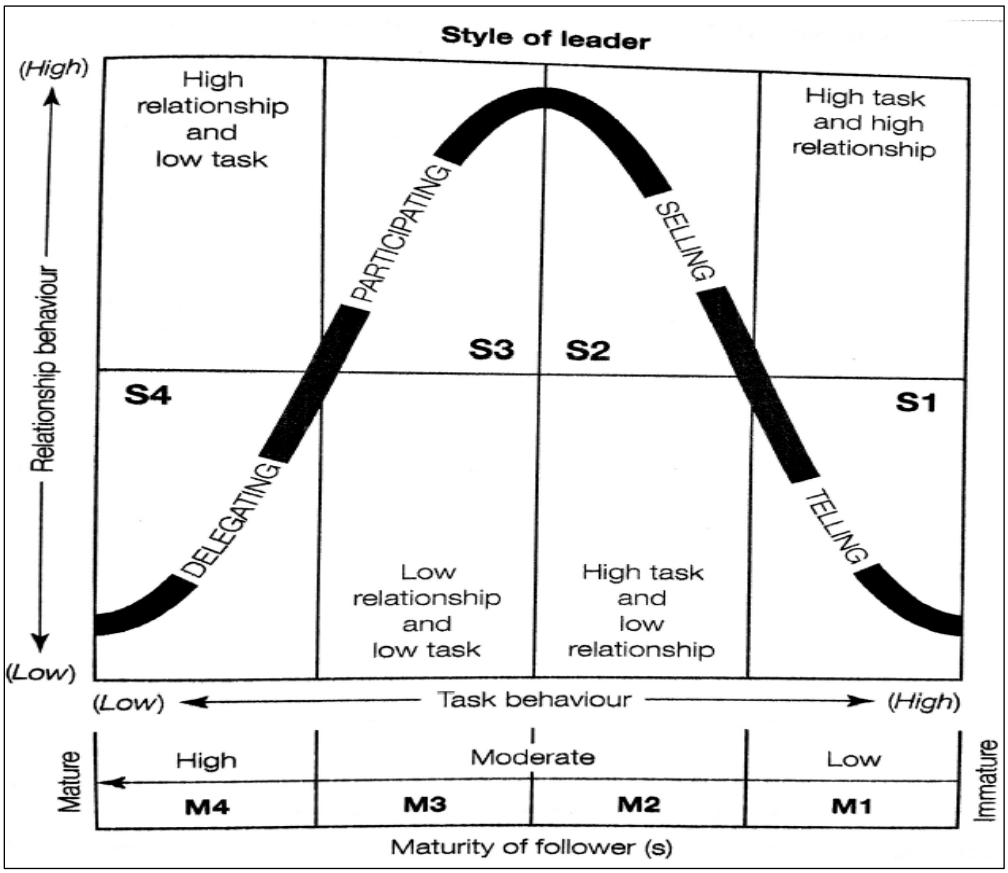

Figure 2.6: Situational leadership approach

Source: (Yemm, 2012:51)

The maturity levels of the followers (M1: Followers lack skill, self-confidence and knowledge to work on own; M2: Followers are willing to work on their own but don't have the skills to do so; M3: Followers are ready and willing to work on a task and have demonstrated such ability however still lack some confidence; M4: Followers are confident and skilled to complete the task and enjoy some degree of independance) would determine the relationship behaviors the project manager would adapt to, known as situational leadership.

Supposing that the followers have low maturity levels (M1), the leader would require high task and low relationship skills and tell or direct the followers what to do, resulting in clear guidelines and communication.

Supposing that the followers have low maturity levels (M2), the leader would require high task and high relationship skills and coach the followers on what to do, resulting in clear guidelines and communication. This line of communication consists of more discussion and interaction.

Supposing that the followers have low maturity levels (M3), the leader would let go of some control and require more input and suggestions from the follower.

Supposing that the followers have low maturity levels (M4), the leader would be delegating the tasks to the followers and only monitor the process with little discussion.

The Situational leadership style is an example of how the project manager would need to be flexible, especially when dealing with individual team members, allowing the project manager to select and adapt to the most effective style (Yamm, 2012:52).

Henry Ford (Andersen, 2013) once quoted that teamwork involves:

"Coming together is a beginning; keeping together is progress; working together is a success."

The study focuses on the project managers' skills and the effect they have on construction productivity. The project managers' ideal leadership type would depend on the project team members, their skills, maturity levels, capability, self-confidence, and how these elements work together.

2.3.3 The project manager as a communicator

Walker (2015:257) list persuasive ability; negotiation skills, commercial expertise, political awareness, breadth of vision, integrative skills, ability to set clear objectives, communication skills, meeting management; ability to recognise early warnings; diplomacy skills and skill of discriminating important information as important project manager skills.

Communication is defined as sharing information between individuals or groups to ensure team members reach a common understanding (Yemm, 2012:90). Communication forms part of the ten (10) areas of project management described in the PMBOK (2015:287)

and is seen as a system with inputs, tools, techniques, and outputs. The process of project communication must be planned, managed, and controlled. Andrew Comley, Chairman of the SAICE PMCD, states that for the successful completion of a project, a project manager must be able to plan, control and monitor and effectively communicate with all team members (Comley, 2018:38). The project managers' communication skills are challenged by the different forms of communication such as formal-, informal-, oral-written-- upward-, downward- and across communication (Cooper, 2004:58-71) involved in construction projects (Cooper, 2004).

The construction industry is labour-intensive and has a wide range of inputs from different organizations people. These inputs are communicated through interactions between parties and are, therefore, vital to be efficient and effective (Langford et al., 1995:144-145). Most communication in the construction industry happens downward, as the workforce onsite would communicate between team members and directly to a line manager. The workforce does not necessarily communicate directly to the client. In cases where the workforce has communicated directly to the client, proven financial rewards have been noted and should, therefore, be encouraged (Adrian, 1987:115-116).

2.3.3.1 Effective communication between the project team and stakeholders

David Packard (Covey, 2008:5) is the co-founder of the computing company Hewlett Packard and stated that *"Nothing beats personal, two-way communication for fostering cooperation and teamwork and for building an attitude of trust and understanding among employees."*

Another definition of communication would be to "be understood" and to "understand others" (Yemm, 2012:92). Communication is sometimes perceived as only conveying the information to the relevant party; however, communication is also experienced by the other end, which is the receiver. Listening skills are just as important as talking skills and can only be effective in four stages, namely to hear the message, to interpret the message, to evaluate the content of the message, and to have a reaction or no reaction (Yemm, 2012:102).

Liikamaa (2015:682) states that effective project managers are good communicators. Some factors in achieving good communication would involve the project manager to reflect an open attitude and behavior, communicate expectations, act proactively, communicate positively, and be an excellent listener (Yemm, 2012:94-95). Zulch (2014:177) indicates that seventy percent (70%) of communication between project teams and stakeholders is verbal communication, which is immediate and direct, as well as often misunderstood.

2.3.3.2 The influence of effective communication styles on construction productivity

Communication on the various project team levels can become an art, science, circus, or torment (Heagney, 2016:196). The project manager must ensure that effective communication is used in projects. When effective communication is not implemented, the results are visible in the project, not meeting deliverables, as the required information is not shared between the relevant parties.

Construction projects contain an extensive amount of information, which is communicated between the project team members. Campbell targeted five hundred (500) project managers and asked them to indicate what the biggest determining factors for project success and failure is and found that the projects with strong communication were the projects nearly always successful (Campbell, G.N., 2009:xiii).

Therefore, communication forms part of the leadership, which a project manager would adapt to to execute and manage projects (Zulch, 2014:173). The project manager would ultimately give in to “walk the talk” (Heagney, 2016:190) by setting an example for effective communication between team members and stakeholders, which would result in the establishment of consistent working relationships.

2.4 THEORIES AND TOOLS AVAILABLE FOR THE PROJECT MANAGER TO MANAGE CONSTRUCTION PRODUCTIVITY

2.4.1 Productivity improvement programs

There are many existing studies providing methods to measure construction productivity (quantitative studies) (Hedaoo & Shinde, 2017:1170), studies which indicate key performance indicators of productivity (Akintye & Takim, 2002:546-547) and studies providing the parameters, which influence construction productivity (Hedaoo & Shinde, 2017:1171; Koelmans, 2004:231-232).

Pan and Zhan (2020:2) studied productivity enhancement strategies and defined the total factor of productivity as a measure in which the efficient use of resources, namely labour capital and materials, is exerted to produce an output.

Bierman, Marnewick, and Pretorius (2016:38) identify three levels of productivity, namely the ideal productivity level, the obtainable productivity level, and the actual productivity level. The aim should be to improve the actual productivity and not the ideal or realistic productivity levels.

The complexity and objectives of projects differ. Objectives in terms of desired productivity would also differ. Because of the human factors involved in projects and the different motivation factors involved in each of these individuals, the project manager would be flexible in an attempt to increase productivity to the ideal productivity levels.

The below theories and tools available to improve productivity can be implemented as per the project managers' preference.

2.4.2 Motivation theories

Many theories have been developed as to what motivates working humans, namely Maslow Theory, Herberg's motivation, and the McGreggor Theory X and Y.

2.4.2.1 Maslow's theory, Douglas McGreggor motivation theory X and Y and Herzberg's motivation

Maslow developed a needs-based theory in which he reflected a hierarchy of the five levels of need, namely basic and psychological need, safety and security need; need to belong (three lower levels), need for esteem and ego, and the need for self-actualization (two higher levels) (Yemm, 2012:109). This hierarchy would move a level from the bottom upwards, based on the satisfaction of a need. The higher the level moved, the higher level of satisfaction is experienced. The higher the level of satisfaction a team member experience, the better the rate of productivity will be.

In the 1950s -1960s, Douglas McGreggor developed two different assumption theories namely: Theory X and Y.

Table 2.2: Douglas McGreggor motivation theory X and Y

	Theory X	**Theory Y**
Human mind-set	- Inherent dislike for work, which the human wants to avoid if possible.	- Assumes the average human does not inherently dislike doing work. People are committed to the objectives of work.
Why the human works	- Human beings work to satisfy needs, which include physical needs regarding safety and security.	- Humans get external and internal satisfaction from doing work. If a manager can satisfy these needs, the human will have work satisfaction and thus be productive.
Human responsibility	- People shun responsibility, have little ambition, and want a high level of security.	- People can learn to accept responsibility and can creatively solve work objectives.
Management's approach to	- Strong leadership where the manager has the	- Management helps workers align personal objectives with

motivating the human being	responsibility and directs the individual worker. - Manage worker by a positive or negative pressurized approach.	company objectives, resulting in maintaining high productivity levels.
Motivate the human being	- With a positive pressure approach, offer the worker extra pay. - A negative pressure approach threatens the worker with punishment.	- Encourage workers to develop and use their creativity, knowledge, and skills to reach company objectives.

Source: (Adrian, 1987:118-119)

In the modern economic world, the working environment tends to be more Theory Y focused than Theory X, where workers are motivated by encouraging them to further develop their skills, knowledge, and creativity, which in it turn, help them to reach align company objectives whilst aligning personal objectives thereto, having a positive effect on productivity as illustrated in Table 2.2 (Adrian, 1987:118-119).

Langford et al. (1995:82) also mention this theory and describes Theory Y, where the workers have a higher order of needs such as social esteem and self-actualization, and the work comes naturally. McGreggor believed that managers who used the Theory Y approach had much more success in motivating their staff than those using the pressure approach in Theory X. Cooper (2004:33) summarise the essence of motivation as a way to sustain the motivational and managerial approach, which would help to develop and upheld employee commitment.

The Herzberg theory is a two-factor theory which was the outcome of a study based on the factors which lead to extreme dissatisfaction and extreme satisfaction in the workplace (Yemm, 2012:110).

Motivators that led to satisfaction included achievement, recognition, work itself, responsibility, advancement, and growth (Yemm, 2012:110). This would include the way the project manager treats the project team and stakeholders. Yemm (2012:112)

identified three motivators, namely, autonomy, which includes the freedom the team member experience, mastery, which includes the engagement the project manager has with the team members; and purpose, which would consist of the purpose each team member feel they have in the project team (Yemm, 2012:112). Other motivation factors would consist of giving team members the recognition they deserve and rewarding team members when due.

Hygiene factors (named as to factors which cause disease or illness) refer to the lower three levels of the Maslow hierarchy, would cause dissatisfaction and include company policy, work conditions, security, relationship with colleagues and boss, salary and supervision (Yemm, 2012:110). It is challenging for the project manager to work on these types of factors. The project manager can focus on creating an environment in which the project team would feel motivated.

2.4.3 Tools and techniques project managers can use to increase productivity

Technology has increased productivity across all sectors, such as the gas and oil sector, however, many construction companies are still hesitant to invest in the technological expense (Frinault, 2018:1).

The use of technology-driven machinery is used during the manufacturing of materials but not widely used during construction implementation. Olomolaiye, Jayawardane, and Harris (1998:251) state that automated devices with driverless cabs have been used, but due to each construction project's uniqueness, it cannot be set to standard therefore not popularly used, especially in the South African-built environment.

However, the South African industry has planning tools in the form of automated resource systems that optimize material delivery patterns through project planning software (Olomolaiye, Jayawardane & Harris, 1998:251).

By identifying project management as the main factor influencing productivity, Peter Landau (2017) defined three relatively easy ways in which a project manager can increase productivity by creating a system of managing and tracking tasks, using

technology as a simple tool to help improve productivity, and removing all distractions which hinder the moving forward of project processes or which clutter the environment in which the system operates.

Langmade (2019) added to the ways to increase construction productivity, namely the use of previous similar project data for identifying productivity weaknesses and strengths; the use of supervisors with sufficient training and work experience; the increase in the use of prefabricated materials; making use of more direct negotiation and shorter, team-friendly contracts; the improvement and provision of safety training; and improved communication.

The above is not a one size fits all, but a basic step, which could improve productivity on-site. Deeper thought and action can also be taken to increase efficient labour, material, and equipment utilization.

Hall (2019:149) quotes an African proverb by stating, "*if you want to go quickly, go alone. If you want to go far, go together."* The project team and how the individuals operate as members of the team have a major impact on productivity. The project manager, as a leader, can therefore, also focus on team building and development.

2.4.3.1 Team Building

Team building is designed to bring together the project-specific stakeholders for the best possible project outcome (Shan *et al.,* 2011:306). Building an effective project team where members are committed and involved should be the project manager's intention from the first day the team exists (Heagney, 2016:176).

Katzenbach and Smith (1993) define a team as several people committed to a common goal with complementary skills and who hold themselves accountable for reaching the objectives.

The team should be selected because they are the best people for the positions, considering their skills and experience, not because they are the only available people (Heagney, 2016:178).

The projects which had team building involved throughout the planning, design, and construction phases had better productivity levels than projects that did not involve team building throughout these phases (Shan *et al.,* 2011:311).

2.4.3.2 Team Development

Good leaders have the ability to bring the characteristics out of their team by using a variety of means (Yemm, 2016:114). There are many ways leaders can develop, encourage, and support team members, which would increase productivity. Many believe that over-working would increase productivity; however, research proved the opposite (Hall, 2019:14).

One of the most common ways a leader can develop their team members is through coaching. Coaching inspires team members to maximize their potential in a thought-provoking and creative process (Hall, 2019:3). Yemm (2012:115) defines coaching as an art, which facilitates the performance, development, and learning of others.

The project manager coaches the team during everyday tasks by observing the team members performing their duties and offering advice and guidance. Team members' confidence, performance, and productivity levels have increased (Hall, 2019:19) by the project manager implementing coaching as a team development mechanism. Team development can also be promoted in other forms.

Heagney (2016:181) defines four (4) stages of team development as forming, storming, norming, and performing. In the forming stage, team members are worried about their position in the team. In the storming phase, team members question their goals and objectives. In the norming phase, team members begin to settle and accept their positions and obligations in the project team. In the performing stage, the team members get along well, share the same objectives, and enjoy working together towards a shared goal.

Heagney (2016:185) provides five (5) rules for developing commitment in a team, namely the team members must interact frequently; each member's individual needs must be met by team participation; all members must know why the project is important; all members

of the team must share the same goal, and keep competition inside the team to a minimum.

2.5 CONCLUDING REMARKS

The South African economy, especially the construction industry, is unstable and faces many challenges in the current market condition. Many companies are defining ways in which they could maximize the profitability of proposed projects. Productivity is a determining factor of every company's success and competitiveness (Enshassi et al., 2013:175) and a determining factor for companies' survival (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016:29).

Shehata and El-Gohary (2012:324) state that the construction industry's main difficulties are a declining rate of productivity and a lack of productivity standards. The project manager can influence the internal factors affecting construction productivity positively.

Effective implementation of project management is divided into two sections: the management and application of the primary project management functions, as stipulated in the PMBOK (2015:60), and the management and application of people skills.

The primary skills of project management are described in the PMBOK and would include the ten (10) knowledge areas of project management (PMBOK, 2015:60) implemented in the five (5) process groups (PMBOK, 2015:51). Many textbooks are exploring these aspects of project management.

The project manager fulfills the role of project leader, communicator, and motivator. A project manager's experience in these areas is essential as dealing with the human factor is unpredictable. Walker (2015:231) defines management as *"working through others,"* which is similar to what is required from the project manager as a leader. The research is based on seven (7) different leadership styles: autocratic, charismatic, transformational, laissez-faire, transactional, supportive, and democratic. The project manager needs to be flexible in his leadership approach (Heagney, 2016:188) and adapt the style as to the situational requirements, which would be named situational leadership (Yamm, 2012:52).

The project manager also needs to use effective communication when managing the project team. Yemm (2012:90) defines communication as the sharing of information between individuals in a group to ensure the team members reach a common understanding. Later Yemm (2012:92) describes effective communication as to *"be understood"* and to *"understand others".* This indicates that effective communication requires the project manager to talk and apply listening skills to ensure the team members' needs and requirements are understood. Zulch (2014:173), therefore, states that communication forms part of leadership. There are many theories and tools studied and tested while attempting to understand which factors would increase productivity from actuals levels to ideal levels (Bierman *et al.,* 2016:38).

Motivation theories, such as Maslow's needs-based theory, indicate that the higher the level of need is satisfied, the better its productivity levels. In Douglas McGreggor's theory X and Y, theory X indicates that the working trends could either inherent a dislike for work and only works to satisfy physical needs, such as safety and security, does not like responsibility and the manager would motivate the worker offering extra pay or threatens with a punishment. Theory Y indicates that the working human being does not dislike work and is committed to the work objectives, gets internal and external satisfaction from performing work obligations, learns to accept responsibility, the manager assists workers to align personal and company objectives to maintain high productivity levels and encourage workers to use creativity, knowledge, and skills. Herzberger's theory is based on the human being either extremely satisfied, due to motivation factors, such as achievement and recognition, or extremely dissatisfied, due to hygiene factors, due to company policy, work conditions, relationships with colleagues' salary, and supervision (Yemm, 2012:110-112).

There are many tools and techniques, which project managers may utilize to increase productivity levels. Technology has proven to increase productivity across all sectors. Hall (2019:149) quotes an African proverb by stating, "*if you want to go quickly, go alone. If you want to go far, go together."* The methods proposed in the study to increase productivity include teambuilding and team development. Team building would include building an effective project team where the team members are committed by holding

themselves accountable, as well as sharing a common goal with the relevant skills. Team development would include how the project manager, as a leader, choose to develop and support the team members to reach their full potential.

The next chapter discusses the research design and methodology used in the study to ensure the research objectives are met, and the findings formulated.

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

The Australian Government Department of Innovation, Industry, Science, and Research (2011:7-8) defines research as creating new knowledge and the use of existing knowledge in a new and creative way to generate new concepts, methodologies, and understanding. This definition identifies two areas, namely new knowledge and existing knowledge. New knowledge would include the findings after the research has been concluded, and the existing knowledge would include the literature being used in the study in the form of primary and secondary resources.

Chellan (2004) defines research as an organized and systematic method of finding answers to questions. Naoum (2007:2) states that a research project needs to have an aim and objective. This indicates that there has to be an end goal for the research to be conducted. The researcher would then work out a plan, which would require systematic implementation and control.

Naoum (2007:2) defines research as a careful search or inquiry to discover new or put together old facts. The study was designed into two sections, namely the literature study and the empirical study. The literature study is a study of existing facts. A problem statement was formulated based on a problem, which was experienced by the researcher on construction projects. The research strategy was formed to confirm a hypothesis with research-clear objectives.

The researcher based the literature research on books, journals, and other publications and decided to use quantitative data collection, based on structured questionnaires issued to a selective group of respondents.

To ensure the outcomes of the study support the hypothesis, the literature was studied and interpreted, which was followed by the empirical study to test the theories.

3.2 RESEARCH PARADIGM

A paradigm is defined by Rehman and Alharthi (2016:51) as a basic belief system and theoretical framework, consisting of four components, namely ontology, epistemology, methodology, and methods.

The paradigm used by the researcher in this study is positivism. Positivism is based on three principles; namely, the social world is viewed objectively; value-free research; and the researcher is an objective analyst (Blumberg *et al.,* 2014:16). The researcher is guided in the study by taking an objective view and reasoning objectively.

Kivunya and Kuyini (2017:27) define ontology as a philosophy based on assumptions made, which causes people to believe that certain facts and information are real, and epistemology as how people get to know the reality, nature, and forms of knowledge. The knowledge to be developed through this study is based on the project managers' influence on construction productivity.

The methodology is defined as a theoretically informed approach of data production techniques and includes the research methods (Rehman & Alharthi, 2016:52). The methodology designed for this study is focused on the hypothesis and objectives identified in the first chapter. The choice of positivism implies that the social world would be observed by collecting objective facts and consists of simple elements to which it can be reduced (Blumberg *et al.,* 2014:16).

3.3 RESEARCH METHODS

The research paradigm and objectives determine the research methodology chosen for a study. The type of research methodology used is determined by the type of data required for the research. There are two types of research studies, namely, qualitative and quantitative studies. Unfortunately, there are no direct guidelines to help a researcher choose between the two types of research studies (Blumberg *et al.,* 2014:149). Two researchers with the same objectives would not necessarily choose the same research methodology. The methodology used would be determined by the researcher's personal choice.

3.3.1 Qualitative Approach

The use of a qualitative research approach entails experiences and meaning, described in a subjective nature and can be divided into exploratory and attitudinal categories (Naoum, 2007:40).

Exploratory research is used when the researcher has limited knowledge regarding the proposed topic and would use the data collected from the research study to create a clear and precise problem statement, and attitudinal research is a subjective research method used to study another person's opinions and perceptions regarding a specific object or subject (Naoum, 2007:40-41).

3.3.2 Quantitative Approach

The quantitative research approach tests a hypothesis or theory to determine whether the hypothesis is true (Naoum, 2007:37-38). A hypothesis is a tentative proposition, which would be tested and verified through the research study (Naoum, 2007:16). This study's research method is based on a hypothesis, which was formulated and tested through a quantitative research approach.

The data used in this quantitative research in this study is reliable and not abstract and is used, based on the hypothesis and objectives, which are used to verify the theories surrounding the factors influencing construction productivity, as stipulated in chapter one. The quantitative research method offers an objective research method, which is well suited for verifying the theories on which this study is based.

Below Table 3.1 shows the main differences between qualitative and quantitative research methods.

Table 3.1: Main differences between qualitative- and quantitative research methods

	Qualitative	***Quantitative***
Role	Attitude measurement based on opinions and perception measurement	Fact-finding based on evidence of records

Relationship between researcher and subject	Close	Distant
Scope of findings	Idiographic	Nomothetic
Relationship between theory and research	Emergent / development	Testing / confirmation
Nature of data	Rich and deep	Hard and reliable

Source: (Naoum, 2007:43)

As mentioned in the previous section, the differences between qualitative and quantitative research are evident. However, the researcher still selected it and based on the type of objectives identified for the purpose of the study.

The quantitative research method is relevant to this study, as the data used are facts and based on hard and reliable data provided by the selected respondents. The theories are tested with the results of confirmation of the proposed hypothesis. The researcher remains objective and distant to the study conducted, as the questionnaire is structured and questions closed-ended. The primary data are collected through the structured questionnaires issued to the selected construction professionals. The secondary data are collected from various journals, books, articles, websites, and media and contains information regarding the project managers' skills affecting construction productivity.

3.4 POPULATION AND SAMPLING METHODS

3.4.1 Population

The empirical study's target population will be South African construction professionals, such as project managers, construction consultants, labour-only subcontractors, general subcontractors, and specialized subcontractors. The participants will require a minimum of three years' experience in the construction industry, based in South Africa and will be contacted through established working connections.

3.4.2 Sampling Method

A stratified sampling method is used to select a group of respondents relevant to the field of research and would not negatively affect the integrity of the study. Representative

sampling is mainly used in quantitative research. Blumberg et al. (2014:174) give four reasons why sampling is used, namely lower cost, greater accuracy of results, greater data collection speed, and limited population elements.

A good sample delivers accurate research results, which are reliable and have integrity. A good sample would also be precise and contain as little as possible elements of error.

This study's sampling selection will be based on construction professionals, such as project managers, quantity surveyors, engineers, managers, contract managers, subcontractors, and other construction professionals who are actively working, with a minimum of three years' experience in the construction industry of South Africa. The selected respondents would represent the targeted population and would determine the integrity of the research results.

3.5 DATA COLLECTION INSTRUMENTS AND PROCEDURES

The researcher followed a structured program with gathering the data of the study. A list of proposed respondents who fall within the criteria of the required sample was put together. Their contact details were also added to the list. Once the approval to proceed with the research was granted, the respondents were contacted through email and were issued the consent form along with the structured questionnaire. The researcher created a survey monkey account, which assisted with the electronic completion of the surveys by allowing the participants to do the survey on any electronic advice within the Covid-19 social distancing regulations and saving the researcher potential time and cost of travel expenses. The respondents were issued with the researcher's contact details and could at any time contact the researcher for assistance and clarification.

The survey consisted of two sections, namely Section A – Demographic information and Section B – The perception of the project managers' skills on construction productivity. Section A consisted of nine (9) questions, and Section B consisted of seven (7) questions. The demographic questions were provided to ensure the participants' involvement does not affect the study's level of integrity. Questions in Section A requested the participant to provide information such as the type of firm and the size of the firm at which the

participant is employed; the year in which the firm was established; the role of the participant in the firm; the age and gender of the participant; the years of experience the participant has in the construction industry, and the qualification and professional registration which the participant has obtained. The questions listed in Section B related to the research questions listed in chapter one of this study.

Two (2) test runs of the questionnaires were done in early August 2020 to ensure that the survey is accessible and the questionnaires simplified, allowing the participants the minimum completion time. The methods of the selection of answers used in the first test run were changed to a more simplified structure, which reduced the completion time of the survey from sixteen (16) minutes to eleven (11) minutes. The questionnaires were issued to the respondents from August 2020 to October 2020, after which the researcher started with the coding of the data.

3.6 DATA COLLECTION TOOL OR TECHNIQUES

Blumberg *et al.* (2014:204) describe the collection of data used for research along three dimensions, as reflected in Table 3.1 below:

Table 3.2:Three dimensions of data collection

DIMENSION	SUBSECTION	DESCRIPTION
Dimension 1:	Primary Data	Determine whether data are collected for a current study;
Type of data being used	Secondary Data	Or whether previously collected data are used
Dimension 2:	Qualitative Data	Attitude measurement based on opinions and perception measurement
What kind of data is collected	Quantitative Data	Fact-finding based on evidence of records
Dimension 3:	Communication Approach	The researcher asks questions via surveys or interviews
The method used for data collection	Observation Approach	The researcher observes events and records what is seen

Source: (Own Contribution:2020)

The above Table 3.2 reflects the three dimensions, which must be defined by the researcher in order for the data selection tool to be identified. The researcher will

determine whether primary or secondary data will be used in a study. In this study, the researcher used primary data, which are collected using the survey. Secondary data are used in the literature review. In the second dimension, as discussed in the previous section, the researcher will decide between qualitative and quantitative data being collected. The researcher in this study used quantitative data in the form of survey responses or questionnaire answers. The third dimension indicates that the researcher will decide on the method used for the data collection, and it could be either in the form of the communication approach or observation approach. The researcher used the communication approach in the form of a survey with close-ended questions issued to participants.

Each of the participants received the survey with questionnaires independently and had an opportunity to complete it at his or her own time. The questionnaires could have been presented to the participants via email, interview (phone or one-on-one), hand delivery, or internet assisted. The researcher used an internet application named Survey Monkey to issue the consent forms and questionnaires. A communication approach is a versatile approach (Blumberg *et al.,* 2014:206) and, when used in quantitative data collection, provides reliable and efficient results. The survey data collection method by use of the questionnaires provided the primary data for this study.

One of the main benefits of using secondary data would be the time and cost-saving element and the high quality of such data (Blumberg *et al.,* 2014:265).

The secondary data used in the study are the data collected from the literature review. As seen in the Table 3.2 above, data could have been used as primary data in previous studies. Such data are extracted from sources, which would include journals, other thesis publications, government publications, textbooks, and articles.

3.7 DATA ANALYSIS TECHNIQUES

Quantitative research is used in this study to test whether the hypothesis is true (Naoum, 2007:37-38). The hypothesis is a tentative proposition being tested and verified through the research study (Naoum, 2007:16). Once the questionnaire data have been received,

the data will be coded, measured and categorized from most important to least important project management skills, leadership styles, factors influencing productivity and leadership style, which would improve productivity and preferred leadership styles.

A quantitative analysis is used, which produced the primary data used in the study. A descriptive statistics method is used to analyze the results in the form of frequency distribution in Tables (Naoum, 2007:103). The data, as collected in the questionnaires, are tabulated for the interpretation of the findings. A frequency data interpretation tool is used for the questions where two or three answers are required to be selected. A weighted factor interpretation tool is used for the questions that required items to be listed from most likely to least likely.

3.8 DATA PRESENTATION

The data captured in the study through the quantitative study using the questionnaires are coded, analysed, and presented in Table and chart format.

3.9 VALIDITY AND RELIABILITY OF DATA

Researchers always aim for the data delivered through their study to be reliable and valid. The data delivered through the empirical study by means of a quantitative study are based on a structured set of questionnaires. The questionnaire directly addresses the objectives and research questions, as discussed in chapter one (1) of this study.

The questionnaire was issued to the study leader, where after the researcher made the necessary adjustments to ensure the questions listed are valid and relevant. Section-A – The questionnaire's demographic information is also a measure used to ensure that the participants fall within the sampling group required for this study, namely construction professionals, such as project managers, construction consultants, labour-only subcontractors, general subcontractors, and specialized subcontractors. Ensuring the participants are relevant to the study guarantees the data created through the study to be relevant and reliable.

Blumberg et al. (2014:129) state that should a study have a sponsor (client), the sponsor has the right to quality research, including providing a research design appropriate to the research questions and using data handling reporting techniques appropriate for the data collected.

The data used for the purpose of this study cannot be used for the purpose of any other study or at any later stage. Should the data be used for any other purpose, but this study, the proposed study's data would be invalid and could also be unlawful in terms of ethical guidelines, as discussed in the next section.

3.10 ETHICAL CONSIDERATIONS

Obtaining Ethical Clearance before the study's research is conducted is a requirement in all research conducted at the University of the Free State. Ethical Clearance serves many institutional goals. It ensures that measures are in place to protect the research participants' interest and assesses and prevents any institutional risk related to the study. The process to obtain Ethical Clearance allows the identification of deficiencies, which could affect the integrity of the study and provides an opportunity for the researcher to do the required corrections before the research is conducted. Thus, by obtaining Ethical Clearance, the research process is strengthened.

Blumberg *et al.* (2014:121) define ethics as the study of the 'right behavior' and requires research to be conducted responsibly and morally.

Mounton (2014:238) identifies four areas to which the researcher has ethical obligations, namely relationship with the practice of science; relationship to society; relationship to the subjects of science, and the relationship to the environment.

The relationship to the practice of science is the epistemic imperative of science, which refers to the moral commitment researchers have when searching for knowledge and the truth (Mounton, 2014:239).

The relationship to society refers to the essential principle between research and society, namely accountability (Mounton, 2014:241). Researchers must ensure their studies are conducted in a socially responsible manner.

The relationship to the subjects of science refers to the respondents used in the study. The Respondent's basic and human rights must always be protected during a study, such as the rights to privacy, confidentiality, full disclosure, and the right not to be harmed in any way (Mounton, 2014:243-245). Ethical treatment of respondents would require for the researcher to protect the right of the respondents by the following three guidelines, namely explaining the benefits of the study and the Respondents rights and protection to the participants and to obtain the informed consent from the participants (Blumberg *et al.,* 2014:129).

This purpose of the study and all relevant information, such as the purpose of the study, the researcher's information, ethical approval reference numbers, the required participation and benefits thereof, any anticipated inconvenience and participation incentives, must be disclosed with the participants before the study is completed. The participants would need to complete a consent form to be able to participate in a study. The relationship to the environment refers to the researcher's responsibility to ensure the study does not harm or affect the environment in any way.

The above guidelines need to be considered in any research being conducted. For the purpose of this study, ethical approvals are issued, and all participants would be required to sign a copy of an informed consent agreement before the questionnaires are completed. The respondents have the right not to part-take in the research and could at any time, before the questionnaires are completed and submitted, withdraw from the study. The following ethical considerations will be provided for in the study, namely the background and purpose of this study will be communicated to all participants before the questionnaires will be completed; all participants will be voluntarily used and able to withdraw from the study any time before the final submission of the questionnaire; the respondents gave the information in the study will solely be used for the purpose of this study; the parties with the relevant experience in the construction industry and project management will be engaged with; hard copies will be destroyed after the research is completed; the participants' details and their responses will be kept private and anonymous to ensure the Respondents right to privacy is always protected; all ethical

considerations would be provided for, and ethical clearance from the University of the Free State would be granted before the study is conducted.

3.11 CONCLUDING REMARKS

This chapter discusses the research methodology used to successfully complete the study. The research approach is based on a quantitative approach, based on the structured questionnaires issued to participants. The participants who were sampled for the study included project managers, quantity surveyors, engineers, managers, contract managers, subcontractors, and other construction professionals, with a minimum of three (3) years of working experience in the construction industry. The results of the questionnaires delivered the primary data used in the empirical study. The literature reviews used secondary resources in journals, articles, textbooks, governmental publications, and web sources. The results were analyzed and assessed, and presented in Tables and charts. Results were compared to the literature study to test whether the hypothesis is correct. The study leader will also review the results of the study to ensure they are reliable and valid. The following chapter will include the analyses and presentation of the results.

CHAPTER FOUR: RESULTS PRESENTATION AND ANALYSIS

4.1 INTRODUCTION

The previous chapter discussed the different research methodologies and identified the methodology on which this study was based on. This chapter will present and analyze the findings of the empirical study, which was based on a quantitative research approach. The primary data used in this study were sourced from a structured questionnaire issued to selected respondents in the South African construction industry.

The objectives of this study (outlined in chapter one) included: identifying the project management skills which influence construction productivity; determining how the project managers' skills, leadership style, knowledge, and experience influence the human factor of construction productivity and to identify the tools available for the project managers to improve construction productivity effectively. The data which were obtained from the respondents used in the empirical study are analyzed and presented in the form of Tables and illustrations in this chapter. The analyzed data will address the research questions and objectives named in chapter one.

4.2 RESPONSE RATE

The research required a minimum of seventy (70) respondents. Hundred and seventy (170) respondents were invited to partake in the study, of which sixty-two (62) successfully completed the survey. This results in a thirty-six percent (36%) response rate. The respondents were all purposefully selected based on their positions in the construction industry as construction individuals acting in project managers' capacity, quantity surveyors, contract managers, material suppliers, subcontract professionals, and engineers.

4.3 THE STRUCTURE OF THE INTERVIEW QUESTIONS

A structured questionnaire is used to collect the data required for the empirical study. The questionnaire is structured into two sections, namely Section A: Demographic Information and Section B: Questions addressing the effect the project managers' skills have on construction productivity. Section A consists of nine (9) closed-ended questions, and Section B consists of six (6) closed-ended questions and one open-ended question based on a specific answer. The next topic will present the responses received from the research questionnaires.

4.4 PRESENTATION AND ANALYSIS OF THE FINDINGS

4.4.1 Respondents characteristics and demographics

Section A of the questionnaire pertains to the Respondent's characteristics and demographics. The researcher can confirm whether the respondent falls within the targeted population by determining the Respondents demographical and characteristic information.

When the number of targeted population is big enough, the researcher could also differentiate the responses of a questionnaire into the different demographical groups.

The listed questions under Section A – Demographic Information are based on the type and size of the firm the respondent is working for; the age (years) of the firm; the Respondents role in the firm; the age of the respondent; the number of experience the respondent has in years; the professional qualifications and professional registration the respondent has obtained. The response to these questions has been analysed and presented below.

4.4.2 Type of firm at which the respondent is employed

The respondents were asked to indicate which type of firm they are employed at. This question is significant because many different construction industry professions would

include professions on the contractor's or consultant's side. The question confirms that the sampling method is correctly implemented to ensure the respondents who are partaking in the study would provide reliable data. Figure 4.1 portrays the percentage of respondents working for construction firms, consulting firms, and other types of firms. Henceforth, figure 4.1 shows that 74.19% of the respondents are employed in construction firms, 11.29 % of the respondents are employed at consulting firms, and 14.52 % of the respondents are employed at other firms such as Mechanical, EPC firms, and Higher Education Institutes.

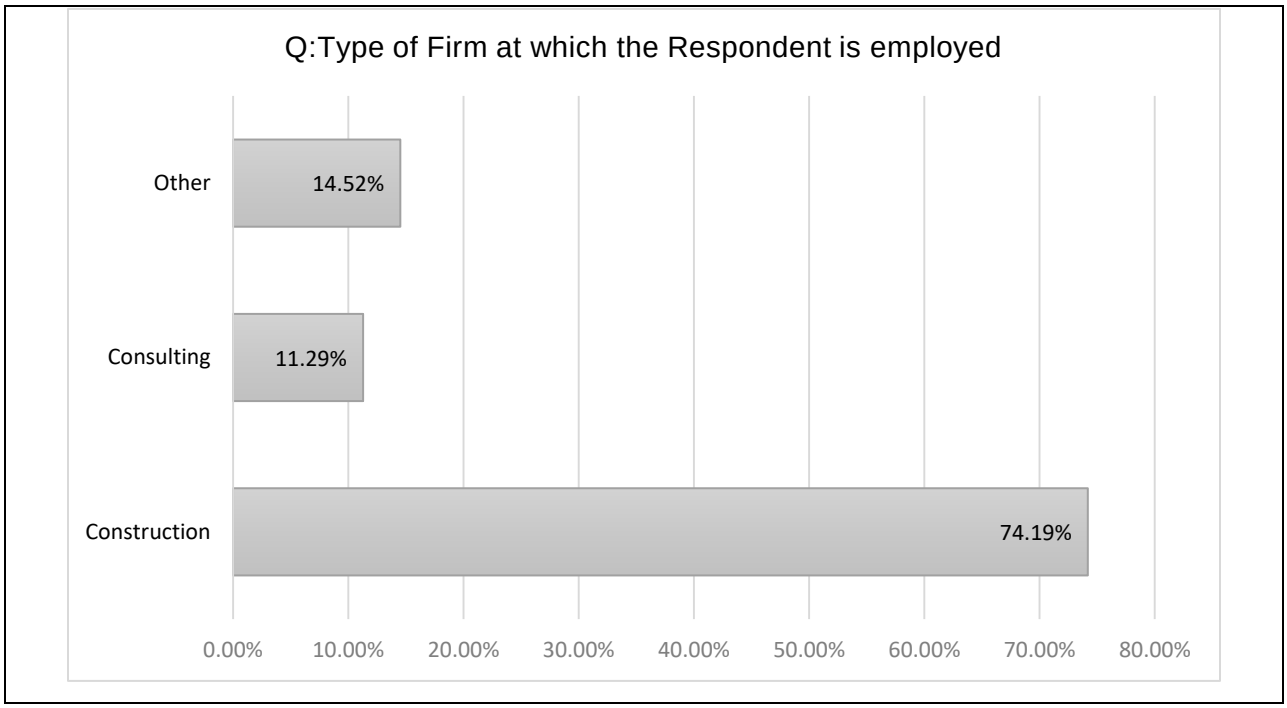

Figure 4.1: Type of firm at which the respondent is employed

Thus, as reflected in figure 4.1, most of the respondents (74.19%) are working for construction firms. The study requires respondents to answer questions relating to construction productivity on projects. Both construction and consulting employees are involved in the execution of such projects, which indicates that the sampling group is applicable and would contribute to the reliability and accuracy of the primary data used in the study.

4.4.3 Size of the firm at which the respondent is employed

The respondents were asked to indicate the firm's size at which they are employed. This question is significant, as the firm's size would indicate the Respondents project exposure, especially respondents working for construction firms. Large and international construction firms would have experience in complex and high-value projects compared to small and medium firms.

Table 4.1 indicates that 19.35% of the respondents work for small firms, 30.65 % work for medium firms, 40.32 % work for large firms, and 9.68 % work for International firms.

Table 4.1: Size of the firm at which the respondent is employed

Size of the Firm	Response Number	Percentage
Small	12	19.35 %
Medium	19	30.65 %
Large	25	40.32 %
International	6	9.68 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

Table 4.1 reflects the majority of the respondents work in large firms, which is a good indication that the work scope and size of the work scope the respondents have been exposed to is relevant to the study and its objectives. Therefore, the respondents can be considered appropriate for the study, as their project exposure would be sufficient for their contribution to be valued.

4.4.4 Year in which the Respondents firms were established

The respondents were asked to indicate in which year the firm they are employed at, established. This question bears significance as most large firms in South Africa have closed due to financial difficulties during the last 20-years. The question would indicate that the companies in which the respondents are employed have faced and overcome many challenges and presume to have systems in place to maintain and improve construction productivity.

Table 4.2 shows that 46.88% of the respondents work at firms, which were established in and before the year 1970, 4.62 % between 1971 to 1980; 1.54 % between 1981 to 1990; 15.38 % between 1991 to 2000; 12.31 % between 2001 to 2010 and 20% between 2011 and 2020.

Table 4.2: Year in which the firm was established

Year in which the Firm was established	Response Number	Percentage
1970 and earlier	30	46.88 %
1971-1980	3	4.62 %
1981-1990	1	1.54 %
1991-2000	10	15.38 %
2001-2010	8	12.31 %
2011-2020	13	20.00 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

The data reflected in Table 4.2 indicates that most of the respondents work for firms, which were established in the year 1970 and before. More than 50% of the respondents work for firms, which were established in the year 1980 and before. 20% of the respondents work for companies, which were established in the last ten (10) years. Therefore, the respondents are exposed to firms with sufficient experience, and their contribution to this study would be reliable and relevant.

4.4.5 Respondents role in their firms

The respondents were asked what their roles were in the firms where they are employed. The question poses significance as this would reflect their involvement in their respective companies and, with the following question, create a holistic confirmation that the Respondent's participation in this study is relevant and valued.

The results captured in Table 4.3 indicate that 6.45 % of the respondents are consultants, 33.87 % are in management roles in their respective firms, 29.03 % are Quantity Surveyors, 17.74 % are Engineers, and 12.90 % is Contract Managers.

Table 4.3: Respondents role in the firm

Role in the Firm	Response Number	Percentage
Consultant	4	6.45 %
Management	21	33.87 %
Quantity Surveyor	18	29.03 %
Engineer	11	17.74 %
Architect	0	0.00 %
Contracts Manager	8	12.90 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

The majority of the respondents (33.87 %) are in management positions at their respective companies. Henceforth, in their respective roles at their firms, the Respondent's contribution is suited for the quality of data that the study requires.

4.4.6 Respondents gender

The Respondents were asked to indicate their gender. Male professionals mainly dominate the construction industry. For this study, the researcher attempted to ensure that female respondent are also included in the sampling. Figure 4.2 indicates that 79.03% of the respondents are men, and 20.97% of the respondents are female.

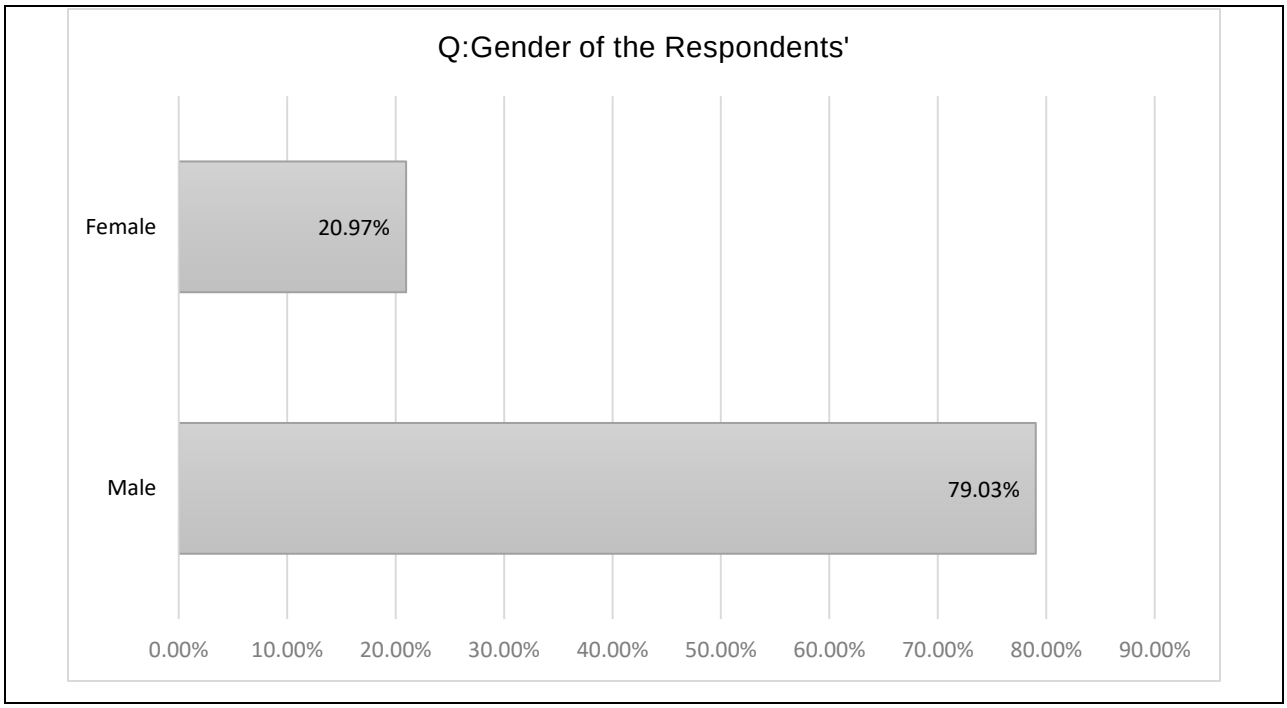

Figure 4.2: Respondents gender

The results of the study indicate that both male and female respondents were used in the survey.

4.4.7 Respondents age

The respondents were asked to provide their age in terms of years. This question is significant since it reflects the different generations the participants are from. Each of the cultural generations has different beliefs and value sets, which would influence this study.

Table 4.4: Respondents age

Respondents Age	Response Number	Percentage
21-30 Years	17	27.42 %
31-40 Years	17	27.42 %
41-50 Years	14	22.58 %
51-60 Years	8	12.90 %
61-70 Years	6	9.68 %
71-80 Years	0	0.00 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

Table 4.4 portrays that 27.42% of the respondents are between the ages of 21 to 30 years old; 27.42% between the ages of 31 to 40 years old, 22.58% between the ages of 41 to 50 years old, 12.90% between the ages of 51 to 60 years old and 9.68% between the ages of 61 to 70 years old. No respondents are recorded to be between the ages of 71 to 80 years old.

This indicates that the majority (77.42%) of the respondents are between the ages of 21 and 50.

4.4.8 The number of years' experience in the construction industry

The respondents were asked to indicate the number of years' experience they have in the construction industry. This question is significant, as not all respondents would enter the construction industry early in their lives, indicating that age cannot be the only reliant question to indicate the level of experience the sampled group of participants may have. Experienced respondents are required for this study as project managers are mostly professionals who have many years of experience and thereby have tested and experienced multiple projects where productivity has been addressed and managed.

Table 4.5 portrays the Respondent's level of experience. 1.54% of the respondents have 0-2 years of experience, 18.46% have 3-5 years' experience, 12.31% have 6-9 years' experience, and 36.92% have 10-20 years' and 30.77% have 21 years plus experience.

Table 4.5: The number of years' experience in the construction industry

Number of Years' Experience	Response Number	Percentage
0-2 Years	1	1.61 %
3-5 Years	11	17.74 %
6-9 Years	8	12.90 %
10-20 Years	24	38.71 %
21 Years+	18	29.03 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

The data reflected in Table 4.5 indicate that the sampled respondents have sufficient experience in the construction industry and their contribution to the study is reliable and valued.

4.4.9 Qualifications of the Respondents

The respondents were asked to indicate the level of professional qualifications they have completed and successfully obtained. This question is relevant, as most construction professionals would have been introduced to the construction industry by studying for construction-related qualifications.

Table 4.6 indicates that 8.06% of the respondents have no degree or diploma, 27.42% have obtained a diploma, 33.87% have obtained a degree, 24.19% have obtained an honours degree, 4.84% have obtained a master's degree, and 1.61% have obtained a doctor's degree.

Table 4.6: Qualifications of the Respondents

Qualifications	Response Number	Percentage
No degree	5	8.06%
Diploma	17	27.42%
Degree	21	33.87%
Honnour's Degree	15	24.19%
Master's Degree	3	4.84%
Doctor's Degree	1	1.61%
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

Table 4.6 indicates that most of the respondents (91.93%) have some form of qualification. This confirms that the respondents used for this study are relevant, and their input to this study would be valuable.

4.4.10 Professional registration the Respondents have obtained

The respondents were asked whether they have obtained any professional registration. This question is significant as there are many active councils within the different building professions. These councils provide guidelines for professionals to adhere to within their membership status. Membership status depends on the qualification and experiences the member would have to date. This is relevant as professionally registered construction individuals have earned their membership, and their opinions are based on extensive knowledge and expertise.

Figure 4.3 indicates that only 27.42% of the respondents have obtained such registration. This is relevant, as the study requires experienced construction professionals to contribute.

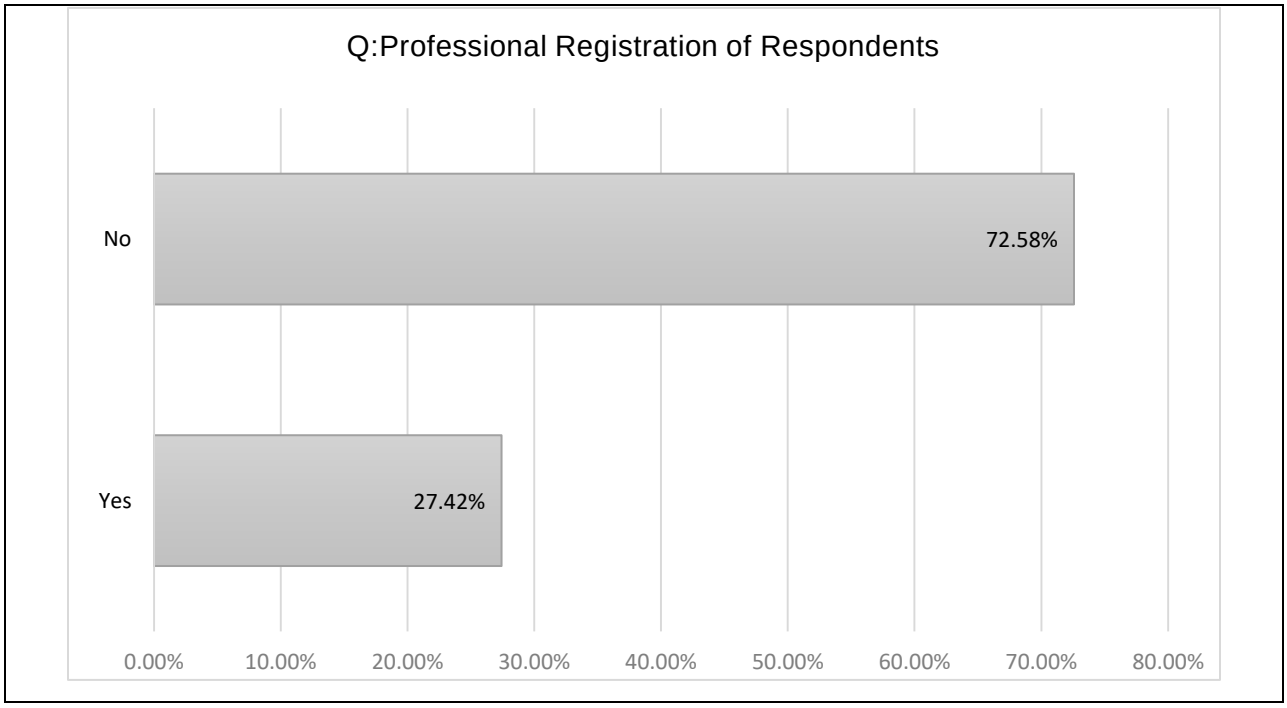

Figure 4.3: Professional registration the Respondents has obtained

This statistic's motivation could be that many construction professionals working for construction firms do not require professional registration. They are not acting as consultants in their professions.

4.5 RESPONDENTS STANDARDISED QUESTIONS ADDRESSING THE RESEARCH AIMS AND OBJECTIVES

The questionnaires were set up to achieve the research objectives and test the hypothesis, as discussed in chapter one (1) of this study. The Tables below show the Respondent's diverse responses.

4.5.1 Respondents views on project managers' skills affecting construction productivity

The respondents were asked to indicate whether they believe the project managers' skills affect construction productivity. The question is relevant to the study because the hypothesis is based on construction productivity. Therefore, if the respondent indicates that he or she does not believe the project manager's skills affect construction productivity, the respondent would not complete the questionnaire's remaining questions.

Sixty-two (62) of the respondents completed the survey. For the research questions to be applicable, all the respondents agree that the project managers' skills affect productivity.

Table 4.7: Project managers' skills affecting construction productivity

Project Managers' Skills affecting Construction Productivity	Response Number	Percentage
Yes	62	100.00 %
No	0	0 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

Based on the results in Table 4.7, all the respondents agreed that the project managers' skills affect construction productivity, indicating that the following question's results can be used for the purpose of the study. The following questions are based on the above statement to be true and would be researched further about the skills referred to in Table 4.7.

4.5.2 Respondents views on the important project management skills affecting construction productivity

The respondents were asked to list the proposed project management skills from most important to least important. This question would provide the key attributes construction- and consultant companies could use to determine whether candidates applying for project manager positions would maintain construction productivity levels and improve the levels of construction productivity to desired rates of productivity.

Sixty-two (62) of the respondents completed the question. Since the researcher seeks to identify the essential project management skills affecting construction productivity, Table 4.8 indicates the responses received. The responses are analysed by the use of a weighted value, which is calculated as follow:

$$Weighted\ Value = \left(\frac{(x^1w^1) + (x^2w^2) + \cdots (x^nw^n)}{\text{total number of respondents}}\right)$$

x is the number of respondents who ranked the skill as most important to least (1 to 11), multiplied by the weight factor calculated by 11 being the weight for 1st ranked, and 1 being the weight for number 11th. The total sum of each of the weight factors divided by the total number of respondents would give the skill a weighted score.

For example, the weighted value for leadership skills is 9.40, which is calculated as follow:

$$Weighted\ Value = \frac{((x^1w^1) + (x^2w^2) + (x^3w^3) + (x^4w^4) + (x^5w^5) + (x^6w^6) + (x^7w^7) + (x^8w^8) + (x^9w^9) + (x^{10}w^{10}) + (x^{11}w^{11}))}{\text{total number of respondents}}$$

The x would be replaced with the number of respondents who ranked leadership skills as 1st, 2nd,3rd,4th,5th,6th,7th,8th,9th,10th, and 11th. The weight would be awarded raking 1 weighting eleven, descending to ranking 11 weightings 1.

$$Weighted\ Value = \left(\frac{(23 * 11) + (20 * 10) + (7 * 9) + (4 * 8) + (1 * 7) + (2 * 6) + (1 * 5) + (1 * 4) + (2 * 6) + (0 * 2) + (1 * 1)}{62}\right)$$

$$Weighted\ Value = \left(\frac{583}{62}\right)$$

$$Weighted\ Value = 9.40$$

Each of the skills' weighted value is calculated and resulted in Table 4.8. The Table reflects the percentage and the number of the respondents who ranked the skills, where after the weighted value is given (as calculated using the weighted value formula) and the project management skill which affects productivity, ranked from 1 to 11, with 1 being most important and 11 being least important.

Table 4.8: Respondents views on the important project management skills affecting construction productivity

Listed Project Managers' Skills	Percentage of the respondents who ranked skills (quantity of respondents who listed the ranking, divided by 62) (with 1 being most important and 11 being least important)											Weighted Value	Importance ranked
	1	2	3	4	5	6	7	8	9	10	11		
Communication Skills	37.10%	32.26%	11.29%	6.45%	1.61%	3.23%	1.61%	1.61%	3.23%	0.00%	1.61%	9.40	1
	23	20	7	4	1	2	1	1	2	0	1		
Leadership Skills	32.26%	30.65%	8.06%	9.68%	4.84%	4.84%	1.61%	3.23%	1.61%	3.23%	0.00%	9.06	2
	20	19	5	6	3	3	1	2	1	2	0		
Time Management Skills	8.06%	9.68%	27.42%	16.13%	6.45%	6.45%	17.74%	4.84%	0.00%	1.61%	1.61%	7.58	3
	5	6	17	10	4	4	11	3	0	1	1		
Negotiation	1.61%	1.61%	1.61%	9.68%	4.84%	14.52%	12.90%	14.52%	17.74%	11.29%	9.68%	4.55	9
	1	1	1	6	3	9	8	9	11	7	6		
Cost Control	3.23%	4.84%	6.45%	8.06%	25.81%	16.13%	9.68%	8.06%	11.29%	6.45%	0.00%	6.11	6
	2	3	4	5	16	10	6	5	7	4	0		
Risk Management	3.23%	3.23%	11.29%	16.13%	16.13%	12.90%	9.68%	11.29%	8.06%	8.06%	0.00%	6.23	5
	2	2	7	10	10	8	6	7	5	5	0		
Contract Management	11.29%	8.06%	12.90%	9.68%	9.68%	14.52%	12.90%	8.06%	6.45%	3.23%	3.23%	6.79	4
	7	5	8	6	6	9	8	5	4	2	2		
Critical Thinking	3.23%	4.84%	14.52%	12.90%	11.29%	8.06%	11.29%	17.74%	8.06%	4.84%	3.23%	6.10	7
	2	3	9	8	7	5	7	11	5	3	2		
Coaching / Mentoring	0.00%	0.00%	1.61%	4.84%	4.84%	6.45%	3.23%	8.06%	12.90%	25.81%	32.26%	2.97	10
	0	0	1	3	3	4	2	5	8	16	20		
Quality Management	0.00%	4.84%	4.84%	3.23%	11.29%	8.06%	16.13%	17.74%	19.35%	11.29%	3.23%	4.81	8
	0	3	3	2	7	5	10	11	12	7	2		
Meetings Management	0.00%	0.00%	0.00%	3.23%	3.23%	4.84%	3.23%	4.84%	11.29%	24.19%	45.16%	2.40	11
	0	0	0	2	2	3	2	3	7	15	28		

Source: (Own Compilation, 2020)

The analysis indicates that communication skills have the highest weighted factor of 9.40; thus, communication skills are deemed to be identified as the most important skill affecting productivity, with leadership skills in the second position with a weighted factor of 9.06, time management skills in third with a weighted factor of 7.58, contract management skills in fourth with a weighted factor of 6.79, risk management skills in fifth with a weighted factor of 6.23, cost control skills in the sixth with a weighted factor of 6.11, critical thinking in seventh with a weighted factor of 6.10, and quality management skills in eight, with a weighted factor of 4.81. The respondents do not put emphasis on the skill in ninth and tenth position, namely negotiation and coaching or mentoring skills, with weighted factors of 4.55 and 2.79, respectively. The respondents also indicated that meeting management with a weighted factor of 2.40 would be the project managers' skill, affecting productivity.

Communication- and leadership skills weighted factors were 9.40 and 9.06 and indicated as the first and second most important project managers' skills affected productivity. The third most important skill affecting productivity is time management with a weighted factor of 7.58. The difference between the second (leadership skills) and third (time management skills) most important project managers' skill is 1.48. This variance is significant as it indicates that many of the respondents agreed that the first and second most important skills, namely communication- and leadership skills, are most likely to influence productivity.

The following question would address the skills, which would be presumed to improve construction productivity.

4.5.3 Respondents view on the project managers' skills which would improve construction productivity

The respondents were asked to indicate which of the previous question's skills would improve construction productivity. Many projects experience delays, whether due to foreseen or unforeseen events taking place. To mitigate the risk of penalties being charged when foreseen program delays are experienced, the project team would work together with the project planners to find ways to make the lost time back. The reprogramming of works would be done with the project manager at the lead.

Sixty-two (62) of the respondents completed the question. Table 4.9 reflects the Respondent's answers. The respondents selected the three project managers' skills that would improve construction productivity. The results are interpreted using frequency as the frequency of respondents who selected one of the eleven project managers' skills to improve productivity, which is reflected in Table 4.9.

Table 4.9: The three project managers' skills, which would improve construction productivity

The three Project Managers' skills which would improve Construction Productivity	Frequency (Number of respondents who selected the skill)	Percentage
Communication Skills	44	70.97 %
Leadership Skills	32	51.61 %
Time Management Skills	23	37.10 %
Negotiation	3	4.84 %
Cost Control	9	14.52 %
Risk Management	17	27.42 %
Contract Management	20	32.26 %
Critical Thinking	18	29.03 %
Coaching / Mentoring	6	9.68 %
Quality Management	14	22.58 %
Meetings Management	0	0.00 %
Total		**100.00 %**

Source: (Own Compilation, 2020)

The results indicate that 70.97% of the respondents believe that the project managers' communication skills are the most important skills, leading to construction productivity improvement. 51.61% of the respondents believed that the project managers' leadership skills are the second most important skill, which would lead to construction productivity improvement. 37.10% of the respondents believed that the project managers' time management skills are listed as the third most important skill, leading to construction productivity improvement.

The results indicate that the three skills which are seen as the project managers' skills which would least likely improve productivity are meeting management skills with no selection at 0%, negotiation skills, which is selected by three respondents resulting in a 4.84% likelihood of improving productivity, and coaching or mentoring selected by six respondents resulting in a percentage of 9.68%.

Based on the analysis, it can be presumed that the respondents put emphasis on leadership, communication, and time management skills when productivity must be improved, and not so much on coaching or mentoring, negotiation, and meeting management skills.

The following question would indicate the factors, which are most likely to affect construction productivity.

4.5.4 Respondents views on the important factors affecting construction productivity

Since the respondents have indicated the project managers' skills, which would improve construction productivity, this question would indicate which factors, listed from most to least important, affect construction productivity. Factors that negatively affect productivity could result in project delays, causing the contractor to miss critical deadlines and provide enough evidence for the client to charge to contractor penalties as prescribed in the building agreement.

Sixty-two (62) of the respondents completed the question. In this question, the respondents were asked to rank factors that would affect construction productivity, from most to least likely. Since the researcher seeks to identify the essential factors affecting construction productivity, Table 4.10 indicates the responses received. The responses are analysed by the use of a weighted value, as used in Table 4.8, which is calculated as follow:

$$Weighted\ Value = \left(\frac{(x^1w^1) + (x^2w^2) + \cdots (x^nw^n)}{\text{total number of respondents}}\right)$$

The results reflected in the Table below are used in the weighted formula to determine the ranking of the factors most likely to affect productivity.

Table 4.10: The factors affecting construction productivity ranked from most to least likely

	Percentage of the respondents who ranked factors (quantity of respondents who listed the ranking, divided by 62) (with 1 being most important and 11 being least important)										
Listed Factors affecting productivity	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Weighted Value**	**Importance ranked**
Material Shortages	4.84 %	11.29 %	9.68 %	8.06 %	17.74 %	22.58 %	14.52 %	3.2 3%	8.0 6%	4.87	**6**
	3	7	6	5	11	14	9	2	5		
Lack of Labour Skills & Experience	19.35 %	12.90 %	17.74 %	19.35 %	16.13 %	6.45 %	4.84 %	1.61 %	1.6 1%	6.44	**3**
	12	8	11	12	10	4	3	1	1		
Incompetent Supervising & Management	19.35 %	25.81 %	17.74 %	16.13 %	11.29 %	3.23 %	4.84 %	1.61 %	0.00 %	6.89	**1**
	12	16	11	10	7	2	3	1	0		
Poor Leadership	24.19 %	16.13 %	20.97 %	12.90 %	9.68 %	3.23 %	6.45 %	4.84 %	1.61 %	6.63	**2**
	15	10	13	8	6	2	4	3	1		
Inefficient Work Methods	3.23 %	11.29 %	16.13 %	11.29 %	19.35 %	24.19 %	4.84 %	9.68 %	0.00 %	5.27	**5**
	2	7	10	7	12	15	3	6	0		
Poor Project Communication	22.58 %	12.90 %	11.29 %	16.13 %	12.90 %	14.52 %	3.23 %	4.84 %	1.61 %	6.26	**4**
	14	8	7	10	8	9	2	3	1		
Unforeseen events taking place	1.61 %	6.45 %	3.23 %	4.84 %	6.45 %	8.06 %	35.48 %	27.42 %	6.45 %	3.50	**7**
	1	4	2	3	4	5	22	17	4		
Poor Site Layout	1.61 %	0.00 %	1.61 %	8.06 %	4.84 %	12.90 %	14.52 %	32.26 %	24.19 %	2.82	**8**
	1	0	1	5	3	8	9	20	15		
Covid-19 Work Restrictions	3.23 %	3.23 %	1.61 %	3.23 %	1.61 %	4.84 %	11.29 %	14.52 %	56.45 %	2.32	**9**
	2	2	1	2	1	3	7	9	3535		

Source: (Own Compilation, 2020)

The results in Table 4.10 indicated that the respondents emphasize competent supervising and management, poor leadership, and the lack of labour skills and experience as the three factors, which negatively influence productivity. The results indicate incompetent supervising and management with a weighted value of 6.89, are seen as the most important factor, which would influence construction productivity the most; poor leadership with a weighted value of 6.63 is indicated as the second factor, which would influence productivity negatively, the lack of labour skills and experience with a weighted factor of 6.44 is listed as the third factor, which would influence productivity

negatively, and poor project communication with a weighted factor of 6.26 is listed fourth as the factor, which would negatively affect productivity.

Inefficient work methods with a weighted factor of 5.27 are listed as the fifth factor, which would influence productivity negatively in fifth, material shortages in the sixth with a weighted factor of 4.87. Unforeseen events taking place with a weighted factor of 3.50, poor site layout with a weighted factor of 2.82, and work restrictions, due to covid-19 social distancing measures with a weighted factor of 2.32, are seen as the three factors, which would least likely have a negative influence on productivity.

The following question would address the management of construction projects by reviewing the project managers' leadership styles.

4.5.5 Respondents views on efficient leadership styles for improving or maintaining good levels of construction productivity

Due to leadership, management, and supervising being some of the most important skills to manage construction productivity, this question asked the respondents to indicate which two leadership styles, with specific reference to seven styles, namely autocratic, charismatic, transformational, laissez-faire, transactional, supportive and democratic leadership would be the most efficient styles to improve and maintain good levels of construction productivity.

Sixty-two (62) of the respondents completed the question. The respondents selected what they believe, the two most efficient leadership styles for improving or maintaining good levels of construction productivity. The results are interpreted using frequency, as the frequency of respondents who selected the two leadership styles which would improve productivity and are reflected in Table 4.11.

Table 4.11: The two most efficient leadership styles for improving or maintaining good levels of construction productivity

The two most efficient leadership styles for improving or maintaining good levels of construction productivity	Frequency	Percentage
Autocratic Leadership (Leader has all the power, authority, and responsibility. Little input from team members.)	2	3.23%
Charismatic Leadership (Leader transform attitudes and beliefs in employees. Power to inspire and influence people. The goals of the organization reflect this leader's vision.)	38	61.29%
Transformational Leadership (Like charismatic leaders, they inspire others. However, the leader is not present to effect change. Transformation is initiated through the organization to motivate employees.)	10	16.13%
Laissez-faire Leadership (Employees of these leaders are skilled, and the leader maintains a hands-off approach to manage workers by providing them tools to do their job. Employees who might need more guidance may struggle to work under this passive leadership style.)	1	1.61%
Transactional Leadership (The employment is seen as a transaction. By accepting the job, the employee accepts to obey the leader and complete the tasks in exchange for compensation. Workers may be punished or rewarded based on their performance. Roles are well defined, and people who are ambitious may respond well to rewards and to this type of leadership style.)	8	12.90%
Supportive Leadership (Leaders delegate and assign tasks to the employees and provide the employees with skills needed to complete the tasks. They work through problems with employees and give a high degree of attention and coaching as needed. Supportive leaders tend to have compassion and are respectful towards their employees.)	43	69.35%
Democratic Leadership (Participative leadership style. All groups are, or members can participate in decision-making processes. Leaders encourage discussion and the flow of ideas. Roles may be not so well defined, which could create communication failures.)	10	16.13%
Total		**100.00%**

Source: (Own Compilation, 2020)

The results as per Table 4.11 indicate that 69.35% of the respondents believe that a supportive leadership style would be the preferred leadership style to maintain and improve construction productivity levels. Secondly, 61.29% of the respondents indicated a charismatic leadership style would maintain and increase construction productivity levels. The respondents indicated that the other leadership styles, such as laissez-faire, had a 1.61%, autocratic leadership style had a 3.23%, transformational leadership style

had a 16.13%, and transactional leadership style had a 12.90% chance of maintaining and improving construction productivity levels. The next question refers to the Respondent's personal preference of leadership styles to be managed by.

Based on the analysis, the respondents indicated that they believe supportive and charismatic leadership styles are the most effective leadership styles for improving and maintaining productivity levels. The two least preferred leadership styles for improvement or maintaining productivity, as perceived by the respondents, would be laissez-faire and autocratic leadership.

The following question would indicate the leadership style by which the respondents prefer to be managed by.

4.5.6 Respondents preference of two management leadership styles

The respondents were asked to indicate, as per Table 4.12 to indicate the two management leadership styles they prefer. The question is relevant: not all respondents would prefer to work under a leadership style that would maintain or increase construction productivity.

Sixty-two (62) of the respondents completed the question. The respondents selected the two management leadership styles by which they prefer. The results are interpreted by use of frequency and are reflected in Table 4.12.

Table 4.12: Respondents preference of two management leadership styles

Respondents preference of two management leadership styles	Frequency	Percentage
Autocratic Leadership (Leader has all the power, authority, and responsibility. Little input from team members.)	1	1.61%
Charismatic Leadership (Leader transform attitudes and beliefs in employees. Power to inspire and influence people. The goals of the organization reflect this leader's vision.)	32	51.61%
Transformational Leadership (Like charismatic leaders, they inspire others. However, the leader is not present to effect change. Transformation is initiated through the organization to motivate employees.)	9	14.52%
Laissez-faire Leadership (Employees of these leaders are skilled, and the leader maintains a hands-off approach to manage workers by providing them tools to do their job. Employees who might need more guidance may struggle to work under this passive leadership style.)	2	3.23%
Transactional Leadership (The employment is seen as a transaction. By accepting the job, the employee accepts to obey the leader and complete the tasks in exchange for compensation. Workers may be punished or rewarded based on their performance. Roles are well defined, and ambitious people may respond well to rewards and this type of leadership style.)	6	9.68%
Supportive Leadership (Leaders delegate and assign tasks to the employees and provide the employees with skills needed to complete the tasks. The work through problems with employees and give a high degree of attention and coaching as needed. Supportive leaders tend to have compassion and are respectful towards their employees.)	50	80.65%
Democratic Leadership (Participative leadership style. All groups are, or members can participate in decision-making processes. Leaders encourage discussion and the flow of ideas. Roles may be not so well defined, which could create communication failures.)	10	16.13%
Total		**100.00%**

Source: (Own Compilation, 2020)

Based on the analysis, 1.61% of the respondents prefer to be managed by an autocratic leadership style, 51.61% preferred to be managed by a charismatic leadership style, 14.52% preferred to be managed by a transformational leadership style, 3.23% preferred to be managed by a laissez-faire leadership style, 9.68% preferred to be managed by a transactional leadership style, 80.65% preferred to be managed by a supportive leadership style and 16.13% preferred to be managed by a democratic leadership style.

The analysis indicated that respondents preferred to be managed by supportive and charismatic leadership styles. The two leadership styles that the respondents indicated they believe would improve or maintain productivity levels. The Respondent's two leadership styles indicated they least prefer to be managed by laissez-faire- and autocratic leadership, which the respondents also believed are the two leadership styles that would most likely not improve or maintain productivity levels.

The analysis of the results would be discussed concerning the research objectives and literature research in the next section.

4.6 DISCUSSION OF THE RESULTS

4.6.1 The project managers' skills that influence construction productivity

The study's first objective was to identify the project managers' skills, which influence construction productivity.

The literature research addresses the importance of productivity due to productivity's influence on the profitability and the survival of companies (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016:29). From the findings, it is evident that the project managers' skills influence construction productivity. The findings in Table 4.7 confirm that all the respondents believe that the project managers' skills influence construction productivity.

The respondents had to rank the project managers' skills from most important to least important in Table 4.8. It is evident from the findings that the most important project management skill, which affects productivity, is communication skills. Leadership skills and time management skills were the second and third most important project management skills affecting productivity. Makulsawatudom and Emsley (2001:286-288) support the findings of communication and leadership skills in their research where they identify incompetent supervisors and poor communication as two of the contributing

factors which affect productivity. The literature review also supports that communication (Zulch, 2014:176) and the different leadership styles (Shan, Goodrum, Goodrum, Zhai, Haas & Caldas, 2010:305), affect the outcomes of a project. Liikamaa (2015:682) also confirms that an effective project manager needs to be a good communicator. Campbell's study (2009) also confirmed communication as critical in a study where five hundred (500) project managers identified project communication as one of the biggest determining factors for project success and failure. The project manager must be able to monitor effective communication with all project team members (Comley; 2018:38).

Time management, which was identified as the third most important factor affecting productivity, is recognised in the literature as one of the ten (10) project management knowledge areas which support desirable project outcomes (PMBOK, 2015:141). The PMBOK (2015:60) identify time management activities that should be implemented during the project planning stage as plan; scheduling, defining activities, sequencing activities, estimating activity resources and durations and developing time schedules as illustrated in Table 2.1.

The respondents (Table 4.8) did not emphasize the skills of negotiation and coaching or mentoring skills and ranked meeting management as the project managers' skill, which least affects productivity. In the literature research, Yemm (2012:116) emphasises that a good leader must be able to coach, and Hall (2019:19) stated that positive changes to productivity are witnessed by those receiving coaching. The literature research does not support the research outcomes, indicating that coaching or mentoring skills is the fourth ranked project management skill that would influence productivity.

4.6.2 The project managers' skills, leadership styles, knowledge, and experience influencing construction productivity

The second objective was to identify how the project managers' skills, leadership styles, knowledge, and experience influence construction productivity.

Bierman *et al.* (2016:38) confirm in their findings that material shortages, the lack of labour experience, incompetent supervising, work methods, late issue of drawings, poor project

communication, unforeseen events that are taking place, poor site layout, the constructability of work and rework, affect construction productivity.

The respondents had to rank the factors they believe affect construction productivity from most to least likely, as indicated in Table 4.10. The findings confirm that the respondents emphasize incompetent supervising and management, poor leadership, and the lack of labour skills and experience as the three main factors that negatively influence productivity.

Makulsawatudom and Emsley (2001:286-288) did not confirm that the lack of labour skills and experience affect productivity in Thailand; however, Bierman, Marnewick, and Pretorius (2016:39) confirmed that the lack of labour skills and experience do influence productivity in South Africa. Adebowale and Smallwood (2018:1) studied the challenges contributing to poor productivity in the South African construction sectors, such as workers with inadequate skills, a lack of leadership, and contractors not having sufficient project planning experience, as some of the factors affecting productivity in South Africa.

Bierman *et al.* (2016:38) identified in their findings that unforeseen events occur and poor site layout, as some of ten (10) factors affect construction productivity. The research findings confirm that unforeseen events taking place, poor site layout, and work restrictions due to covid-19 social distancing measures are seen as the three factors that would least likely negatively influence productivity. When the building industry was allowed to operate during the covid-19 lockdown, certain social distancing restrictions affected the amount of labour allowed in a confined space and the screening process, which increased the clock in time for all construction workers. The respondents listed covid-19 working restrictions as the factor that would least likely negatively influence productivity.

4.6.3 Project Managers' skills to Improve Construction Productivity

The study's third objective was to identify the project managers' skills, which would improve construction productivity.

The literature research addresses the importance of a qualified and skilled project manager. Projects have different levels of complexity. Knipe *et al.* (2010:19) identify the factors which determine the complexity of a project as the nature of the proposed work scope, the number of people involved, the number of resources available and required (time and capital), and the level of innovation (such as technology) involved.

Therefore, the project managers' skills must be project manager's skills must be matched with the project's complexity to prevent the loss of project control and project failure (Mouchi, Rotimi & Ramachandra, 2011:89). The project managers' role is divided into the PMBOK functions and people-skills. The PMBOK project management areas as per Table 2.2 indicate the ten (10) knowledge areas, each with their deliverables (Heagney, 2016:11).

Project management has to do with getting people to execute work, which is required to meet the project objectives (Heagney, 2016:27). The project manager is required to apply human resource skills to motivate (Langford *et al.,* 1995:80) resources to execute the work to improve productivity. This is achieved by implementing effective leadership and communication (Zulch, 2012; Burger, 2013; Cerff, 2015).

The literature study's findings state that the project manager must adopt the leadership style to the project circumstances (Heagney, 2016:189). Zulch (2014:174)

The respondents had to select the three project managers' skills that would improve construction productivity. The findings in Table 4.9 confirm that all the respondents believe that the project managers' communication, leadership, and time management skills would improve construction productivity.

4.6.4 Project Managers' Leadership Styles to improve construction Productivity

The study's fourth objective was to identify the leadership styles, which the Respondents believe would improve construction productivity.

The literature study addressed the different leadership styles and the degree of interaction between the leader and followers. As a leader, the project manager can get people to follow instructions (Mouchi et al., 2011:92) effectively. This task would not necessarily result in productivity being maintained or increased; however, for productivity to be improved, the project manager would have to "*work through others"* (Walker, 2015:231).

The respondents also had to indicate what leadership styles they believe would improve or maintain satisfactory productivity levels, as indicated in Table 4.11. The results confirmed that the respondents believe supportive and charismatic leadership styles are the most effective leadership styles for improving and maintaining productivity levels. The literature research address the importance of the project manager adapting to a single or combination of leadership styles, based on assessing the project environment or situation (Zulch, 2014:173).

Supportive leadership is described as a leader who takes into account the behavior and motivation of the followers by showing concerns for their needs and wants, whilst offering rewards for performance, clear set goals, and objectives and removing obstacles, which hinder performance (Klippenberger, 2002:92). Charismatic leadership is described as the leader being an inspiration to the project team, an excellent communicator, very much like politicians (Walker, 2015:238). These two leadership styles have people-orientation in common, where supportive leaders are concerned over people's needs and offer performance rewards as motivation. The charismatic leader is an excellent communicator and inspiration to team members. Performance rewards and motivation, driven by the project manager, could be identified as a tool that a project manager could use to improve productivity.

The results indicated that the two least preferred leadership styles for improvement or maintaining productivity, as perceived by the respondents, would be laissez-faire- and autocratic leadership. Klippenberger (2002:16) defines laissez-faire leadership as a leadership style with a very low level of participation by the leader in any form of activity. Autocratic leadership is defined by Walker (2015:235) as a leader who solicits very little input from their project team and prefers to make decisions by themselves. These findings confirm that of Klippenberger (2002:16), where leadership styles are believed to be the

least likely to influence productivity, where the project manager would either give no input on activities or have such tight control over group activities and give team members no opportunity to provide their input (Klippenberger, 2002:16).

It can be noted that leadership styles where the team members receive no input from the project manager or where the project team is not included in decision-making activities are prescribed as insufficient for productivity improvement.

The respondents indicated which leadership styles they prefer to be managed by, as indicated in Table 4.12. The results confirmed that the respondents prefer to be managed by the same leadership styles, which increase or maintain productivity levels, namely supportive and charismatic leadership styles. Therefore, the two most effective leadership styles for improving and maintaining productivity levels and project team satisfaction would be supportive and charismatic leadership styles.

4.7 HYPOTHESIS EVALUATION

The formulated hypothesis, as stated in chapter one, is:

1. Project managers greatly influence construction productivity at every stage of the project life cycle, even though they do not directly manage construction labour.

The above hypothesis is supported by the study's findings sourced from the questionnaires (Table 4.7). All the respondents of the study agreed that the project managers' skills affect productivity. It is, therefore, agreed that the above hypothesis is accepted.

2. *Each construction project has unique objectives and constraints. The project manager must be flexible to adapt to the unique project management approach to reach the project objectives whilst also satisfying the human factor.*

The study's findings support the above hypothesis. The respondents indicated that a range of factors influence the productivity of which incompetent supervising and management, poor leadership, and the lack of labour and skills are listed (Table 4.10).

All supervisors and management require some leadership skills to manage people. The respondents indicated in Table 4.10 that poor leadership and incompetent supervising and management would affect construction productivity.

The project manager would continuously work with other human beings whose response to actions would be different. The respondents indicated the leadership styles which they believe would improve construction productivity (Table 4.11). The two leadership styles that the Respondents believe would improve construction productivity are the same leadership styles they want to be managed by (Table 4.12), namely, charismatic and supportive leadership. Both styles are people-orientated, where the managers rely on the team members to conduct their work and provide their input in some decision-making processes. The hypothesis is, therefore, supported.

3. *The project managers' skill set, leadership style, and experience are important to manage a project's productivity by referring to past similar projects where the acceleration of the program or eliminating elements was implemented.*

The above hypothesis is supported in the study by the findings sourced from the questionnaires. The project manager must have sufficient skills and experience to deliver projects and manage productivity successfully. The project manager would apply skills, knowledge, and tools to achieve project objectives. The project management areas and process groups are identified in the research by use of the PMBOK.

Incompetent supervising and management, poor leadership, and the lack of labour and skills are listed, as Table 4.10, by the respondents in the questionnaires as factors most likely to affect productivity. These results indicate that the project manager should be incompetent with poor leadership and skills; it would negatively affect productivity.

Project management is a field of specialisation, with many skills being used to manage project deliverables. The respondents had to rank the project managers' skills, influencing construction productivity, from most to least important. The results indicate that communication and leadership skills are the two factors that would most likely influence construction productivity.

Seven (7) leadership styles are identified and defined in the literature. As indicated in Table 4.11, the questionnaires' findings identified charismatic and supportive leadership styles to be the preferred leadership style the respondents prefer to be managed by (Table 4.12), and the leadership styles that the respondents believe would maintain or improve productivity levels. The hypothesis is, therefore, accepted.

4. *The knowledge and experience levels of a project manager will ultimately affect the productivity of a project.*

The above hypothesis is supported in the study by the findings sourced from the questionnaires. The respondents used in this study are between 21 to 70 years old, with the majority being between the ages of 31 to 60 years old, with 10 and more years of experience (Table 4.4). These respondents indicated that the project managers' skills affect productivity, as resulted in Table 4.7. Skills are developed, and knowledge is gained with experience. The findings support and accept the hypothesis by indicating that the project managers' skills must be matched with the projects' complexity. Thus, the more complex a project is, the better skilled and more experienced the project manager is required to be to ensure all project deliverables, including productivity, are effectively managed. The hypothesis is, therefore, accepted.

4.8 CONCLUDING REMARKS

The literature study's findings provided information about the basic principles of project management and the importance of people skills and the management of relationships within the project team environment, and how these skills influence productivity. The project manager holds a position, which determines the failure or success of projects. The project manager can eliminate many project failures by implementing the people skills, namely leadership and communication skills, as discussed in the literature.

The respondents agreed that the project managers' skills influence productivity; identified the project manager's skills, which influence construction productivity from most important to least important; listed the three skills which would improve productivity; listed the factors affecting construction productivity from most likely to least likely; identified the two most efficient leadership styles, which would improve or maintain satisfactory levels of

construction productivity and identified the two leadership styles, which they would prefer to be managed by.

The respondents ranked the factors, which would influence productivity from most likely to least likely, indicating that incompetent supervising and management and poor leadership are the two factors, which would most likely influence productivity, as per Table 4.10. The respondents indicated that the two main project managers' skills, which most likely influence productivity are communication and leadership skills, as per table 4.8. The respondents indicated the three project managers' skills that would improve productivity are communication, leadership, and time management skills, as per Table 4.9. The respondents indicated the two most efficient leadership styles to improve and maintain productivity as charismatic and supportive leadership (Table 4.11), which are also the Respondents preferred leadership style to be managed by (Table 4.12).

The results of the study show that the project manager's leadership and communication skills are vital to productivity. The project manager can harvest a culture where productivity can be improved using project team development and team-building. The following chapter would conclude the proposed research by providing a study overview, supplying a summary of the key empirical findings, discussing the achievement of study objectives, giving recommendations, and addressing proposed future studies.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter will conclude the study by providing an overview of the study. Further emphasis will be put on the research questions and objectives, and the findings will be summarised to draw conclusions and recommendations for further research.

5.2 OVERVIEW OF THE STUDY

The study aimed to investigate the effects of the project managers' skills on construction productivity. The literature study has highlighted the South African economy crisis and its importance as a contributor to the economy.

The hypothesis formulated in the study was divided into five sections, namely:

1. *Project managers greatly influence construction productivity at every stage of the project life cycle, even though they do not directly manage construction labor.*
2. *Each construction project has unique objectives and constraints. The project manager must be flexible to adapt to the unique project management approach to reach the project objectives whilst also satisfying the human factor.*
3. *The project managers' skill set, leadership style, and experience are important to manage the productivity of a project by referring to past similar projects where the acceleration of the program or eliminating elements was implemented.*
4. *Developing the project managers' leadership, communication, and management skills could lead to improve the productivity of a project.*
5. *The knowledge and experience levels of a project manager will ultimately affect the productivity of a project.*

The literature study discussed the importance of productivity, which ultimately determines construction companies' profitability and livelihood. The factors that influence productivity and the project managers' skills and how these skills influence productivity were explored. The importance of project managers' leadership and communication skills were

highlighted. The existing tools relating to existing motivation theories were explored, and two new tools are introduced.

A quantitative research approach was used. The primary data used in the study were retrieved from the questionnaires, and the secondary data used in the literature study were retrieved from journals, textbooks, articles, government documents, and other informative websites.

The questionnaire was divided into sections A (demographic information) and section B (questions relating to the respondents' perceptions).

Section A requested demographic information from the respondents and consisted of nine (9) questions pertaining to the type and size of the firm the respondent is working for, the year in which the firm was established, the Respondents role in the firm, the Respondents gender, number of years' experience, qualifications and professional registration. Section B, which consisted of six (6) questions, requested the respondents to indicate whether they believe the project manager's skills affect construction productivity, ranking the factors affecting productivity, ranking the project management skills which affect productivity, indicating the three project manager's skills which would improve productivity, indicating the two leadership style which would maintain or improve productivity levels and indicating which leadership style the respondents prefer to be managed by.

5.3 SUMMARY OF KEY EMPIRICAL FINDINGS

Listed below are the key findings from the empirical study:

i. The project managers' skills affect construction productivity.
ii. Incompetent supervising and management, poor leadership skills, lack of labor and skills and experience, and poor communication are the main factors that influence productivity.
iii. Communication and leadership skills are the main project managers' skills, which affect construction productivity.

iv. Communication, leadership, and time management skills are the main project managers' skills that would improve construction productivity.
v. Charismatic and supportive leadership styles are identified as the two leadership styles, maintaining and improving productivity levels.
vi. Construction individuals prefer being managed by charismatic (inspirational and excellent communicator) and supportive (people-focused and reward performance) leadership styles.

5.4 ACHIEVEMENT OF OBJECTIVES

Objective 1: To identify the project managers' skills that influence construction productivity

The empirical study confirmed that the project managers' skills influenced construction productivity and identified the factors that affect construction productivity, from most likely to least likely. These factors identified incompetent supervising and management and poor leadership as the two factors most likely to influence productivity.

Objective 2: To determine how the project managers' skills, leadership styles, knowledge, and experience influence construction productivity.

After the respondents agreed that the project managers' skills affect productivity, the Respondents identified the project management skills that affect construction productivity and ranked the skills from most likely to least likely. Leadership and communication skills were found to be the two most important skills.

Objective 3: To determine which project managers' skills improve construction productivity.

The empirical study identified three project managers' skills that improve construction productivity, namely, leadership, communication, and time management skills.

Objective 4: To determine which project managers' leadership styles would improve construction productivity.

i. The empirical study identified charismatic and supportive leadership styles as the two leadership styles, maintaining and improving construction productivity levels. The study indicated that both these leadership styles are also recognised as the respondents' leadership styles prefer to be managed by.

5.5 RECOMMENDATIONS

Following the findings of this study, the following recommendations are made:

i. Project Managers: Project managers' could use the study's list of factors that the respondents ranked from most likely to least likely, to influence construction productivity as a guideline to identify possible risks. The project managers' could also use the study's information on effective leadership styles to improve construction productivity as a guide to develop the people-management skills pertaining to these styles. Project managers' could also use the three most important project managers' skills that respondents believe would improve construction productivity and guide projects where construction productivity levels are critical or declining.
ii. Professional Bodies: The Project Management Book of Knowledge explores general project management theories. The PMBOK needs to develop a supportive guide for the development of people-related skills. It is evident that people skills have a major impact on project delivery, thereby creating a reliable and universal resource for project managers' to explore and develop their people skills.
iii. Construction Industry: Declining levels of productivity is a common problem across countries. The building industry's councils need to address the problem by taking hands with international countries, to research and test ways in declining productivity rates are effectively managed.
iv. Training Industry: Project management training academies and educational institutes could use the study's findings that indicate people skills form a vital part of successful project management, as an indication of material to be incorporated in the training and educational manuals.
v. Employers: Construction companies could use the three most important project managers' skills, namely, communication, leadership, and time management, and the

leadership styles that respondents believed would improve construction productivity, to make determinations on the appointments of project managers on selected projects.

5.6 DIRECTION FOR FUTURE RESEARCH

- Only consultants and construction professionals were invited to participate in the research study. For future research exploring other professions with particular, the labour and tradesmen who work onsite could provide a different perspective on selecting factors and skills influencing productivity, which the proposed respondents identify.
- Survey Monkey was proven a very effective tool for the purpose of the study. However, the rate of response was 36%. This rate could improve if the researcher sends reminder emails to non-responsive participants. Many construction individuals are actively working on construction sites and do not have access to their laptops on a daily basis. Thus sending a weekly reminder or issuing the survey via other media platforms such as WhatsApp could increase the response rate.
- Future research would recommend doing an experimental survey on two or more projects, similar in complexity, where the project productivity is measured against the time, cost, and quality objectives, and the project managers implement their respective project management styles. Results could confirm the management styles that were proven more successful in terms of productivity.
- A study to identify further tools and techniques to promote productivity on construction sites.

5.7 INCLUDING REMARKS

Based on the study's findings, the area of project management is much more complicated than the definition stated by Burke (2012:29), as the application of knowledge, skills, tools, and techniques to project activities to ensure project requirements are met. The literature study indicated that the project manager has to continually evolve with new project

complexity, elements, and technologies. The project manager wants to reap the benefits of effective and efficient project management (Neybour, 2012). The project manager's skills must be matched with the projects' level of complexity to prevent the loss of project control and project failure (Mouchi, Rotimi, & Ramachandra, 2011:89). The project manager must keep a sensitive balance set aligned with the project management plan and the project objectives.

The study has revealed that the project manager's role is divided into two sections, namely; the management and application of the primary project management functions, as stipulated in the Project Management Book Of Knowledge (PMBOK), and the management and application of people alternatively called human resource skills.

The project manager should be efficient and effective as a leader where attention is given to the workers' needs (Adrian, 1987:113). The project manager should also be an effective and efficient communicator, as the work is done in construction projects is detailed and non-repetitive (Adrian, 1987:114).

The building industry plays a significant role in the economic development of South Africa. The study indicated that productivity is a determining factor of every company's success and competitiveness (Enshassi *et al.,* 2013:175) in this industry and a determining factor for companies' survival (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016: 29).

The study identified that productivity of construction is influenced by industry, management, and labor-related factors (Shehata & El-Gohary, 2012:324), whereby the project manager has many influences to reduce risks and increase the possibility of objectives being met to ensure a project conforms to the characteristics of a successful project (Kerzner, 2006).

The researcher can thereby conclude, as the study was able to meet all the research objectives. The findings of the empirical study confirm the hypothesis.

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ANNEXURE A: ETHICAL CLEARANCE

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

08-Oct-2020

Dear Mrs Catherine Robbertse

Application Approved

Research Project Title:
The Effect of the Project Managers' Skills on Construction Productivity

Ethical Clearance number:
UFS-HSD2020/0292/2608

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Dr Adri Du Plessis
Chairperson: General/Human Research Ethics Committee

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www.ufs.ac.za

ANNEXURE B: RESPONDENTS CONSENT FORM

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

RESEARCH STUDY INFORMATION LEAFLET AND CONSENT FORM

DATE
08 July 2020

TITLE OF THE RESEARCH PROJECT
The Effects of the Project Managers' Skills on Construction Productivity

PRINCIPLE INVESTIGATOR / RESEARCHER(S) NAME(S) AND CONTACT NUMBER(S):
Catherine Robbertse 2008005943 Contact Number: 0782985394

FACULTY AND DEPARTMENT:
Faculty of Natural and Agricultural Sciences
Department of Quantity Surveying and Construction Management

STUDYLEADER(S) NAME AND CONTACT NUMBER:
Dr. Christopher Amoah (Staff Number: 0884722)
Contact number: 051 401 3326

WHAT IS THE AIM / PURPOSE OF THE STUDY?
The theoretical importance of this study is to introduce the importance of construction productivity, the factors affecting construction productivity, and skills and capabilities of the project manager as a remedy to achieve the maximum construction productivity levels in a South African industry which is in a critical and dire stance.

The practical significance refers to the outcomes of the research which can be used by any construction company in South Africa as a tool to focus their actions and thoughts on practical ways in which maximum productivity can be achieved by making use of the project managers' skills. Human resource departments of construction companies, can use the scale of important skills and qualities, when appointing project managers' in positions where construction productivity is critical.

WHO IS DOING THE RESEARCH?
Catherine Robbertse is a student at the University of the Free State. She is conducting the research in fulfilment of the requirements in respect of the degree of Masters in Land and Property Development in the Department of Quantity Surveying and Construction Management in the Faculty of the Natural and Agricultural Sciences at the University of the Free State

HAS THE STUDY RECEIVED ETHICAL APPROVAL?
This study has received approval from the Research Ethics Committee of UFS. A copy of the approval letter can be obtained from the researcher.

Approval number: *UFS-HSD2020/0292/2608*

WHY ARE YOU INVITED TO TAKE PART IN THIS RESEARCH PROJECT?
Professionals in the industry have experience which when used in research can be immensely beneficial to the industry they are involved in. The experience these working professionals have differ from company-to-company and by using participants from across the construction industry, creates for all-

inclusive results across the construction sector. Participants asked to voluntary participate in the research was based on their involvement in the construction industry with a minimum of three years' experience. A minimum of 70 participants will be asked (via written consent) to participate on a voluntary base.

WHAT IS THE NATURE OF PARTICIPATION IN THIS STUDY?

The participant's role is to complete the set of demographic- and perception questions. The study involves a consent form and questionnaire to be completed on the Survey monkey online website, which will be issued to the participants via a link. The questionnaire is based on the participants' perception and experience.

CAN THE PARTICIPANT WITHDRAW FROM THE STUDY?

The participation includes completion of a questionnaire, which is voluntary. If the participant decide to part take in the study, this information sheet will be issued and the participant will be asked to sign the written consent form. The participant is allowed to withdraw from the study at any time before completion of the questionnaire and will not be penalized in any way. Withdrawal after completion of the questionnaire is however not possible.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The outcomes of the research can be used by any construction company in South Africa as a tool to focus their actions and thoughts on practical ways in which maximum productivity can be achieved by making use of the project managers' skills. Human resource departments of construction companies, can use the scale of important skills and qualities, when appointing project managers' in positions where construction productivity is critical.

WHAT IS THE ANTICIPATED INCONVENIENCE OF TAKING PART IN THIS STUDY?

Some inconvenience as to the time which needs to be set aside to complete the survey might be experienced, however it is estimated that the survey can be completed in a minimum of 15-minutes. To minimize any loss in work time, the survey will be done via Surveymonkey.. No other inconvenience is expected.

WILL WHAT I SAY BE KEPT CONFIDENTIAL?

Ant information given by the participant including their names will be kept confidential and none other than me, the researcher, will have access to this data. It will be safely locked up in a cupboard and stored on a password secured laptop, in order for it to be kept entirely private. No other person shall have access to any of the data provided by participants.

HOW WILL THE INFORMATION BE STORED AND ULTIMATELY DESTROYED?

The electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval and the participants consent. The information will be deleted by the deactivation of the monkey survey account at the end of the research. No foreseeable risks or harm will be caused to any participants of this study. All personal information will be kept confidential.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICPATING IN THIS STUDY?

No payments will be made for participation in this study.

HOW WILL THE PARTICIPANT BE INFORMED OF THE FINDINGS / RESULTS OF THE STUDY?

If the participant would like to be informed of the final research findings, please contact Catherine Robbertse on 0782985394 or email catherine.robbertse@gmail.com. The findings are accessible for 2020-09-15 until 2021-12-30. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Catherine Robbertse on 0782985394 or via email catherine.robbertse@gmail.com. Should you have concerns about the way in which the research has been conducted, you may contact Dr. Christopher Amoah on AmoahC@ufs.ac.za. No possible inconvenience or discomfort, other than the minimum 15-minutes to complete the survey, may occur from this study.

Thank you for taking time to read this information sheet and for participating in this study.

CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable). I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I agree to the recording of the *questionnaire*.

I have received a signed copy of the informed consent agreement.

Full Name of Participant: _____

Signature of Participant: _____ Date: _____

Full Name(s) of Researcher(s): Catherine Elizabeth Robbertse

Signature of Researcher: _____ Date: 21 August 2020

ANNEXURE C: QUESTIONNARE

QUESTIONNAIRE

SECTION A – Demographic Information

1. The type of firm the respondent is working for.
   ☐ Construction. ☐ Consulting. ☐ Other.
2. Size of the firm.
   ☐ Small. ☐ Medium. ☐ Large. ☐ International.
3. State the Year in which the firm / company was established. Click here to enter text.
4. The Respondents role in the firm.
   ☐ Consultant. ☐ Management. ☐ Quantity Surveyor. ☐ Architect. ☐ Engineer. ☐ Contracts Manager.
5. The gender of the respondent.
   ☐ Male. ☐ Female.
6. The age of the respondent.
   ☐ 21-30 Years. ☐ 31-40 Years. ☐ 41-50 Years. ☐ 51-60 Years. ☐ 61-70 Years. ☐ 71-80 Years.
7. The years of experience the respondent has in the construction industry.
   ☐ 0-2 Years. ☐ 3-5 Years. ☐ 5-10 Years. ☐ 10-20 Years. ☐ 20 Years+.
8. The professional qualifications the respondent has obtained.
   ☐ No degree. ☐ Diploma. ☐ Degree. ☐ Honnour's Degree. ☐ Master's Degree. ☐ Doctor's Degree.
9. The professional affiliation the respondent has obtained.
   ☐ Professional Registration obtained. ☐ Professional Registration not obtained.

SECTION B – The Perception of the Effect the Project Managers Skills have on Construction Productivity

10. Do you think the project managers' skills affect construction productivity?

Yes	No
☐	☐

11. If No answered in question 1, please elabourate why you think the project managers' skills does not affect construction productivity:

_____

_____

12. If Yes, please list the below skills from most to least important (with 1 being most important, and 11 being least important)
    - ☐ Communication Skills
    - ☐ Leadership Skills
    - ☐ Time Management Skills
    - ☐ Negotiation
    - ☐ Cost Control
    - ☐ Risk Management
    - ☐ Contract Management
    - ☐ Critical Thinking

- ☐ Coaching / Mentoring
- ☐ Quality Management
- ☐ Meetings Management

13. Tick off three project managers' skills which you think can **improve** construction productivity:
    - ☐ Communication Skills
    - ☐ Leadership Skills
    - ☐ Time Management Skills
    - ☐ Negotiation
    - ☐ Cost Control
    - ☐ Risk Management
    - ☐ Contract Management
    - ☐ Critical Thinking
    - ☐ Coaching / Mentoring
    - ☐ Quality Management
    - ☐ Meetings Management

14. What is the most important factors that influence construction productivity? Please list the factors from most to least important (with 1 being most important, and 10 being least important)
    - ☐ Material Shortages
    - ☐ Lack of labour skills and experience
    - ☐ Incompetent supervising and management
    - ☐ Poor leadership
    - ☐ Inefficient work methods
    - ☐ Poor project communication
    - ☐ Unforeseen events taking place
    - ☐ Poor site layout
    - ☐ Rework
    - ☐ COVID-19 work restrictions

15. What leadership style do you think is most efficient in terms of improving or maintaining good levels of construction productivity? Tick off no more than 2.
    - ☐ Autocratic Leadership (Leader have all the power, authority and responsibility. Little input from team members)
    - ☐ Charismatic Leadership (Leader transform attitudes and beliefs in employees. Power to inspire and influence people. The goals of the organization reflect this leader vision)
    - ☐ Transformational Leadership (Like charismatic leaders, they inspire others. However the leader is not present to effect change. Transformation is initiated through the organization to motivate employees)
    - ☐ Laissez-faire Leadership (Employees of these leaders are skilled and the leader maintains a hands-off approach to manage workers by providing them tools to do their job. Employees whom might need more guidance may struggle to work under this passive leadership style.)
    - ☐ Transactional Leadership (The employment is seen as a transaction. By accepting the job, the employee accepts to obey the leader and complete the tasks in exchange for compensation. Workers may be punished or rewarded based on their performance. Roles are well defined and people whom are ambitious may respond well to rewards and to this type of leadership style.)

- ☐ Supportive Leadership (Leaders delegate and assign tasks to the employees and provide the employees with skills needed to complete the tasks. The work through problems with employees and give a high degree of attention and coaching as needed. Supportive leaders tend to have compassion and is respectful towards their employees.)
- ☐ Democratic Leadership (Participative leadership style. All groups are or members are able to participate in decision-making processes. Leaders encourage discussion and the flow of ideas. Roles may be not so well defined which could create communication failures.)

16. What leadership style do you prefer to be managed by? Tick off no more than 2.
    - ☐ Autocratic Leadership
    - ☐ Charismatic Leadership
    - ☐ Transformational Leadership
    - ☐ Laissez-faire Leadership
    - ☐ Transactional Leadership
    - ☐ Supportive Leadership
    - ☐ Democratic Leadership

ANNEXURE D: ARTICLE

Publishable Paper

THE EFFECTS OF THE PROJECT MANAGERS' SKILLS

ON CONSTRUCTION PRODUCTIVITY

Submitted in Fulfilment of the Requirements in respect of the degree of Masters in Land and Property Development in the Department of Quantity Surveying and Construction Management in the Faculty of the Natural and Agricultural Sciences at the University of the Free State, Nelson Mandela Drive, Bloemfontein, 9301, South Africa

Year 2020

THE EFFECTS OF THE PROJECT MANAGERS' SKILLS ON CONSTRUCTION PRODUCTIVITY

(Student name to be inserted here)

Department of Quantity Surveying and Construction Management

University of the Free State

Bloemfontein, 9300, South Africa

(Student email to be inserted here)

ABSTRACT

Purpose

This study aims to determine the influence of the project managers' skills on construction productivity. The importance of construction productivity, management factors that influence construction productivity, the essential qualities and skills of a project manager, and the tools and techniques used by the project manager to influence construction productivity are studied. The empirical study will support the hypothesis and questions of this research.

Research Methodology

The study used a quantitative research approach that tests a hypothesis or theory to determine whether the hypothesis is true. A structured questionnaire made up of closed-ended questions was distributed, via the Survey Monkey platform, to construction individuals working in the South African construction industry.

Findings

The main findings of the study showed that the project managers' skills affect construction productivity. Incompetent supervising and management, poor leadership skills, lack of labor and skills and experience, and poor communication is indicated as the main factors that influence productivity. The project managers' main skills affecting construction

productivity include communication and leadership skills. Communication, leadership, and time management skills are the main project managers' skills that would also improve construction productivity. The two leadership styles that would maintain and improve construction productivity is charismatic and supportive leadership. The respondents also indicated that they prefer to be managed by charismatic and supportive leadership.

Limitations

The literature research is limited to construction project managers' skills, knowledge, and experience. The empirical study is limited to only construction individuals with a minimum of three years' experience, based in South Africa.

Practical Implications

The study contributes to the understanding of the influence of the project managers' skills on construction productivity. Therefore, the study contributes to project management in an unstable economic environment where the survival of companies depends on satisfactory productivity levels. It is envisaged that the study also contributes to developing the project managers' people skills by way of effective communication and leadership management.

The value of the paper

The study has revealed the project managers' skills to increase construction productivity and what they must do to enhance the output of the project they manage. Human resource departments of construction companies can use the study's findings to identify the essential skills and qualities when appointing project managers' in positions where construction productivity is critical. The project management training institutions can identify areas where they must emphasise project managers' training by referencing the study's findings.

Keywords: Construction, Productivity, Project Manager, Project Management, Skills

1. Introduction

Kerzner and Belack (2010) define project management as an attempt to improve efficiency and effectiveness, using resources by getting work to flow in a multidirectional manner through an organization. Project management is also seen as applying knowledge, skills, tools, and techniques to project activities to achieve project requirements (Heagney, 2016: 4).

Many companies are focused on keeping desirable profit margins in the current declining economy. Improved construction productivity rates deliver a higher probability of desired profit margins. Kazaz, Ulubeyli, Acikara, & Er (2016: 28) researched factors affecting labour productivity and noted that construction projects significantly contribute to national economies, especially in developing countries, such as South Africa.

Bierman, Marnewick, and Pretorius (2016: 37-38) indicated that productivity could improve if either the output increases with the input staying constant or if the input decreases and the output remains constant while describing that productivity will improve if the quantity of labour used stays constant whilst the project performance increase, or if the quantity of labour used decrease when the project performance remains constant.

Because of the immense pressure the current economy is facing, with high unemployment rates and the COVID-19 lockdown regulations where many companies could not operate at full capacity, attention is drawn to improving construction productivity. The study focuses on utilising the project managers' skills to maintain or improve construction productivity levels.

The criteria (Cooke-Davies, 2002: 185) used to measure the success or failure of projects would include construction cost, construction time, cost predictability, time predictability, defects, client satisfaction with products, and client satisfaction with service (Takim & Akintoye, 2002: 545). The project time is controlled by assigning accountability clearly and effectively managing risk (Dinsmore & Cooke-Davies, 2006). The project cost is controlled by controlling the scope and maintaining a performance measurement baseline, which means time, cost, and technical progress are monitored simultaneously (Dinsmore & Cooke-Davies, 2006).

Since the reconstruction of towns and buildings after the Second World, studies have been conducted to improve construction workers' performance (Olomolaiye, Jayawardane, & Harris, 1998: 1). The practice was to increase the construction worker's remuneration in order to increase the project performance, but it was soon realised that other factors, such as the management of the construction workers, also affect the projects' level of productivity (Olomolaiye, Jayawardane & Harris, 1998).

In this study, the researcher will confirm the importance of construction productivity and how the project manager influence construction productivity.

The literature study will provide an overview of the importance of construction productivity, project management (Kerzner & Belack, 2010) and how skills, experience, and knowledge are applied to efficiently manage construction, which enables the researcher to define productivity as a parameter (Cambridge Dictionary, 2019: Online), which determines project success (Kerzner, 2006) and how it can be measured and managed (Peter Landau, 2017).

2. Literature Review

2.1. Factors affecting construction productivity

The construction industry is one of the most important industries of a country, supporting economic development (Dixit, Mandal, Thanikal & Saurabh, 2018: 1). Productivity is defined as the rate at which a country, company, etc., produces goods or services, usually judged concerning the number of people and the time taken to produce them (Cambridge Dictionary, 2019). Thus, productivity is a determining factor of every company's success and competitiveness (Enshassi *et al.,* 2013: 175).

In an article by Bierman, Marnewick, and Pretorius (2016: 37) they state that the South African labour productivity levels are less efficient than its emerging market competitors and one of the lowest in the developing world. However, many international studies have come to identify low rates of productivity growth over the past decade (Dixet *et al.,* 2018: 1; Shahhosseini *et al.,* 2016: 93; Al-Hazim *et al.,* 2017: 18; Ibironke & Elamah, 2011: 1; Enshassi *et al.,* 2013: 173).

Due to the challenges the construction industry face, contractors are trying to stay competitive in terms of profitability by using tools to survive and remain in the market, such as controlling construction productivity (Enshassi *et al.,* 2013: 174). Thus the productivity of labour influences both the profitability and survival of companies and is a crucial issue (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016: 29).

Shehata and El-Gohary (2012: 324) state that the construction industry's main difficulties are a declining rate of productivity and a lack of productivity standards. Many factors are contributing to low levels of productivity. Kazaz and Acikara (2015: 491) motivate poor productivity to a complex of factors, such as labour, experience, skills, leadership and competency, lack of labour experience, shortage of materials, labour supervision, lack of cooperation and communication and rework, to name a few (Makulsawatudom & Emsley, 2001: 286-288).

Shehata and El-Gohary (2012: 324) provide three areas of factors, which could affect productivity, namely, industry-related, management-related, and labour-related factors. Industry-related factors would include complex designs, building codes, and use of construction technology, regulatory laws, project characteristics, adverse weather conditions, and locality of projects (Shehata & El-Gohary, 2012: 324).

Management-related factors would include project planning and scheduling, management style (Shan, Goodrum, Goodrum, Zhai, Haas & Caldas, 2010: 305), project leadership, communication (Zulch, 2014: 176), and work motivation (Shehata & El-Gohary, 2012: 324), such as team-building (Heagney, 2016: 176; Shan *et al.,* 2010: 310) and development (Heagney, 2016: 182). Labour-related factors would include the workforce's skills, motivation to work, and skilled labour availability (Shehata & El-Gohary, 2012 325).

Kerzner (2017: 3) identified eight (8) potential benefits of effective project management, namely defined responsibilities of the deliverables of team members; minimal reporting requirements; time limits identified; identification of methodology for trade-off analysis; effective progress measurement; early problem identification; experience for estimating future project gains and identify the objectives, which might not be reached or be exceeded.

Project management has to do with getting people to execute work that is required to meet the project objectives (Heagney, 2016: 27). The inefficient management of construction resources (including human resources) is one of the key contributors to low productivity Shehata and El-Gohary (2012: 324)

2.2. Important skills and qualities of a project manager

Project management in this study focuses on the project manager in the construction industry. Different projects have different levels of complexity. Each complexity level would require a specific set of skills to manage and deliver the project successfully. The project manager's skills must be matched with the project's complexity to prevent the loss of project control and project failure (Mouchi, Rotimi, & Ramachandra, 2011: 89).

The project manager needs to be an effective leader. Leadership is defined as getting people to do something that you (the Leader) believe should be done (Mouchi *et al.,* 2011: 91). Walker (2015: 230) defines leadership as a way managers conduct themselves to get the best results from the people they are managing, or as "*working through others*" (Walker, 2015: 231). Therefore, it is possible to state that "good people skills" is the primary skill expected from a project manager (Mouchi, 2011: 91).

After assessing the project environment or situation, the project manager may adopt a single leadership style or a combination, depending on the most effective style (Zulch, 2014: 173). The study identified seven (7) different leadership styles, namely autocratic leadership (Walker, 2015: 235), charismatic leadership (Walker, 2015: 238), transformational leadership (Klippenberger, 2002: 16), laissez-faire leadership (Klippenberger, 2002: 16), transactional leadership (Klippenberger, 2002: 94), supportive leadership (Klippenberger, 2002: 92), and democratic leadership (Klippenberger, 2002: 16).

Andrew Comley, Chairman of the SAICE PMCD, states that for the successful completion of a project, a project manager must be able to plan, control and monitor and effectively communicate with all team members (Comley, 2018: 38).

Another definition of communication would be to "be understood" and to "understand others" (Yemm, 2012: 92). Zulch (2014: 177) indicates that seventy percent (70%) of

communication between project teams and stakeholders is verbal communication, which is immediate and direct and often misunderstood. Listening skills are just as important as talking skills and can only be effective in four stages, namely to hear the message, interpret the message, and evaluate the content of the message, and a reaction or no reaction (Yemm, 2012: 102).

Communication on the various project team levels can become an art, science, circus, or torment (Heagney, 2016: 196). Campbell targeted five hundred (500) project managers and asked them to indicate the biggest determining factors for project success and failure and found that the projects with strong communication were the projects nearly always successful (Campbell, G.N., 2009).

2.3. Theories and tools available for the project manager to manage construction productivity

There are many existing studies providing methods to measure construction productivity (quantitative studies) (Shinde & Hedaoo, 2017: 1170), studies which indicate key performance indicators of productivity (Takim & Akintye, 2002: 546-547), and studies providing the parameters, which influence construction productivity (Shinde & Hedaoo, 2017: 1171; Koelmans, 2004: 231-232). Pan and Zhan (2020: 2) studied productivity enhancement strategies and defined the total factor of productivity as a measure in which the efficient use of resources, namely labour capital and materials, is exerted to produce an output.

Research has proven that many studies identifying the factors which motivate individuals have been conducted, namely Maslow's (Yemm, 2012: 109), Douglas McGreggor's (Adrian, 1987: 118-119), and Herzberg's motivation theory (Yemm, 2012: 110). The theories are based on the level of satisfaction which humans would experience. The higher the level of satisfaction a team member experiences, the better the productivity rate will be.

The project team and how the individuals operate as members of the team have a significant impact on productivity. Hall (2019: 149) quoted an African proverb by stating,

“If you want to go quickly, go alone. If you want to go far, go together.” The project manager, as a leader, can, therefore, also focus on team-building and development.

Team-building is designed to bring together the project-specific stakeholders for the best possible project outcome (Shan *et al.,* 2011: 306). Building an effective project team where members are committed and involved should be the project manager's intention from the first day the team exists (Heagney, 2016: 176). The projects that had team-building involved throughout the planning, design, and construction phases had better productivity levels than projects that did not involve team-building throughout these phases (Shan *et al.,* 2011: 311).

Good leaders can bring out their team's characteristics by using a variety of means (Yemm, 2016: 114). There are many ways leaders can develop, encourage, and support team members, which would increase productivity. Many believe that overworking would increase productivity; however, research proved the opposite (Hall, 2019: 14). One of the most common ways a leader can develop their team members is coaching, inspiring team members to maximize their potential in a thought-provoking and creative process (Hall, 2019: 3).

3. Methodology

The research approach is based on a quantitative approach based on the structured questionnaires issued to participants. The quantitative research approach tests a hypothesis or theory to determine whether the hypothesis is true (Naoum, 2007: 37-38). The hypothesis is a tentative proposition, tested and verified through the research study (Naoum, 2007: 16). This study's research method is based on a hypothesis, which was formulated and tested through a quantitative research approach. The data used in this quantitative research in this study is reliable and not abstract and is used, based on the hypothesis and objectives, which are used to verify the theories surrounding the factors influencing construction productivity, as stipulated in chapter one. The quantitative research method offers an objective research method, which is well suited for verifying the theories on which this study is based.

3.1. Sampling methods and size

A stratified sampling method is used to select a group of respondents who are relevant to the field of research and would not negatively affect the integrity of the study. Representative sampling is mainly used in quantitative research. Blumberg et al. (2014: 174) give four reasons why sampling is used, namely lower cost, greater accuracy of results, greater speed of data collection, and the limited availability of population elements. The empirical study's target population will be South African construction professionals, such as project managers, construction consultants, labour-only subcontractors, general subcontractors, and specialized subcontractors. The participants will require a minimum of three years' experience in the construction industry, based in South Africa and will be contacted through established working connections.

3.2. Response rate

The research required a minimum of seventy (70) respondents. Hundred and seventy (170) respondents were invited to partake in the study, of which sixty-two (62) successfully completed the survey. This results in a thirty-six percent (36%) response rate.

3.3. Data collection method

The researcher followed a structured program with gathering the data of the study. A list of proposed respondents who fall within the criteria of the required sample was put together. Their contact details were also added to the list. Once the approval to proceed with the research was granted, the respondents were contacted through email and were issued the consent form along with the structured questionnaire. The researcher created a survey monkey account, which assisted with the electronic completion of the surveys by allowing the participants to survey any electronic advice within the Covid-19 social distancing regulations and saving the potential researcher time and travel costs expenses. The respondents were issued with the researcher's contact details and could at any time contact the researcher for assistance and clarification.

3.4. Data analysis and interpretation

A structured questionnaire is used to collect the data required for the empirical study. The questionnaire is structured into two sections, namely Section A: Demographic Information and Section B: Questions addressing the effect the project managers' skills have on construction productivity. Section A consists of nine (9) closed-ended questions, and Section B consists of six (6) closed-ended questions and one open-ended question based on a specific answer.

A quantitative analysis is used, which produced the primary data used in the study. A descriptive statistics method is used to analyze the results in frequency distribution in Tables (Naoum, 2007: 103). The data, as collected in the questionnaires, are tabulated for the interpretation of the findings. A frequency data interpretation tool is used for the questions where two or three answers are required to be selected. A weighted factor interpretation tool is used for the questions that required items to be listed from most likely to least likely. The features of the respondents who participated in the survey are shown in Table 1.

Table 1: Features of Respondents

Nature of the Respondents	Number of the Respondents	Percentages
Type of firm where the respondent is employed:		
Construction	46	74.19%
Consulting	7	11.29%
Other	9	14.52%
Total	**62**	**100.00%**
Size of the firm at which the respondent is employed:		
Small	12	19.35%
Medium	19	30.65%
Large	25	40.32%
International	6	9.68%
Total	**62**	**100.00%**
Year in which the firm was established:		
1970 and earlier	30	46.88%
1971-1980	3	4.62%
1981-1990	1	1.54%
1991-2000	10	15.38%
2001-2010	8	12.31%
2011-2020	13	20.00%
Total	**62**	**100.00%**
Respondents role in the firm:		
Consultant	4	6.45%
Management	21	33.87%
Quantity Surveyor	18	29.03%

Architect	0	0.00%
Engineer	11	17.74%
Contracts Manager	8	12.90%
Total	**62**	**100.00%**
Respondents gender:		
Male	49	79.03%
Female	13	20.97%
Total	**62**	**100.00%**
Respondents age:		
21-30 Years	17	27.42%
31-40 Years	17	27.42%
41-50 Years	14	22.58%
51-60 Years	8	12.90%
61-70 Years	6	9.68%
71-80 Years	0	0.00%
Total	**62**	**100.00%**
Respondents years of experience:		
0-2 Years	1	1.61%
3-5 Years	11	17.74%
6-9 Years	8	12.90%
10-20 Years	24	38.71%
21 Years+	18	29.03%
Total	**62**	**100.00%**
Respondents qualifications:		
No qualification	5	8.06%
Diploma	17	27.42%
Degree	21	33.87%
Honours' Degree	15	24.19%
Masters' Degree	3	4.84%
Doctors' Degree	1	1.61%
Total	**62**	**100.00%**
Respondents Professional Registration obtained:		
Yes	17	27.42%
No	45	72.58%
Total	**62**	**100.00%**

Source: (Own Contribution, 2020)

Table 1 shows that the majority of the respondents are working at large construction firms established before the year 1970 and who are males in management positions with 10-20-years' experience. The ages are almost equally spread, with most Respondents between the ages of 21-50 years. The majority of the Respondents also have the qualification and are not professionally registered.

4. Findings

4.1. Respondents views on project managers' skills affecting construction productivity

The respondents were asked to indicate whether they believe the project managers' skills affect construction productivity. The question is relevant to the study because the hypothesis is based on construction productivity. Therefore, if the respondent indicates that he or she does not believe the project manager's skills affect construction productivity, the respondent would not complete the questionnaire's remaining questions.

Table 2: Project managers' skills affecting construction productivity

Project managers' skills affecting construction productivity	Response Number	Percentage
Yes	62	100.00 %
No	0	0 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

Based on the results in Table 2, all the respondents agreed that the project managers' skills affect construction productivity, indicating that the following question's results can be used for the purpose of the study.

4.2. Respondents views on the important project management skills affecting construction productivity

The respondents were asked to list the proposed project management skills from most important to least important. This question would provide the key attributes construction- and consultant companies could use to determine whether candidates applying for project manager positions would maintain construction productivity levels and improve the levels of construction productivity to desired rates of productivity.

Table 3: Respondents views on the important project management skills affecting construction productivity

	Percentage of the respondents who ranked skills (quantity of respondents who listed the ranking, divided by 62) (with 1 being most important and 11 being least important)												
Listed Project Managers' Skills	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Weighted Value**	**Importance ranked**
Communication Skills	37.10%	32.26%	11.29%	6.45%	1.61%	3.23%	1.61%	1.61%	3.23%	0.00%	1.61%	9.40	**1**
	23	20	7	4	1	2	1	1	2	0	1		
Leadership Skills	32.26%	30.65%	8.06%	9.68%	4.84%	4.84%	1.61%	3.23%	1.61%	3.23%	0.00%	9.06	**2**
	20	19	5	6	3	3	1	2	1	2	0		
Time Management Skills	8.06%	9.68%	27.42%	16.13%	6.45%	6.45%	17.74%	4.84%	0.00%	1.61%	1.61%	7.58	**3**
	5	6	17	10	4	4	11	3	0	1	1		
Negotiation	1.61%	1.61%	1.61%	9.68%	4.84%	14.52%	12.90%	14.52%	17.74%	11.29%	9.68%	4.55	**9**
	1	1	1	6	3	9	8	9	11	7	6		
Cost Control	3.23%	4.84%	6.45%	8.06%	25.81%	16.13%	9.68%	8.06%	11.29%	6.45%	0.00%	6.11	**6**
	2	3	4	5	16	10	6	5	7	4	0		
Risk Management	3.23%	3.23%	11.29%	16.13%	16.13%	12.90%	9.68%	11.29%	8.06%	8.06%	0.00%	6.23	**5**
	2	2	7	10	10	8	6	7	5	5	0		
Contract Management	11.29%	8.06%	12.90%	9.68%	9.68%	14.52%	12.90%	8.06%	6.45%	3.23%	3.23%	6.79	**4**
	7	5	8	6	6	9	8	5	4	2	2		
Critical Thinking	3.23%	4.84%	14.52%	12.90%	11.29%	8.06%	11.29%	17.74%	8.06%	4.84%	3.23%	6.10	**7**
	2	3	9	8	7	5	7	11	5	3	2		
Coaching / Mentoring	0.00%	0.00%	1.61%	4.84%	4.84%	6.45%	3.23%	8.06%	12.90%	25.81%	32.26%	2.97	**10**
	0	0	1	3	3	4	2	5	8	16	20		
Quality Management	0.00%	4.84%	4.84%	3.23%	11.29%	8.06%	16.13%	17.74%	19.35%	11.29%	3.23%	4.81	**8**
	0	3	3	2	7	5	10	11	12	7	2		
Meetings Management	0.00%	0.00%	0.00%	3.23%	3.23%	4.84%	3.23%	4.84%	11.29%	24.19%	45.16%	2.40	**11**
	0	0	0	2	2	3	2	3	7	15	28		

Source: (Own Compilation, 2020)

Communication- and leadership skills weighted factors were 9.40 and 9.06 and indicated as the first and second most important project managers' skills affected productivity. The third most important skill affecting productivity is time management with a weighted factor of 7.58.

4.3. Respondents view on the project managers' skills which would improve construction productivity

The respondents were asked to indicate which of the previous question's skills would improve construction productivity.

Table 4: The three project managers' skills which would improve construction productivity

The three project managers' skills which would improve construction productivity	Frequency (Number of respondents whom selected the skill)	Percentage
Communication Skills	44	70.97 %
Leadership Skills	32	51.61 %
Time Management Skills	23	37.10 %
Negotiation	3	4.84 %
Cost Control	9	14.52 %
Risk Management	17	27.42 %
Contract Management	20	32.26 %
Critical Thinking	18	29.03 %
Coaching / Mentoring	6	9.68 %
Quality Management	14	22.58 %
Meetings Management	0	0.00 %
Total	**62**	**100.00 %**

Source: (Own Compilation, 2020)

The results indicated that 70.97% of the respondents believe that the project managers' communication skills are the most important skills, leading to construction productivity improvement. 51.61% of the respondents believed that the project managers' leadership skills are the second most important skill, which would lead to construction productivity improvement. 37.10% of the respondents believed that the project managers' time management skills are listed as the third most important skill, leading to construction productivity improvement.

4.4. Respondents views on the most to least important factors affecting construction productivity

In this question, the respondents were asked to rank factors that would affect construction productivity, from most to least likely.

Table 5: The factors affecting construction productivity ranked from most to least likely

Listed Factors affecting productivity	Percentage of the respondents who ranked factors (quantity of respondents who listed the ranking, divided by 62) (with 1 being most important and 11 being least important)									Weighted Value	Importance ranked
	1	2	3	4	5	6	7	8	9		
Material Shortages	4.84%	11.29%	9.68%	8.06%	17.74%	22.58%	14.52%	3.23%	8.06%	4.87	6
	3	7	6	5	11	14	9	2	5		
Lack of Labour Skills & Experience	19.35%	12.90%	17.74%	19.35%	16.13%	6.45%	4.84%	1.61%	1.61%	6.44	3
	12	8	11	12	10	4	3	1	1		
Incompetent Supervising & Management	19.35%	25.81%	17.74%	16.13%	11.29%	3.23%	4.84%	1.61%	0.00%	6.89	1
	12	16	11	10	7	2	3	1	0		
Poor Leadership	24.19%	16.13%	20.97%	12.90%	9.68%	3.23%	6.45%	4.84%	1.61%	6.63	2
	15	10	13	8	6	2	4	3	1		
Inefficient Work Methods	3.23%	11.29%	16.13%	11.29%	19.35%	24.19%	4.84%	9.68%	0.00%	5.27	5
	2	7	10	7	12	15	3	6	0		
Poor Project Communication	22.58%	12.90%	11.29%	16.13%	12.90%	14.52%	3.23%	4.84%	1.61%	6.26	4
	14	8	7	10	8	9	2	3	1		
Unforeseen Events taking place	1.61%	6.45%	3.23%	4.84%	6.45%	8.06%	35.48%	27.42%	6.45%	3.50	7
	1	4	2	3	4	5	22	17	4		
Poor Site Layout	1.61%	0.00%	1.61%	8.06%	4.84%	12.90%	14.52%	32.26%	24.19%	2.82	8
	1	0	1	5	3	8	9	20	15		
Covid-19 Work Restrictions	3.23%	3.23%	1.61%	3.23%	1.61%	4.84%	11.29%	14.52%	56.45%	2.32	9
	2	2	1	2	1	3	7	9	3535		

Source: (Own Compilation, 2020)

The results indicated that incompetent supervising and management with a weighted value of 6.89, is seen as the most important factor which would influence construction productivity the most, poor leadership with a weighted value of 6.63 is indicated as the second factor which would influence productivity negatively, the lack of labour skills and experience with a weighted factor of 6.44 is listed as the third factor which would influence productivity negatively,

4.5. Respondents views on the two most efficient leadership styles for improving or maintaining good levels of construction productivity

The respondents were asked to select what they believe the two most efficient leadership styles for improving or maintaining acceptable construction productivity levels are.

Table 6: The two most efficient leadership styles for improving or maintaining good levels of construction productivity

The two most efficient leadership styles for improving or maintaining good levels of construction productivity	Frequency	Percentage
Autocratic Leadership	2	3.23%
Charismatic Leadership	38	61.29%
Transformational Leadership	10	16.13%
Laissez-faire Leadership	1	1.61%
Transactional Leadership	8	12.90%
Supportive Leadership	43	69.35%
Democratic Leadership	10	16.13%
Total		**100.00%**

Source: (Own Compilation, 2020)

The results indicated that 69.35% of the respondents believe that a supportive leadership style would be the preferred leadership style to maintain and improve construction productivity levels. Secondly, 61.29% of the respondents indicated a charismatic leadership style would maintain and increase construction productivity levels. The respondents indicated that the other leadership styles, such as laissez-faire, had a 1.61%, autocratic leadership style had a 3.23%, transformational leadership style had a 16.13%, and transactional leadership style had a 12.90% chance of maintaining and improving construction productivity levels.

4.6. Respondents preference of two leadership style to be managed by

The respondents were asked to indicate the two leadership styles they prefer to be managed.

Table 7: Respondents preference of two leadership style to be managed by

Respondents preference of two leadership style to be managed by	Frequency	Percentage
Autocratic Leadership	1	1.61%
Charismatic Leadership	32	51.61%
Transformational Leadership	9	14.52%
Laissez-faire Leadership	2	3.23%
Transactional Leadership	6	9.68%
Supportive Leadership	50	80.65%
Democratic Leadership	10	16.13%
Total		**100.00%**

Source: (Own Compilation, 2020)

The results indicated that 1.61% of the respondents preferred to be managed by autocratic leadership style, 51.61% preferred to be managed by charismatic leadership style, 14.52% preferred to be managed by transformational leadership style, 3.23% preferred to be managed by laissez-faire leadership style, 9.68% preferred to be managed by transactional leadership style, 80.65% preferred to be managed by supportive leadership style and 16.13% preferred to be managed by democratic leadership style.

4.7. Discussion of the Findings

4.7.1. The project managers' skills that influence construction productivity

The literature research addresses the importance of productivity due to productivity's influence on the profitability and the survival of companies (Yates, 2014; Kazaz, A., Ulubeyli, S., Acikara, T. & Er, B., 2016: 29). From the findings, it is evident that the project managers' skills influence construction productivity. The findings in Table 2 confirm that all the respondents believe that the project managers' skills influence construction productivity.

The respondents had to rank the project managers' skills from most important to least important in Table 3. It is evident from the findings that the most important project management skill, which affects productivity, is communication skills. Leadership skills and time management skills were the second and third most important project management skills affecting productivity. Makulsawatudom and Emsley (2001: 286-288) support the findings of communication and leadership skills in their research where they identify incompetent supervisors and poor communication as two of the contributing factors which affect productivity. The literature review also supports that communication (Zulch, 2014: 176) and the different leadership styles (Shan, Goodrum, Goodrum, Zhai, Haas & Caldas, 2010: 305), affect the outcomes of a project. Liikamaa (2015: 682) also confirms that an effective project manager needs to be a good communicator. The project manager must be able to monitor effective communication with all project team members (Comley; 2018: 38).

As per the results in Table 3, the respondents did not emphasise negotiation and coaching or mentoring skills and ranked meeting management as the project managers' skill, affecting productivity. In the literature research, Yemm (2012: 116) emphasized that a good leader must coach, and Hall (2019: 19) stated that positive changes to productivity are witnessed by those receiving coaching. The literature research does not support the research outcomes, indicating that coaching or mentoring skills is the fourth ranked project management skill that would influence productivity.

4.7.2. The project managers' skills, leadership styles, knowledge, and experience influence the human factor of construction productivity

Bierman *et al.* (2016: 38) confirmed in their findings that material shortages, the lack of labour experience, incompetent supervising, work methods, late issue of drawings, poor project communication, unforeseen events that are taking place, poor site layout, the constructability of work and rework, affect construction productivity.

The respondents had to rank the factors they believe affect construction productivity from most to least likely, as indicated in Table 5. The findings confirmed that the respondents emphasize incompetent supervising and management, poor leadership, and the lack of labour skills and experience as the three main factors that negatively influence productivity.

Makulsawatudom and Emsley (2001: 286-288) did not confirm that the lack of labour skills and experience affect productivity in Thailand; however, Bierman, Marnewick, and Pretorius (2016: 39) confirmed that the lack of labour skills and experience do influence productivity in South Africa. Adebowale and Smallwood (2018: 1) studied the challenges contributing to poor productivity in the South African construction sectors, such as workers with inadequate skills, a lack of leadership, and contractors not having sufficient project planning experience, as some of the factors affecting productivity in South Africa.

Bierman *et al.* (2016: 38) identified in their findings that unforeseen events taking place, and poor site layout, as one of ten (10) factors that affect construction productivity. The research findings confirm that unforeseen events taking place, poor site layout, and work restrictions due to covid-19 social distancing measures are seen as the three factors that

would least likely negatively influence productivity. When the building industry was allowed to operate during the covid-19 lockdown, certain social distancing restrictions affected the amount of labour allowed in a confined space and the screening process, which increased the clock in time for all construction workers. The respondents listed covid-19 working restrictions as the factor that would least likely negatively influence productivity.

4.7.3. Project Managers' skills to Improve Construction Productivity

The literature research addresses the importance of a qualified and skilled project manager. Projects have different levels of complexity. Knipe *et al.* (2010: 19) identify the factors which determine the complexity of a project as the nature of the proposed work scope; the number of people involved; the number of resources available and required (time and capital), and the level of innovation (such as technology) involved. Therefore, the project managers' skills must be project manager's skills must be matched with the project's complexity to prevent the loss of project control and project failure (Mouchi, Rotimi & Ramachandra, 2011: 89).

Project management has to do with getting people to execute work, which is required to meet the project objectives (Heagney, 2016: 27). The project manager is required to apply human resource skills to motivate (Langford *et al.,* 1995: 80) resources to execute the work to improve productivity. This is achieved by implementing effective leadership and communication (Zulch, 2012; Burger, 2013; Cerff, 2015).

The respondents had to select the three project managers' skills that would improve construction productivity. The findings in Table 4.9 confirm that all the respondents believe that the project managers' communication, leadership, and time management skills would improve construction productivity.

4.7.4. Project Managers' Leadership Styles to improve construction Productivity

The literature study addressed the different leadership styles and the degree of interaction between the leader and followers. As a leader, the project manager has the task of getting people to effectively follow instructions (Mouchi *et al.,* 2011: 92). This task would not

necessarily result in productivity being maintained or increased; however, for productivity to be improved, the project manager would have to "*work through others"* (Walker, 2015: 231).

The respondents also had to indicate what leadership styles they believe would improve or maintain satisfactory productivity levels, as indicated in Table 6. The results confirmed that the respondents believe supportive and charismatic leadership styles are the most effective leadership styles for improving and maintaining productivity levels.

The literature research address the importance of the project manager adapting to a single or combination of leadership styles, based on assessing the project environment or situation (Zulch, 2014: 173).

Supportive leadership is described as a leader who takes into account the behavior and motivation of the followers by showing concerns for their needs and wants, whilst offering rewards for performance, clear set goals, and objectives and removing obstacles, which hinder performance (Klippenberger, 2002: 92). Charismatic leadership is described as the leader being an inspiration to the project team, an excellent communicator, very much like politicians (Walker, 2015: 238). These two leadership styles have people-orientation in common, where supportive leaders are concerned over people's needs and offer performance rewards as motivation. The charismatic leader is an excellent communicator and inspiration to team members. Performance rewards and motivation, driven by the project manager, could be identified as a tool that a project manager could use to improve productivity.

As per Table 6, the results indicated that the two least preferred leadership styles for improvement or maintaining productivity, as perceived by the respondents, would be laissez-faire- and autocratic leadership.

It can be noted that leadership styles where the team members receive no input from the project manager or where the project team is not included in decision-making activities are prescribed as insufficient for productivity improvement.

The respondents had to indicate which leadership styles they prefer to be managed by, as indicated in Table 7. The results confirmed that the respondents prefer to be managed

by the same leadership styles, which increase or maintain productivity levels, namely supportive and charismatic leadership styles. Therefore, the two most effective leadership styles for improving and maintaining productivity levels and for project team satisfaction would be supportive and charismatic leadership styles.

5. CONCLUSION AND RECOMMENDATIONS

The building industry plays a significant role in the economic development of South Africa. The current economic crisis has caused much concern across all industries. In particular, infrastructure development, the construction industry provides a significant amount of projects in South Africa. Many of these projects are only executed by experienced contractors because of the complexity. Projects have different levels of complexity. MEP projects tend to be more complicated in terms of materials and equipment. Projects managers' who have MEP experienced would be utilised on such projects. Productivity plays a major role in the profitability of companies. Productivity in construction is easily measured, as there are quantities and amounts linked to specified work scope. The costing of the work scope enables the project team to calculate the productivity of labour onsite.

Based on the study's findings and discussions, it is evident that the project managers skills' play a determining role in the level of construction productivity onsite. These skills would be divided into two areas: the skills as defined in the PMBOK 's ten (10) knowledge areas and the deliverables that go along with such and the people skills. People-skills is vital for good communication and leadership management. As the project manager is moved to alternative sites with alternative staffing, the project manager must be able to identify productivity risks and resolve them. The project manager needs to constantly evolve and adapt to the project circumstances in which he or she is in. Using situational leadership (adapt the style as the project requires) and using effective communication is believed to be elements that would improve construction productivity.

The project manager should be efficient and effective as a leader where attention is given to the workers' needs (Adrian, 1987: 113) and an effective and efficient communicator (Adrian, 1987: 114).

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ANNEXURE E: TURN IT IN REPORT

PMMD 7900_FINAL

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This letter certifies that I have edited the thesis detailed below.

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THE EFFECTS OF THE PROJECT MANAGERS' SKILLS ON CONSTRUCTION PRODUCTIVITY

Author:

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Regards
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