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DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

STUDY OF THE IMPACT OF MANAGEMENT SKILLS ON LABOUR PRODUCTIVITY IN THE BUILDING CONSTRUCTION INDUSTRY IN UGANDA

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DECLARATION

I, Natukunda Nathan, certify that this dissertation is my own original work with my effort, does not contain, without acknowledgement, any material previously submitted for any master's degree in any university and to the best of my knowledge and belief, it does not comprise any material previously published or written by another person except where due reference is made in text and the authors mentioned accordingly.

Student Signature: ……………………………… Date ………………………………

Natukunda Nathan

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Kyambogo University a dissertation titled: **"Study of the impact of management skills on labour productivity in building construction industry in Uganda"**, in fulfillment of the requirements for the award of a degree of Master of Science in Construction Technology and Management of Kyambogo University.

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DEDICATION

I would like to dedicate this dissertation report to the Almighty God, who never left me alone, gave me the life and health; thank you Jesus.

I also dedicate this report to my encouraging and obliging supervisors Dr. Muhwezi Lawrence and Dr. Ruth Sengonzi, for the knowledge and skills they gave me, may Almighty God bless you awesomely.

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LIST OF ABBREVIATIONS

CS	Conceptual Skills
ERB	Engineering Registration Board
FLMs	First Line Managers
GDP	Gross Domestic Product
IS	Interpersonal Skills
NCHE	National Council for Higher Education
RII	Relative Importance Index
TS	Technical Skills
UIPE	Uganda Institute of Professional Engineers
UNABCEC	Uganda National Association of Building and Civil Engineering Contractors

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ABSTRACT

The construction industry plays a significant role in integrating the economy of any developing country. Moreover, the growing rate of building construction projects has led to an increasing demand of competent first line managers (FLMs) in the building construction industry, who possess the right skills to effectively manage and supervise construction projects. FLMs' incompetence leads to cost and time overruns as well as poor quality work thus affecting labour productivity. The aim of this investigation was to study the impact of management skills on the productivity in the building construction industry in Uganda. Both quantitative and qualitative research approaches were used to gather data from 155 respondents who were purposively selected. This study categorized management skills under three groups: conceptual, interpersonal and technical skills. Their impacts were assessed using Relative Importance Index (RII) as a basis for analysis and a model was developed. The relationship was determined using regression analysis in R-Studio software. Findings revealed technical skills as the most significant management skill, followed by interpersonal skills and lastly conceptual skills. Model results showed a fairly strong significant effect with, R^2 above 0.70 an indication of a strong relationship between construction management skills and productivity. It is recommended that adequate attention should be paid to training, retraining and continuous professional development of people charged with supervisory roles on construction sites so as to achieve higher construction worker's productivity.

Key words: Management skills, Productivity, Building construction, First Line Managers

CHAPTER ONE: INTRODUCTION

1.1 **Background to the study**

The construction industry plays a significant role in integrating economies of developing countries because construction demand increases with economic growth and development (Dakhil, 2013; Anugwo & Shakantu, 2015; Alaghbari *et al*., 2019). In many developing countries, major construction activities account for about eighty percent of the total fixed assets and contribute about twelve percent of the Gross Domestic Product (GDP) of Uganda's economy (Ssewanyana *et al*., 2011).

In Uganda construction industry is the second largest employer to agriculture with over 1.3 percent of the total registered employees (Alinaitwe, 2008; UBOS, 2011). Among the registered employees, seventy seven percent are engaged in building construction industry and eighteen percent are engaged in Civil Engineering activities but a bigger percentage lack technical management skills (UBOS, 2011). The construction of new structures (commercial buildings, infrastructures, industrial zones with factories etc.) with the current official figures indicate that the growth rate in the sector averaged over 13 percent per annum between 2014 and 2016 (UBOS, 2017).

The increasing rate of building construction projects in developing countries like Uganda, has led to the increasing demand of management skills in the construction industry (Utting, 2010). Therefore, more attention should be given to the management skills in the construction industry. According to Hickson and Ellis (2014) and Ahmad *et al*., (2020), incompetent First Line Managers (FLMs) affect labour and equipment productivity leading to many consequences in the construction industry such as cost overruns, time overruns, disputes, poor quality work and project failure, among others.

In the recent past, there has been a significant concern of the failure and collapse of some structures at various sites like Busiga-Munyonyo, Kyaseka Tower on Makerere Hill Road, National Social Security Fund Pension Tower on Lumumba Avenue collapsed in Uganda which may be due to inadequate management skills of FLMs, weak foundation, poor materials, heavier load than expected and noncompliance with approved plan (Nakibuuka, 2017).

As cited by Nyangwara and Datche (2015) Idoko indicates that, many projects in developing countries are characterized by considerable time overruns, cost overruns and fail to realize their intended benefit. Some building construction projects are totally terminated and abandoned before or after their completion due to inadequate management skills of FLMs. In addition, building construction in Uganda is labour oriented industry. It is heavily relies on the construction management skills of its workforce such as construction managers, project managers and among others (Alinaitwe *et al*., 2013). These managers, a failure to possess required construction management skills leads to low productivity. Decreasing productivity of building construction projects has always been major concern for building construction industry. Previous studies by Ouko (2016) and Alaghbari *et al*., (2019) indicate that incompetence of FLMs is one of the critical problems leading low labour productivity of the construction industry in developing countries. Therefore construction management skills competence of FLMs needs to be one of the first priority considerations.

1.2 Problem Statement

In developing countries such as Uganda, building construction projects are still run using labour intensive methods (Alinaitwe *et al*., 2013; Alaghbari *et al*., 2019). Low productivity is one of the most and severe challenges faced by the building construction contractors (Alaghbari *et al*., 2019; Ahmad *et al*., 2020). This partially explains the reason behind the big number of over 4 percent of uncompleted and abandoned buildings, poor quality work, cost and time overruns as a result of low labour productivity (UBOS, 2017).

In addition, the cost of labour in building construction industry is estimated to be about 30 percent to 50 percent of the entire project cost (Gundecha, 2012; Robles *et al*., 2014), yet little or no attention has been paid to the impact of management skills on labour productivity in building construction projects. The persistence of low labour productivity has become a significant concern to the construction contractors Alinaitwe *et al*., 2013; Ainobushoborozi, 2013; Alaghbari *et al.*, 2019). This may indicate that, there are still weaknesses in the construction management skills of FLMs during the execution of construction projects. If this is not addressed, there is a likelihood of continued low labour productivity, which translates into financial losses, contractual disputes and time overrun to both clients and contractors.

A number of studies have been conducted on the factors affecting productivity on building construction projects in Uganda, Asaya (2018) studied on assessment of equipment productivity in building construction projects in Uganda, similarly Ainobushoborozi (2013) researched on the impact of effective communication on labour productivity in civil engineering projects in Uganda, in addition Alinaitwe *et al*. (2007) assessed the factors affecting the productivity of building craftsmen-studies of Uganda but they did not tackle the issue of the impact of management skills on labour productivity in the building construction industry in Uganda. This study therefore, sought to examine the impact of construction management skills on labour productivity in building construction projects in Uganda.

1.3 Objectives of the study

1.3.1 Main Objective

The objective of this research was to study the impact of construction management skills on labour productivity in the building construction industry in Uganda.

1.3.2 Specific Objectives

The specific objectives of this study were:

(i)To characterize construction management skills that affect labour productivity**;**

(ii) To establish the impact of construction management skills on labour productivity;

(iii) To determine a relationship between construction management skills and labour productivity;

(iv) To suggest strategies for improving construction management skills aimed at increasing labour productivity.

1.4 Research Questions

In order to achieve the objectives stated in section 1.3 above, the study attempted to provide answers to the following research questions:

(i)What are the different categories of management skills that affect productivity in the building construction industry?

(ii) What are the impacts of management skills on the labour productivity in the building construction industry?

(iii)What is the relationship between management skills and labour productivity in the building construction industry in Uganda?

(iv) What are possible measures of improving management skills aimed at increasing labour productivity in the building construction industry?

1.5 Justification

Productivity loss is one of the severe problems faced by building construction practitioners (Gundecha, 2012). Little emphasis has been put on labour productivity and most of the construction companies pay attention to equipment, technology and material productivity components as the most-risk cause of low productivity (Alinaitwe *et al.*, 2013). Inadequate performance of the FLMs contributes to low labour productivity. When this study is conducted it will suggest strategies towards improving construction management skills of FLMs to enhance up labour productivity in the building construction industry. This will control labour productivity constraints in building construction such as poor quality work, contractual disputes, time and cost overruns. An increase in labour productivity, in various building construction firms in this sense, leads to an increase in their annual revenue which in turn contributes to Uganda's overall GDP growth. This study therefore determines the impact of construction management skills on productivity with the aim of developing a model and will enable the increase in labour productivity in terms of cost, time and quality work.

1.6 Significance

Inadequate management skills are some of the causes of low labour productivity. Lack of management skills impacts on building construction projects with low productivity in terms of cost, time and quality. The findings of this study will enable the Top Managers to engage FLMs with adequate management skills such as conceptual skills, interpersonal and technical skills with the aim of increasing labour productivity on a building construction project.

Furthermore, this study when published will contribute to the existing body of knowledge to be utilized by building construction industry, researchers, consultants, contractors, and the community involved. This will help to improve their management skills which will result in increased labour productivity in the building construction industry.

1.7 Scope of the study

1.7.1 Content Scope

The study focused on the impact of management skills on labour productivity in building construction industry. It was limited to the following; the sample population of company grades from A-1 to A-5 with their characteristics indicated in section 3.5.1 in Table 3.1, where FLMs (construction managers, project managers, site managers, health and safety managers, general foreman) were purposively selected.

This is a technical team in charge of smooth running of a construction project execution. They manage the day-to-day work flow, the quality of work, direct communication of workers and problem solving at project sites.

1.7.2 Geographical scope

The study area was restricted to Kampala District, since it has a high concentration of building construction projects coming up compared to other parts of the nation.

1.7.3 Time Scope

The study took a period of over one year. The study started from August 2018 to September 2019.

1.8 Conceptual Framework

The aim of this research was to study the impact of construction management skills on labour productivity in the building construction industry in Uganda. This study determined the impact of construction management skills on labour productivity with the intention of developing a model that will enable the increase in labour productivity in order to positively impact contractual disputes, cost, time and quality work. The model included labour productivity as dependent variable and conceptual, interpersonal and technical skills as predictors.

The intervening variables like weather changes, change orders by consultants and poor buildability of design are uncontrollable by FLMs even though they affect labour productivity. The impact of these variables will be considered constant. Figure 1.1 gives a summary of the conceptual framework

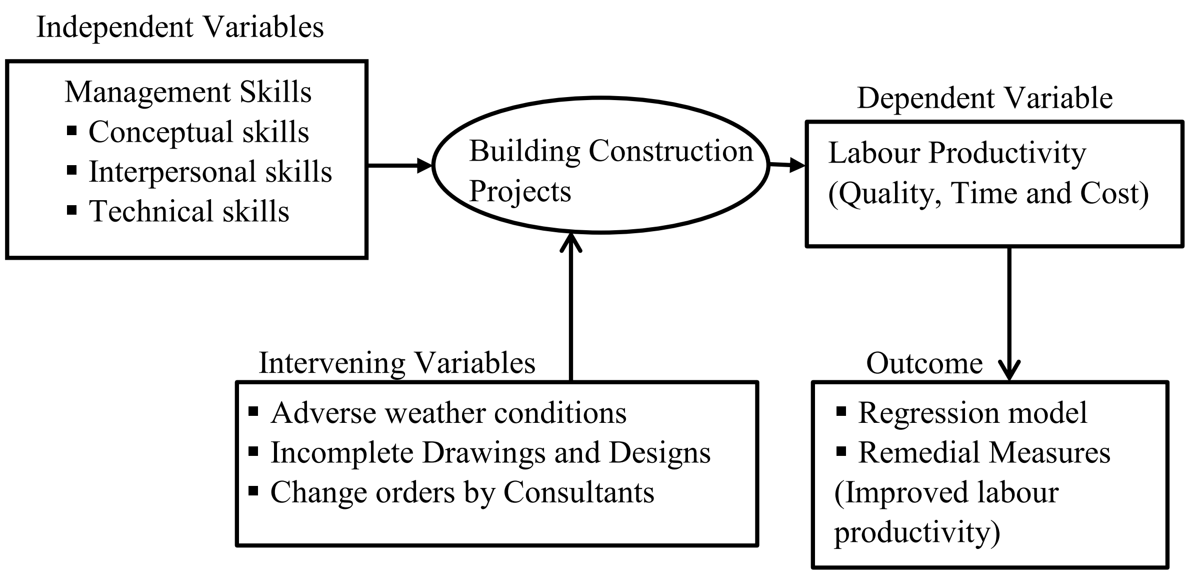


Figure 1.1: Conceptual framework

1.9 Chapter One summary

The construction industry plays a significant role in integrating economies of developing countries because construction demand increases with economic growth and development (Dakhil, 2013; Anugwo & Shakantu, 2015). Recently, there has been a significant concern of the failure and collapse of some structures in Uganda which may be due to inadequate management skills of FLMs, weak foundation, poor materials, heavier load than expected, non-compliance with approved plan, among others (Nakibuuka, 2017). This consequently has led to low labour productivity in building construction industry in Uganda. This low labour productivity in the building construction projects has brought about consequences such as contractual disputes, cost overruns, time overruns, poor quality work, project abandonment. This study determined the impact of construction management skills on labour productivity with the intention of developing a model that will enable the increase in labour productivity in order to positively impact on cost, time and quality work.

The next chapter explains the review of existing literature with regard to the theories of management skills, motivational theories, labour productivity, categories of construction managers and categories of construction management skills. It also reviews the existing literature on characterization of management skills, impact of management skills and Theoretical regression model development.

Chapter Three shall discuss research design, research approach, description of the population, sampling strategies, sample size determination, description of the study area, data collection instructions and sources of data. It also explains the presentation and analysis of the data and regression model development procedures in the study along with ethical considerations.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the existing literature relating to theories of management skills, motivational theories, labour productivity, categories of construction managers and categories of construction management skills. It also reviews the existing literature on characterization of management skills, impact of management skills and theoretical regression model development.

2.2 Building Construction

Building construction is the technique and industry involved in the assembly and erection of structures, like residential houses, apartments, schools, hospitals, complex storeyed shopping malls and factories, primarily to provide shelter (Benator & Thumann, 2003). According to Ofori and Toor (2012), the construction industry in both developed and developing countries is a sector of the economy that transforms various resources into constructed services and an essential contributor to the process of development.

The products of the construction industry are investments and it has linkage with the rest of the economy in terms of generation of output and employment. Ogunde *et al*., (2017) indicated that, the success of a developing construction industry is aligned with the use of construction project management skills. Inadequate management skills in the construction industry has been linked to a number of issues such as cost overrun, time overrun and poor quality work leading to low productivity of the building construction projects (Ogunde *et al*., 2017). Makulsawatudom and Emsley (2001) reported that the major cause of the problem lays in inadequate project management skills.

2.3 Review of management theories

A theory provides an explanation of observed behavior, prediction of future behavior, contributes to the understanding and when shared it provides common language. Furthermore, a theory gives the direction in pinpointing the sources of further progress, thus the application of the theory leads to improved productivity. However, lack of the application of the theory results in inferior productivity of any building construction project (Url, 2008).

2.4 Theories of Management

Management is the attainment of organizational goals in effective and efficient manner through planning, organizing, leading and controlling organizational resources (Olum, 2004). According to Valence (2012) and Opeyemi *et al*., (2018) management is the art of knowing what you want to do, how to do it best and in a cheapest way, with an aim of attaining high quality work. Top managers give direction to their organizations, provide leadership and decide how to use organizational resources to accomplish goals. More so, according to Olum (2004) management is the art or science of achieving goals through supervising the tasks located to the employees.

Management theories are the set of general rules and hierarchy of authority which best suit the work force and company culture that guides the managers with the aim of achieving goals of an organisation (Haque and Islam, 2014). Management theories address how different levels of managers relate to their organizations in the knowledge of its goals (Haque and Islam, 2014). Managers deal with human beings whose behavior cannot be reduced to routine formulas which can be used to manage them effectively. Managers benefit from learning, implementing best practices and testing approaches to run an organization.

These theories are visions of different ways to run a construction project based on different assumptions about how people and systems operate effectively. The application of these theories by managers lead to high productivity in construction projects (Rana *et al*., 2016). The management theories include: scientific management theory (Frederick W.Taylor, 1856-1919), bureaucratic management theory (Max weber, 1864-1920), human relations theory (Elton Mayo, 1880-1949), administrative theory (Henri Fayol, 1841-1925) and Management By Walking Around theory (Guru Tom Peters, 1978-1982)

2.4.1 Scientific Management theory

Scientific management means knowing exactly what you want employees to do, in the right and the cheapest way (Valence, 2012). Scientific management theory is a theory of management which was developed by Frederick Taylor. It analyses, blends workflows and its main objective is to amalgamate workflow and increase productivity (Turan, 2015).

Yimeng (2017) stated that, the main principle of Taylorism is to reduce the cost of skilled labourers by breaking skill needing activities into smallest tasks which can be executed by more of unskilled labourers and supervised by few skilled workers. Other basic principle of Taylor involves many best practices and strategies through various models such as soldiering, time and motion studies which are considered very effective to increase productivity in building construction industry (Turan, 2015). According to Gull (2017), Taylor's theory is that, construction managers can improve productivity by increasing the efficiency of production processes through: developing a series of rules and routines to help workers in their daily work; replacing the rule of thumb method by finding the most efficient way of accomplishing a task; recruiting the right personnel, training, teaching and developing the workers and providing wage incentives for workers for increased output.

The benefits of Taylorism included wider scope for specialization, accurate planning, timely delivery, standardized methods, between quality, lesser costs, minimum wastages of materials, time and energy and cordial relations between management and workmen (Gull, 2017; Valence, 2012). This theory has proved to be very effective in construction organizations by increasing their productivity. However, it is characterized by a lot of controversies of increased pressure between skilled and unskilled employees for quality management as well as decreased productivity as result of monotonous and routine activities (Paramboor & Musah, 2016).

2.4.2 Bureaucratic Management Theory

Bureaucratic management theory is defined as an organization structure characterized by many processes , rules, procedures and requirements as well as clear hierarchies (Jain, 2004). Ferdous (2016) studies cited Weber (1864-1920) that, every office and every official is part of a hierarchy and under this system the lower office functions under the control of higher office. This concept has been used by many building construction managers to increase productivity through the following: high degree of specialization of workers; clear definition of duties and fixation of responsibilities; full time appointment of workers; impersonal authority based on rules and structure; autonomy of officials in their respective spheres and reward of workers based on performance (Ferdous, 2016; Matte, 2017).

The study conducted by Jain (2004) cited Beetham and Weber (1974) saying that bureaucratic management is the most efficient theory used in most building construction organizations. The theory has a well-defined line of authority, clear rules and regulations which are strictly applied in most of the building construction organizations. Weber's theory concurs with Taylor scientific management theory which also advocates for a system based on standardized procedures and a clear chain of command which brings effective and efficient production (Jain, 2004).

The major contributions of the Max Weber's theory is the division of labour, reliance on rules, a hierarchy of authority and employment based on technical competence which leads to increased productivity in building construction organizations. However, the theory has weaknesses in the results which lack innovation and excessively rely on formal, impersonal channels which tend to reduce efficiency in production.

2.4.3 Administrative Management Theory

Henri Fayol's management theory is a simple model of how management interacts with personnel and a relevant guide to productively manage staff (Godwin *et al.,* 2017). Fayol was one of the first persons to describe the main management principle roles which are: planning, organizing, command,coordination and control. These Fayol`s five principle roles of management are still being actively practiced today in most building construction organisations (Wren *et al*., 2002; Rahman, 2012).

He further developed fourteen principles of administration to go along with management`s five primary roles. These fourteen principles are: division of work/specialization,authority with apropriate responsibility,Descipline where the employees should obey orders only if management play their part by providing good leadership,unity of command, unity of direction, subordination of individuals interest to the general interest, remuneration of staff, centralization,line of authority, order, equity,stability of tenure, initiative and esprit de corps (Rahman, 2012).

The major contribution of Henri Fayol theory is that, the successful manager should understand the basic management functions and he believed that, specific management skills could taught and learned. If this theory is properly implemented, it leads to organizational effectiveness and efficiency hence increased productivity in the building construction organisation (Rahman, 2012). According to Godwin *et al*., (2017), Fayol`s theory were based on personal experience, limited observations, too much generalizations and lack empirical evidence. The theory does not provide guidance as to which principle should be given precedence over the other.

2.4.4 Human Relations Theory

It is the study of all types of interactions, conflicts, cooperative efforts, group relationships for the purpose of improving interpersonal relationships among the employees with the aim of increasing labour productivity in any organization (Obakpolo, 2015). Elton Mayo's studies proved that the factors that influence workers' productivity are: interpersonal relationships among employees, involvement in decision-making, respect and dignity, attention and freedom to express their views. Thus management's role is to provide welfare and good communication between the managers and subordinates. Lack of cooperation among members results in low productivity (Kuranchie-mensah & Amponsah-tawiah, 2016).

The major contribution of this theory is that, it highlights the fact that production is not just an engineering problem as mentioned by Fredrick Taylor, but a social problem as well. Most building construction organization managers use Elton Mayo`s human relations theory to appreciate work done by their workers through rewards, parties, celebrations, group outings for motivation. The criticism of this theory is that it lacks validity. The employees during Mayo's study may have improved their performance because of the motivation but the study did not consider that production also depends on technology and other factors (Obakpolo, 2015; Kuranchie-mensah & Amponsah-tawiah, 2016).

2.4.5 Management by Walking Around Theory

Management by Walking Around (MBWA) theory refers to the management style in which the managers spend significant part of their time walking around in unstructured and unplanned manner amongst their employees to listen their problems, ideas and supervise the tasks they are performing. This creates a more meaningful relationship among themselves boosting the company's labour productivity (Airawashdeh, 2012). In addition MBWA creates motivation for team operation and maintains the method of defining the objectives for employees to accomplish their tasks with at most accuracy and simplicity with an aim of improving labour productivity (Kwon *et al.*, 2018).

The major contribution of this theory is that; it highlights low labour productivity as a social problem, it breaks the barriers that may frustrate the communication between workers and the building construction managers through interaction and continuous meetings. It portrays a sense of attention and commitment of the manager which motivates their employees to respond to their given tasks aiming at increasing labour productivity. Most building construction organization managers use this theory to motivate their workers hoping to improve the company's labour productivity (Airawashdeh, 2012; Kwon *et al*., 2018).

2.5 Motivational Theories

Motivation theory is an attempt to explain the interaction between constructs like attitude, habit, behavior of workers and motive that make up the theory of motivation. Motivation is done to keep workers doing the right things which is a key activity of managers and supervisors with the hope that may result in increased labour productivity (Aina, 2014). Motivation theory is very important for the managers to know and understand why people behave differently at workplaces and how to manipulate their behavior so that they exert their best efforts to achieve building construction organizational goals (Barg *et al*., 2014).

Researchers tried to find out the answers to what motivates an employee in the building construction organisation most and have classified theories under two headings, namely content and process theories.

- **Content Theories**

Content theories are concerned with ‘what’ motivates employees at the workplace.The prominent ones are: Maslows hierarchy of needs theory, Alderfer ERG theory, MC Cllelland need theory and Herzbergs motivation theory.

- **Process Theories**

Process theories are concerned with ‘how’ motivation occurs among the employees. The prominent ones are: Vroom’s expectancy theory, Adam’s equity theory, goal setting theory and reinforcement theory. The study concentrated on content theories that deal with what motivates employees so that they can keep doing the right things which are a key activity of all types of managers with the aim of increasing productivity in any building construction company.

2.5.1 Maslow's Hierarchy of Needs Theory

Maslow developed a pyramid hierarchy of needs (as indicated in Figure 2.1) for a worker that they will satisfy from bottom to top order namely, physiological, security, belongingness, esteem and self-actualization needs (Haque *et al*., 2014). He believed that workers/humans would not try to satisfy a need at the next level in the hierarchy until the lower needs have been satisfied (Haque *et al*., 2014). Further, he believed that once a given level of need is satisfied, it no longer serves the employee, instead the higher level emerges. This theory is a useful tool to all managers in determining the kinds of rewards that could be effective in motivating employees (Barg *et al*., 2014).

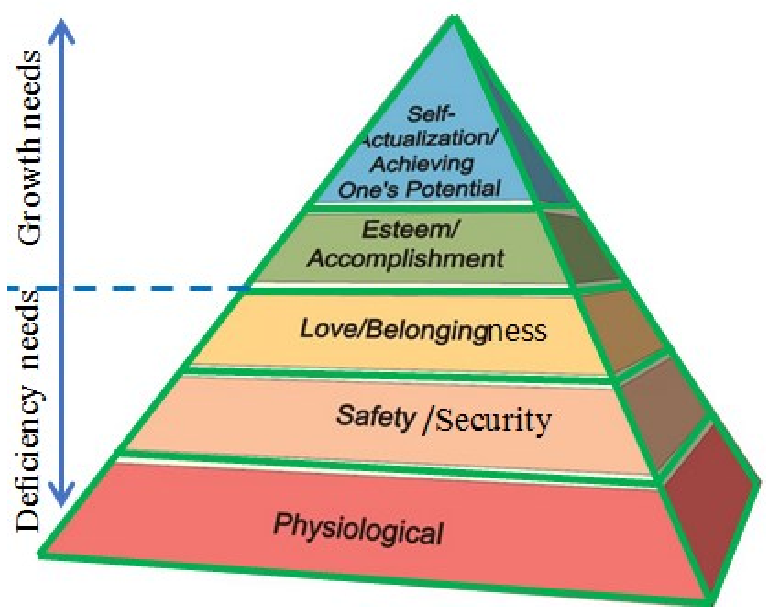


Figure 2.1: Maslow's pyramid

Source: (Haque *et al*., 2014)

Maslow's hierarchy of needs in building construction workplace situations implies that managers have the following responsibilities:

- To create a safe environment and proper wages for their workers, in order to meet their deficiency needs (physiological, security, belongingness).

- To create a proper climate in which employees can develop their fullest potential (esteem and self-actualization needs). Failure to do so would theoretically increase employee frustration, increased withdrawal from the organisation and could result in low productivity. Maslow's theory has been influential and has had a significant impact on management approaches to motivate worker's needs (Adjei, 2009). This theory has been widely criticized for lacking empirical support and that it cannot be scientifically proven (Barg *et al*., 2014).

2.5.2 Alderfer ERG theory

Alderfer ERG theory categorizes Maslow's hierarchy of five human needs into three progresses. These are the arranged levels from existence needs (E), to relatedness needs (R) and to growth needs (G) as the lower needs become satisfied (Adjei, 2009).

- Existence needs: they are concerned with sustaining human existence and survival, and it covers physiological and safety needs

- Relatedness needs: This focuses on the relationships with the social environment and it encompasses belongingness (love), personal relationships, safety and esteem needs.

- Growth needs: It is concerned with the development of potential, and cover self-esteem and self-actualization needs.

Alderfer's theory observed that the importance of the existence and relatedness needs decreases with satisfying them but the importance of growth needs increases always more and more with satisfying them (Adjei, 2009). Alderfer's theory observed that, for any manager to increase productivity in the building construction organisation, employees' frustration, increased withdrawal from the organisation should be reduced by considering employees needs as shown in Table 2.1.

Table 2.1: Relationship between Maslow's and Alderfer's theories of Motivation

Maslow's hierarchy of needs	Alderfer's ERG needs
Physiological	Existence
Safety and security	
Belongingness (Love)	Relatedness
Self esteem	
Self-actualization needs	Growth

Source: (Adjei, 2009)

2.5.3 Hygiene theory (Herzberg's Motivational Theory)

Herzberg extended the work of Maslow and proposed a new motivation theory popularly known as Herzberg's motivation Hygiene (Two-Factor) theory. He conducted a study based on the interview of 200 engineers and accountants in different firms and based upon the answers received from them, he observed that, there are certain factors which are consistently related to job satisfaction called motivational factors and there are certain factors which are consistently related to job dissatisfaction called hygiene factors, if they are under looked by building construction managers it could lead to low productivity (Adjei, 2009; Barg *et al.,* 2014).

Motivational Factors: these factors are intrinsic /essential in nature, boosts production each time they are increased and they are related to the job satisfaction. These factors have a positive influence on moral, job satisfaction, efficiency, increased total output and often result in an increase in productivity. Herzberg believed that managers should concentrate on motivators to maximize the benefits from motivation and he came up with six factors that motivate employees and they are indicated in Table 2.2 (Aina, 2014; Haque *et al*., 2014).

Hygiene Factors: These are factors that do not significantly affect motivation but are necessary to maintain hygiene within working environment, they prevent dissatisfaction. Furthermore, these factors do not produce positive results but prevent negative results and they do not provide any satisfaction but eliminate dissatisfaction and maintain a zero level of motivation. More so, managers should always try and ensure that they do not reduce these hygiene factors indicated in Table 2. 2 or else risk negative effects of reduced productivity and lower employee morale that leads to low productivity (Haque *et al.*, 2014).

The implication of Herzberg Motivational theory to the building construction organizational management is that the job should have sufficient challenges to utilize the full ability of the employee. The employees who demonstrate increasing levels of ability should be given increasing levels of responsibility. If a job cannot be designed to use an employee's full abilities, then the organization should consider automating the task or replacing the employee with one who has a lower level of skills. If a person cannot be fully utilized, then there will be a motivation problem (Adjei, 2009). Herzberg further concluded that one person's hygiene may be another person's motivator, because motivation is also influenced by the personality characteristics of individuals (Haque *et al*., 2014).

Table 2.2: Herzbergs motivational and hygiene factors

Motivators: Job Satisfaction	Hygiene factors: Job Dissatisfaction
Achievement	Company policy and Administration
Recognition	Technical Supervision
Work itself	Interpersonal relation with supervisor
Responsibility	Work conditions
Advancement	Salary
Possibility of growth	Relationship with peers
	Job security
	Personal life
	Interpersonal relations with subordinates
	Status

Source: (Haque *et al*., 2014)

The criticisms of Herzberg's theory: The study was limited to the engineers and accountants. General workers are motivated by pay and other benefits. The effect of hygiene and motivational factors may be reverse on some other categories of employees. People tend to credit themselves when things go well and they blame failures on the external environment, more so, this theory explains job satisfaction not motivation and neglects situational variable to motivate an individual (Aina, 2014).

The contribution of this theory in building construction projects is that, to increase labour productivity, top managers should always employ workers with full ability for the task given, and avoid under looking motivational factors and hygiene factors which may lead to dissatisfaction of workers and thereby reduce labour productivity.

2.6 Construction Management skills in the building construction industry

Management skills are the knowledge and ability of the individuals in a managerial position to fulfill some specific management activities or tasks (Ghalandari, 2012).

According to Abbass (2012), management skill is defined as ability and knowledge of a manager to make the right decisions and lead subordinates with in a company during implementation of building construction projects. According to Katz (1974) and Robbins *et al.*, (2013) they identified three types of management skills namely: Conceptual, Interpersonal and Technical, which are required for a successful manager to be able to increase productivity in building construction company.

These management skills are obligatory ingredients for efficiency and effectiveness of all managers. This enables them accomplish the vision and missions of the construction company to meet the stipulated goals and objectives of the projects (Katz, 1974; Url, 2008). Furthermore, Katz argued that, what a manager can achieve in production is based on the skills that the manager owns.

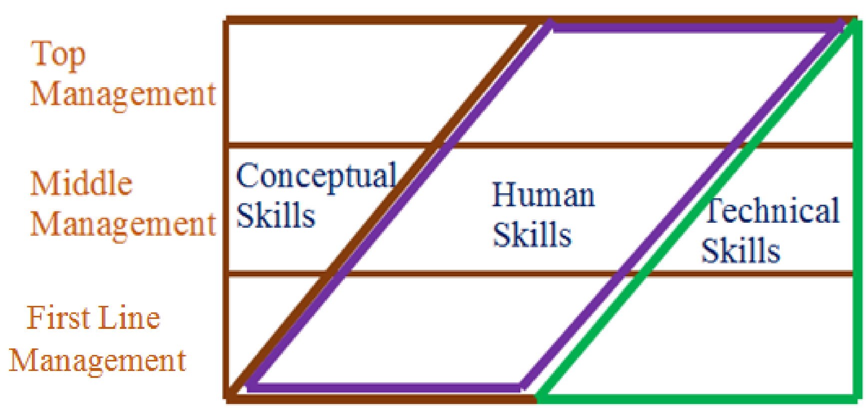


Figure 2.2: Management Skills

Source: (Katz, 1974**;** Robbins *et al*., 2013)

2.6.1 Conceptual Management Skills

These refer to the ability to co-ordinate and integrate all of the building construction organization's interests and activities. Managers with a high level of conceptual skills have the mental capacity to understand various cause and effect relationships in the building construction organisation and to view the organisation in a holistic manner (Seyedinejat *et al*., 2014).

The conceptual skills help mostly top managers such as Chief Executive Officer, Managing Director and General Manager to look outside their department`s goals and make decisions that will satisfy overall building construction company goals.These skills are vital for top managers, less critical for middle managers, and to some extent are required for FLMs. The conceptual management skills include: decision-making, analysis, communication, creative thinking, leadership, problem solving, planning, motivation and listening (Seyedinejat *et al.*, 2014).

2.6.2 Interpersonal Management Skills

Human management skills are the skills that involve the ability to interact, work or relate effectively with people. They enable the managers to make use of human potential in the company and motivate the employees for better results (Ghalandari, 2012). According to Peterson and Vanfleet (2014) cited Katz 1995 who defined human skills as the ability to work cooperatively with others, to communicate effectively, to resolve conflict and to be a team player, also human skills are essential for all hierarchical levels in the building construction company.

According to Zadeh *et al*., (2016), interpersonal management skills include: problem-solving, self-confidence and self-control, time management, active listening, negotiation, communication, reliability, leadership, openness to feedback, delegation, public speaking, Political awareness, goal orientation, team work, flexibility and dispute resolution skills.

2.6.3 Technical Management Skills

These are skills necessary to accomplish specialized activities of the FLMs such as Operation Manager, Project Manager, Site Manager, Foreman, Construction Manager, Supervisor, and Health and Safety Manager. These skills incorporate the ability to use procedures, techniques and knowledge of a specialized field. FLMs likely have to possess technical skills as they are responsible for the day to day running of the building construction projects (Seyedinejat *et al*., 2014).These technical management skills are obtained through formal education training and on-job experience.

These skills involve understanding and proficiency in a specific kind of activity, particularly involving methods, processes, procedures, techniques and skills in the specific areas of responsibility. They are most important for both middle line and FLMs. For the top managers, these skills have low significance level, as we move through a hierarchy from the bottom to higher levels of management (Seyedinejat *et al*., 2014; Ghalandari, 2012). Project managers, construction managers, site managers all need specific technical skills to perform their building construction tasks.

According to Zadeh *et al.*, (2016) technical management skills include: Planning, scheduling, good communication, problem solving, decision-making, motivation, estimation, time management, teamwork, procurement, contractual, safety management, risk assessment, good knowledge of building methods, knowledge of project close out and regulations.

2.7 Categories of Managers in Building Construction Firms

The Project manager is an expert leader completes administrative duties, such as organizing meetings, completion of paperwork, whereas the construction manager gives work to employees, communicates with sub-contractors about the work that needs to be done (Ghalandari, 2012). Furthermore the construction manager efficiently and economically applies the required resources to realize a constructed facility of acceptable quality within the time frame and budgeted cost specified (Ghalandari, 2012).

Seyedinejat *et al*., (2014) cited Robert Katz (1987), who categorized construction managers as Top managers /Strategic managers such as Chief Executive Officer, Managing Director, General Manager etc, Middle Managers such as Branch Manager, Regional Manager, Senior Manager etc and First Line Managers such as Construction Manager, Project Manager ,Foreman, Supervisor, Health and Safety Manager etc**.**

2.7.1 Top Managers

Top managers account for a relatively small group of executives who control the construction organisations. They are responsible for establishing the construction organisation's goals, strategies and operating policies. They also represent the organizational to the external environment e.g. by meeting with government officials. They tend to focus on the construction organisation as a whole, with emphasis on both the present and the future scale of operations and monitors middle managers (Ogunsanmi, 2016; Zadeh *et al.*, 2016).

2.7.2 Middle Managers

Middle Managers are primarily concerned with directing the operations of lower level managers. In addition, they are responsible for implementing and interpreting the policies formulated by the top management level. Thus they are intermediaries between top managers and first line managers e.g Branch Managers, Regional Managers, Senior Managers etc. Furthermore they are responsible for the supervision of first-line managers and responsible for finding the best way to use departmental resources to achieve construction organisation goals (Seyedinejat *et al*., 2014; Zadeh *et al*., 2016).

2.7.3 First Line Managers

First Line Managers are the lowest management level in the construction organisation hierarchy, being directly responsible for the supervision of non-managerial staff. Their activities focus mainly on the day-to-day running of the construction organisation. FLMs require technical management skills, which involve the ability to use tools, procedures and techniques in the specialized field. Further more, Human and technical skills are most important for the FLMs but Technical skills are less important in the higher level of hierarchy (Ogunsanmi, 2016; Zadeh *et al.*, 2016).

FLMs play an important role in construction projects by balancing functional expertise with strong interpersonal skills to optimize specific project operational activities. They manage work flow, monitor the quality of work, deal with labourer problems and keep the middle managers informed of successes and problems at project sites (Hutchinson & Purcell, 2008). Despite the importance of these managers and the growth rate of the construction projects with higher complexity (scope and design) there is high demand of skilled personnel to execute different tasks of building projects (Ouko, 2016). Furthermore, 70 percent of building construction companies have a difficulty in finding qualified professional FLMs to fill these growing positions and be able to execute their building construction projects (Ofori & Toor, 2012).

There are numerous building construction projects facing serious problems due to inadequate management skills in the building industry. Because of so many different professionals involved in the construction process, the majority lack management skills (Anugwo & Shakantu, 2015; Yousaf & Awan, 2015). Even though there are improved technology systems and innovation in work methods used in building construction, many running projects still begin and end with the concern of disputes, abandonment, cost and time overruns because of inadequate management skills of FLMs which is a global problem. It is evidenced from Ryugyong Hotel in North Korea that would be one of the tallest hotels and seventh in the world but it is uncompleted and abandoned. Uganda is not an exception for example the extension of Uganda house has been at foundation level for years, more so there are many abandoned and uncompleted buildings in Kyambogo University (Otim *et al*., 2009).

2.8 Productivity in the building construction industry

According to Fellows *et al*., (2002), productivity is defined as a measure of the output obtained from a given amount of input. According to Thomas and Sudhakumar (2014), productivity is defined as the effective utilization of resources in producing goods and services. Productivity is one of the most important aspects that affect overall performance of any type of building construction company. If the productivity is improved, ultimately it increases profitability and reduces time overrun which will overall give the best performance of the building construction projects. Thus the effective use of proper management skills is very important in construction task operation with the aim of improving labour productivity. There are different types of productivity in building construction industry which include: Equipment, Material and Labour productivity.

2.8.1 Labour productivity

Labour productivity is at the lead of concerns facing contractors in the building construction industry worldwide. It is defined as the ratio between the output and the number of man-hours worked (Robles *et al.*, 2014).

Labour productivity (LP) = $\frac{Output\ in\ terms\ of\ units\ or\ quatity/Volume}{Number\ of\ man-hours\ spent\ on\ production}$ ... (*Equation 2.1*)

Where: Man- hours = the number of workers employed on production x the number of hours worked.

Labour productivity is important especially in developing countries including Uganda, where most of the building construction activities are still performed using labour intensive methods (Alinaitwe *et al*., 2007). The cost of labour in the building construction industry is in the average rate of thirty three percent of the cost of construction building project which indicate that the cost of labour is quite high (Gundecha, 2012; Robles *et al.*, 2014). Therefore construction labour force should be seen as an important input (Robles *et al.*, 2014). There is need for attention of skilled FLMs for supervision to improve efficiency of production in building construction projects. For the building construction company to remain competitive, it should employ adequate skilled FLMs so as to improve the efficiency of the production of labour.

2.8.2 Equipment Productivity

Equipment/Tool selection of the appropriate type and size are some of the most important factors in the construction industry that affect productivity. It is necessary for FLMs to be familiar with the characteristics of the major types of equipment most commonly used in construction. According to Alinaitwe *et al.*, (2007), in order to increase productivity (quality, time and cost), it is important to select equipment with the proper characteristics and size most suitable for the work conditions at a building construction project (Gundecha, 2012).

2.8.3 Material Productivity

Material management is one of the most important factor in the construction industry. Productivity can be affected if required materials, correct location, selection of the appropriate material and time of delivery to building construction sites are not taken seriously with a proper materials management system before the project commences.

The size of the construction site and the material storage location has a significant impact on productivity because labourers require extra time to move required materials from inappropriate storage locations thus resulting in loss of productivity (Gundecha, 2012).

2.9 Characterization of management skills that affect productivity in building construction industry

According to Katz (1987), management skills are categorized as Conceptual, Interpersonal and Technical skills as in Section 2.7 and some of identified skills by different authors are presented in Table 2.3.

Table 2.3: Categories of management skills that affect productivity

Groups of Management Skills	Management Skills	References
Conceptual Skills	discipline, time management, analysis and diagnosis complex situation, ability of prediction, creativity, goal making, mental stability	(Mostafa *et al*., 2012 ; Ogunsanmi, 2016)
	Problem solving, critical thinking, leadership, decision making	(Zadeh *et al*., 2016)
	delegation, leadership, strategic planning	(Seyedinejat *et al*., 2014)
Interpersonal Skills	Communication skills, time management, good temper, creativity, conducting a meeting, problem solving, motivation, controlling conflicts, supervision, openness to feedback, report generation	(Mostafa *et al*., 2012)
	Listening ability, desire to learn, self-confidence and self-control	(Ogunsanmi, 2016)
	Delegation of authority, team work skills and reliability	(Zadeh *et al*., 2016)
Technical Skills	Managerial knowledge & experience, computer skills, operational planning, evaluation of performance,	(Mostafa *et al*., 2012
	health hazards identification, planning & scheduling	(Zadeh *et al*., 2016)
	Scheduling, special knowledge	(Seyedinejat *et al*., 2014)
	plan interpretation, knowledge of construction operation, knowledge of green and sustainable construction, estimating skills, knowledge of project closure out, proficiency in construction IT, ,scheduling	(Ogunsanmi, 2016)

2.10 Impact of management skills on labour productivity in the building construction industry

According to Valverde-Gascuena *et al*., (2011), one of the most important factors for the success of building construction projects are the management skills. The managers play a main role of planning and controlling of all activities during the construction period. The impact of management skills on the productivity in building projects include: contractual disputes, abandoning of building projects, poor quality work, massive cost and time overruns thus resulting in low productivity of the project (Gamil & Rahman 2017). Gamil and Rahman (2017), indicated that management skills are one of the critical reasons which can negatively affect the building construction project and thus results in project failure.

2.10.1 Poor quality Work

Quality is the fulfillment of project responsibilities in the delivery of products and services in a manner that meets or exceeds the stated specifications and expectations of the owner, design professional and constructor (Yousaf & Awa, 2015). Project responsibilities refers to the tasks that a participant is expected to perform to accomplish the project activities as specified by contractual agreement and applicable laws and licensing requirements, codes, prevailing industry standards and regulatory guidelines (Valence, 2012). Measures used to achieve quality work are:

Quality inspection, Quality control, Quality Assurance and Total quality management.

(i) Quality inspection involves measurements, tests and gauges applied to a certain characteristic in regard to an activity. The results are compared to specified requirements and standards for determining whether the activity is in line with target (Fellows *et al.*, 2002).

(ii) Quality control is the periodic inspection to ensure that the constructed facilities meet the standards specified in the contract. It involves observing actual performance comparing it with some standards and then taking action if observed performance is significantly differently from standards. It is an overall commitment to produce defect free building products (Fellows *et al*., 2002; Valence, 2012).

(iii) Quality Assurance is a program covering activities necessary to provide quality in the work to meet the project specifications/requirements. It involves establishing project related policies, procedures, standards, training, guidelines and system necessary to produce quality building product (Fellows *et al.,* 2002; Valence, 2012).

Total quality management: seeks to improve the quality of building products delivered through the participation of all levels of managers and functions of the organization. It has proved to be a useful tool in ensuring the achievement of set standards and successful productivity improvement in building construction industry. These measures should be observed by FLMs to avoid building construction suffering from poor workmanship which leads to poor quality work (Fellows *et al.,* 2002; Yousaf & Awa, 2015).

2.10.2 Massive cost overruns

Cost overrun (budget overrun) is unexpected cost incurred in excess of budgeted amounts due to an underestimation of the actual cost during budgeting (Ullah *et al*., 2017). Cost overrun is the difference between the original cost and the actual cost when the project is completed. It reduces the contractors' profit sometimes leading to enormous losses and leaving the project in great trouble (Vaardini *et al*., 2016).

Some causes of cost overruns in developing countries are attributed to: inadequate technical skills, extension of time, improper construction methods, lack of cost report during construction stage, Poor site management, poor coordination, inadequate planning, inadequate supervision, administration error, communication breakdown, poor workmanship, employees absenteeism etc (Vaardini, 2016; Ullah *et al.*, 2017). Most of these cost overruns are contributed by FLMs in building construction projects due to inadequate construction management skills (Ullah *et al*., 2017).

2.10.3 Time overrun of the project

Time overrun of the project is defined as the difference between the estimated project duration and the actual time taken to complete the project. Time overrun is one of the most usual, significant and serious problem which impact the time factor in the productivity of the building construction projects (Valverde-Gascuena *et al*., 2011). Time overrun may arise due to postponement of material delivery to the site of the project, equipment failure, political issues and severe weather conditions. In some situations, delays make the conditions even more difficult. In such cases, managers are required to have a detailed appraisal to recognize the factors and choose accurate and right action to reduce the adverse impact of delays on the duration of the building construction projects (Valverde-Gascuena *et al*., 2011).

2.10.4 Project cancellation

Project cancellation is the termination of a project prior to its completion. The construction project cancellation for the contractor may result when the contractor or subcontractor does not fulfill obligations within the contract agreement (Benator & Thumann, 2003).

For example:

- Contractor failing to perform in scheduled time;
- Contractor failing to perform in terms of quality or quantity of the work and materials furnished in accordance with the construction contract, the plan and specification;
- Contractor alters the original budget and change of project goals.

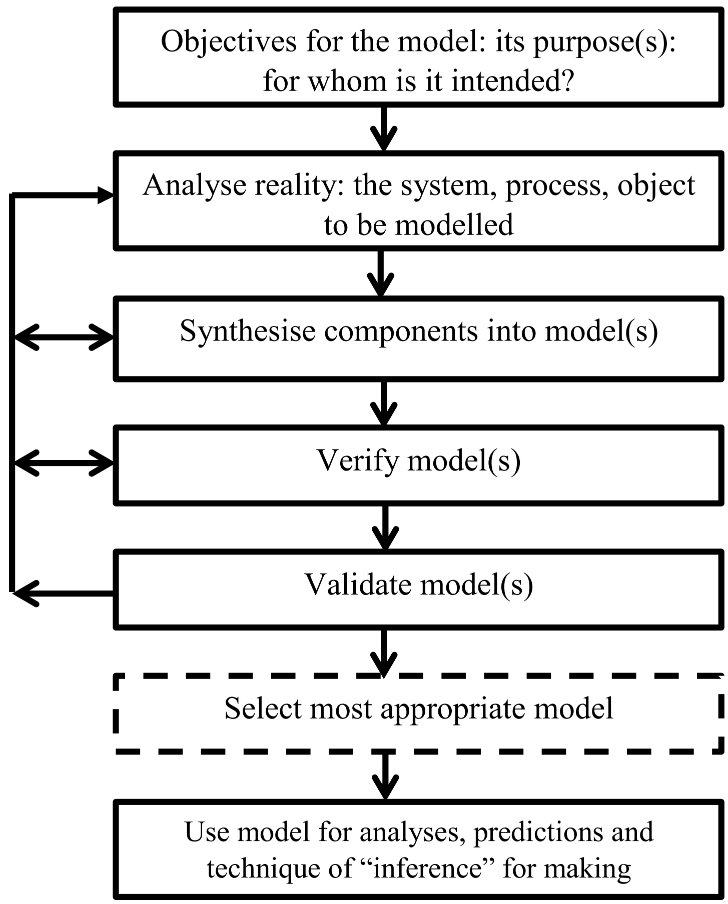
The building project cancellation should be helped with negotiation if either party disagrees on the some of the project tasks. The contractor cancels the project not yet started; otherwise, either party may face heavy penalty leading to company losses of costs (Benator & Thumann, 2003). The building construction practitioners should always exhibit management skills to fulfill their obligations after signing contract agreements with the aim of increasing labour productivity to avoid project cancellation.

2.11 Modelling

2.11.1 Introduction

According to Yan and Su, (2009) modeling refers to the development of a mathematical expression that describes in some sense the behavior of random variable of interest. In statistics, regression analysis consists of techniques for modeling the relationship between a dependent variable and one or more independent predictors.

2.11.2 Modelling process



Source: (Fellows & Liu, 2008) p.117

Figure 2.3: Modelling Process

Modelling processes are the work performed by a system/model in the response to incoming data flows. Models are derived from theory and are developed iteratively until the best fit with the data is found. They are used to investigate/ or to predict the relationship between dependent and independent variables. An investigative model comprises a set of equations in several unknowns, sufficient that provided a certain number of values of some of the variables are known, the equations can be used to determine the remainder, as in linear programming and this modelling process is shown in Figure 2.3. The steps used for model-building are the same across all modelling methods only the details vary from the method to another method (Fellows & Liu, 2008).

2.11.3 Model Verification

It involves determining whether the structure of the model is correct and it is achieved by testing the model through examining the outputs resulting from the model under a given set of inputs. The overall fit of the model is checked by looking at model F-value and the associated p-value to confirm model significance (Fellows & Liu, 2008). The greater the observed F-value than the F-value critical from F-distribution table in appendix A8, the more the relationship is strongly significant (Blaikie, 2003; Creswell & Creswell, 2018).

The observed F-value can be obtained using equation 2.2.

$$F = \frac{RSS/_{K}}{SSE/_{n-(K+1)}} = \frac{MSR}{MSE} \quad \text{...} \quad \textit{(Equation2.2)}$$

Where: RSS is the regression sum of squares, SSE is the sum of squared error, MSR is the mean regression sum of squares, MSE is the mean squared error, n is the number of observations and K is the number of independent variables.

2.11.4 Model Validation

Model validation is the stability and reasonableness of the regression coefficients, plausibility and usability of the regression function and ability to generalize inference drawn from the regression analysis. It helps the researcher in assessing the reliability of the model before it can be used in decision making (Oredein *et al*., 2011; Gupta, 2013). In the validation of a model, the models output resulting from known inputs is compared to realizations of the reality. Model validation tests several sets of inputs and known outputs of the reality to examine consistency of the model over a range of conditions including extreme (Fellows & Liu, 2008). The regression model validation can be performed using cross-validation, bootstrapping approach and split sample approach, in this study split sample technique was used.

In split sample technique approach, the data set is split into two separate samples using one part for model predicted and the second subsample to estimate the predictive accuracy of the model (Gupta, 2013; Hair *et al.*, 2014). In addition, Kleinbaum *et.al*. (2008), suggested that difference between the estimated and predicted model values of R^2 should be less than 0.1(10%), meaning the model is stable and judged to be valid.

More so, model validation can be checked using student's t-test. According to Creswell and Creswell (2018), the greater the observed t-value than the t-value critical from student's t-distribution table in appendix A9, the more the model is stable and valid. The observed t-value can be computed using equation 2.3.

$$t = \frac{r_{xy}\sqrt{n-2}}{\sqrt{(1-r^2{}_{xy})}} \quad \text{.................................} \quad (\textit{Equation 2.3})$$

Where: r_{xy} is the Pearson correlation coefficient, n is the number of observations

2.11.5 Types of regression model equations

Regression analysis helps researcher to understand how the typical value of dependent variables change when any one of the independent variables is varied, while the other independent variables are held fixed. In the regression process, the dependent variable is modeled as a function of independent variables, corresponding regression coefficients and a random error (Hair *et al*., 2014; Thomas & Thomas, 2017).

To perform regression analysis, a researcher often assembles data collected on underlying variable of interest and employs regression model to estimate the quantitative relate to effect of the independent variables to the dependent variable. In addition, regression analysis is a statistical technique for investigating and modeling the relationship between variables (Montgomery *et al*., 2012). The researcher assesses the statistical significance of the estimated relationship between the independent variables and dependent variable, that is, the degree of confidence on how the true relationship is close to the estimated statistical relationship. Therefore, regression model development would help the contractors and construction managers to monitor labour productivity by varying management skills (predictors) in the model.

The general mathematical regression model expression is given by:

$$Y = f(x_1, x_2 \ldots x_n) + \varepsilon \quad \text{.................................} \quad (\textit{Equation 2.4})$$

There are three types of regression (Yan & Su, 2009).

(i) Simple linear regression. It is for modeling the linear relationship between two variables.

$Y = \beta_o + \beta_1 x + \varepsilon$ ………………………………………………….(*Equation 2.5)*

Multiple linear regressions: It is linear regression model with one dependent variable and two or more independent variables. After plot the data, on scatter graph it appears as indicated in Figure 2.4. In linear regression models the scatter and residual plots are linear and correlation between variables is significant. Linear model assumes that the dependent variable is a linear function of the model parameters and there are more than one independent variables in the model as indicated in equation 2.6.

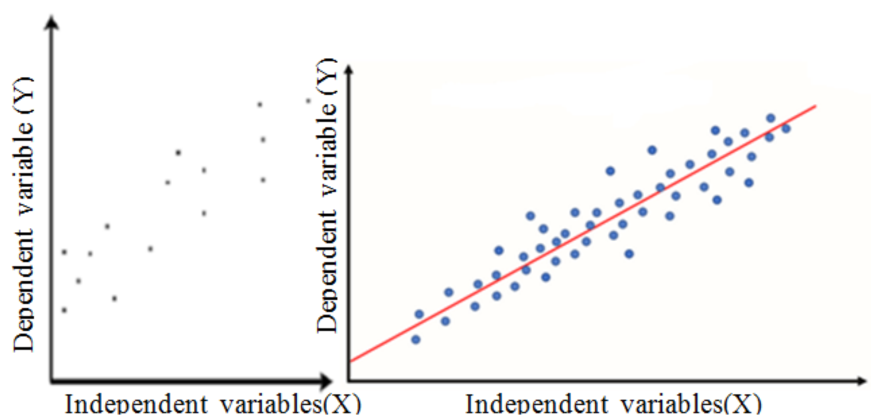


Figure 2.4: Exploratory scatter graphs for linear regression models

According to Kleinbaum *et al*., (2008) linearity is the concept used to express, that the model possesses the properties of additivity and homogeneity. The linear regression models predict values that fall in a straight line by having a constant unit change (slope) of the dependent variables for a constant unit change of the independent variable.

$Y = \beta_o + \beta_1 x_1 + \beta_2 x_2 + \ldots\ldots\ldots\ldots + \beta_n x_n + \varepsilon$ …………………..(*Equation 2.6)*

(ii) Non-linear regression: It assumes that the relationship between dependent variable and independent variables is not linear in regression parameters. Non-linear regression model uses non-linear regression equations which take the form in equation 2.7.

Y = f(βX) + ε ………………………………………………………(*Equation 2.7)*

In non-linear regression models in the scatter and residual plots possess curves and no significant correlation between variables.

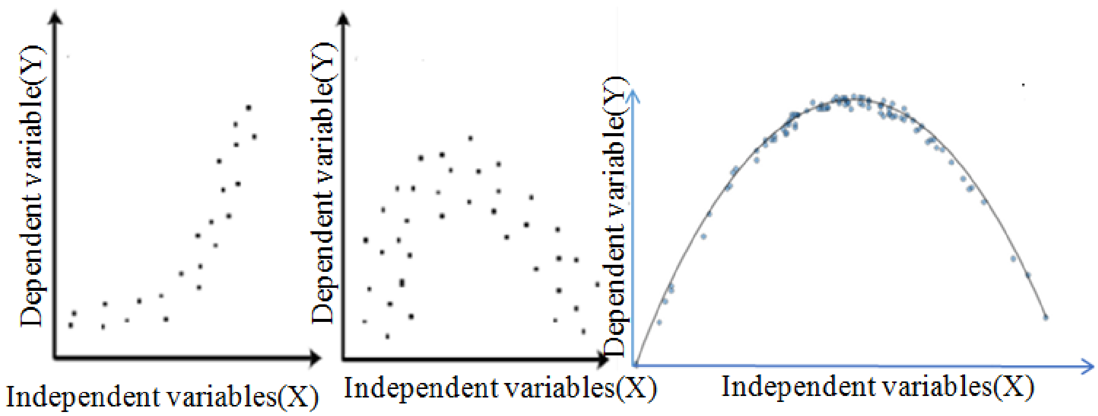


Figure 2.5: Exploratory scatter graphs for non- linear regression models

$Y = \beta_o + \beta_1 log x_1 + \beta_2 log x_2 + \beta_3 log x_3 + \ldots\ldots + \beta_n x_1 + \varepsilon$………(*Equation 2.8)*

Where:

β_o , β_1 , β_2 …….. β_n are the regression coefficients and x_1 , x_2 , x_3 ………x_n are independent variables in the model and ε is the residual error.

2.11.6 Gauss-Markov Regression Theorem

The ordinary least square (equation 2.3) is the best linear unbiased estimator under certain assumptions.

- Regression model is linear see equation 2.5

- This does not mean that the theory must be linear see model equation 2.8

- Regression model is correctly specified

-The model must have the right variables

- Regression model must have an additive error term (ε)

- Error term has a zero population mean $\sum \varepsilon_i = 0$

- Explanatory variables are determined outside of the model (they are exogenous)

- Homoscedasticity: the error has a constant variance

- Heteroscedasticity: the variance of the error dependent on the values of Xs

-Two variables are perfectly collinear if one can be determined perfectly from the other.

If Y = $\beta_o + \beta_1 agemonths_i + \beta_2 ageyears_i + \varepsilon_i$

↔ The change in Y is associated with a one unit increases in age in months holding age in years constant.

2.11.7 **Model parameters determination**

These coefficients of the regression model can be estimated using the least square method as follows:

$\beta_o = \bar{y} - \beta_1 \bar{x}$ ……………………………………………………………(*Equation 2.9)*

Where: $\bar{y}$ and $\bar{x}$ are the mean

$\beta_1 = \frac{\sum_{i=1}^{n}=(x_i - \bar{x})(y_{i-\bar{y})}}{\sum_i^n (x-\bar{x})^2}$ ………………………………………………………(*Equation 2.10)*

2.11.8 Statistical Computation for Regression Analysis

Before the development of the user friendly statistical software for regression analysis, the model development has been laborious using least square method as described in section (2.11.7). Currently, there are user-friendly statistical computer software packages to perform regression analysis easier and more efficiently; these include MS-Excel, R-Studio, and SPSS. These software packages enable researchers to perform data entry, data management, retrieve data from data base and produce statistical graphics (Yan and Su, 2009; Thomas and Thomas, 2017).

Researchers mentioned that, regression model analysis enables one to understand how the typical values of the dependent variables change when any one of the independent variables is altered, while the other independent variables are held fixed (Chakkappan & Das, 2016; Thomas and Thomas, 2017). Parthasarathy *et al*., (2018) studied modeling manpower and equipment productivity in tall residential building projects and obtained the model using multiple linear regression analysis as shown in equation 2.8.

$Y = -519 + 0.192x_1 + 0.454x_2 + 7.223x_3 + 4.856x_4$ ....(*Equation 2.8)*

Where: Y = Formwork quantity, $\boldsymbol{x_1}$ = Height, $\boldsymbol{x_2}$ = Man-day, $\boldsymbol{x_3}$ = Tower Crane hour, x_4 = Hoist hour

($R^2 = 0.95$, N = 624, SE = 2609.25)

The model (equation 2.9), indicate that the unit change in x_3 while keepingx_1, x_2 and x_4 constant produce an increase of 7.223 units of productivity and R^2 of 0.95 indicate a strong significant effect of independent variables on productivity. In addition, Thomas and Thomas (2017) studied the regression modeling for prediction of construction cost and duration and obtained a model using multiple regression analysis tool.

Table 2.4: Regression Model for the actual cost of the project

Variables	Unstandardized Coefficients		Standardized coefficients	Sig.
	B	Std. Error	Beta	
(Constant)	-264240.249	37849.883		<.0001
Area (sq.ft.)	-146.963	23.370	-.098	<.0001
Estimated cost (Rs)	1.210	.017	1.091	<.0001

Source: (Thomas and Thomas , 2017)

A_c = -264240.249 - $146.963A_1 + 1.210E_c$ ....(*Equation 2.10)*

Where:

A_c = Actual cost, A_1 = Area and E_c = Estimated cost**,** (R^2 = 0.968)

From the Table 2.4 and equation 2.10 indicate that the unit change in E_c while keeping A_1 constant produces an increase of 1.210 units/shillings on the actual cost of the project (Thomas and Thomas, 2017).

2.12 Possible measures to improve management skills

Management skills and approaches have a significant bearing on productivity. Many organizations experience low productivity because of inefficient FLMs' skills, even though the latest technology and trained manpower are available. Advanced technology to be used and improve productivity, requires knowledgeable managers, who can guide labourers, to improve the productivity under their supervision (Ogunsanmi, 2016). According to Ogunsanmi (2016) and Jackson (2020) management skills aiming at increasing productivity in the building construction project can be improved through, Training in the following skills: servant leader, good communication system, transparency, trust your people, leading by example, motivation and engagement, taking refresher courses, take leadership course and read management books.

The study by Barbosa *et al*. (2017) indicate that, increased labour productivity in the building construction industry can be achieved through investing in continuously reskilling and training of the workforce to use the latest equipment and digital tools other than firing inadequate and hiring adequate skilled workers. This phenomenon makes the building construction company remain unstable in terms of workforce.

2.13 Literature Review summary and Research Gap

2.13.1 Literature Review summary

As seen in Section 2.4, management theories such as Scientific, Bureaucratic, Administrative, Human Relations and Management By Walking Around management theories, if properly implemented they lead to organizational effectiveness and efficiency which will contribute to the increased labour productivity in building construction projects (Valence, 2012; Turan, 2015; Gull, 2017). In addition as seen in section 2.5, motivational theories such as Maslow's hierarchy of needs, Alderfer ERG, Herzberg's motivational theories, should not be under looked by construction building practitioners because they may result into low labour productivity (Adjei, 2009; Haque *et al*., 2014) .

Section 2.6, showed that construction management skills that affect productivity in building construction projects are grouped into three as follows:

- Conceptual skills: these skills are mostly needed by managers involved in planning, controlling, organising and decision making of the company. The success of decisions made depends on conceptual skills of the people who decide and put them into action.

- Human skills: these skills are needed by all groups of managers (Top, Middle and First Line). It involves active communication, listening skills, good interaction with your employees.

- Technical skills: these skills are most needed by FLMs who are involved in construction work. These skills involve specialized knowledge, analytical ability within that speciality and the competence in the use of the tools and techniques of the specific discipline (Katz, 1974; Robbins *et al*., 2013).

Section 2.8 showed that there are different types of productivity in the building construction industry such as labour, material and equipment productivities. These components of productivity are considered the most risky in the construction building projects in Uganda (Alinaitwe *et al*., 2007). The impact of management skills on the productivity in building construction industry include, contractual disputes, abandonment of building projects, massive cost and time overrun (Valverde-Gascuena *et al*., 2011; Gamil & Rahman, 2017).

2.13.2 Research Gap

Management skills are essential components for efficiency and effectiveness of all managers to enable them accomplish the vision and missions of the construction company to meet the stipulated goals and objectives of the projects (Url, 2008). Currently management skills are known as a cause of low productivity in the construction projects, however, it is often neglected and little study has been conducted.

Management skills have a big impact on construction projects such as the loss to the company in terms of time, quality, cost and reputation of the company is tarnished, more so, a number of studies have been conducted on the factors affecting labour productivity on building construction projects in Uganda and the significant factors are: shortage of competent labours, design and specification errors ,lack of tools, poor construction methods (Alinaitwe *et al*., 2007; Otim *et al.,* 2009). Furthermore, there is inadequate information identified on the impact of management skills on productivity in building construction industry in Uganda.

Asaya (2018) researched on assessment of equipment productivity in building construction projects in Uganda but did not tackle the issue of the impact of management skills on labour productivity. Similarly Ainobushoborozi (2013) studied the impact of effective communication on labour productivity in civil engineering projects: A case study of Kampala Central Division but did not tackle management skills impact on labour productivity in building construction industry. Otim *et al*., (2009) researched on the causes and impact of uncompleted building; studies in Kampala city but did not study the issue of management skills impact on productivity in building construction industry. Therefore, understanding the impact of management skills on productivity in the construction industry is very crucial and needs to be studied.

The next chapter discusses research design, research approach, description of the population, sampling strategies, sample size determination, description of the study area, data collection instructions and sources of data. It also explains the presentation and analysis of the data and regression model development procedures in the study along with ethical consideration.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methods that were used in this research to accomplish the study objectives. It reviewed the quantitative, qualitative and cross-sectional methods with discussions on the selection of a suitable method for this research. It also explains the research design, approaches to data collection, sampling strategies, source of data, data analysis and results presentation that were obtained in this study along with ethical considerations. The study investigated the following research questions:

- How are the management skills that affect productivity in building construction industry characterized?
- What is the impact of management skills on productivity?
- How are the management skills related to productivity, in building construction industry?
- What are possible measures of improving management skills aimed at increasing labour productivity in the building construction industry?

3.2 Research design

Research design is a framework of methods and techniques chosen by a researcher to combine various components of research in a reasonably logical manner so that the research questions are efficiently handled to conclusions (Fellows & Liu, 2008; Creswell & Creswell, 2018). The study design was cross-sectional survey design where data was corrected at once from various respondents without visiting them repetitively

(Amin, 2005). The cross-sectional survey design was chosen because it enables the researcher to collect data within a shortest possible time and relatively less costs is used in the process (Creswell & Creswell, 2018). In addition cross-sectional data exhibits validity comparable to other data types, in a particular, longitudinal data which makes repeated observation (Creswell, 2009).

3.3 Research approach

Research approach is a plan and procedure that consists of steps from broad assumptions to detailed methods of data collection, analysis and interpretation, based on the nature of the research problem being addressed (Creswell & Creswell, 2018). The research approach is categorised as qualitative and quantitative approaches.

3.3.1 Qualitative approach

Qualitative research approach is a scientific method of observation to gather information that is not in numerical form, the information collected is typically descriptive data (Fellows & Liu, 2008; Creswell & Creswell, 2018). The data format is textual which is obtained through audiotapes, videotapes, field notes and the question format was both open and closed-ended. Qualitative approach was used to apply various open and closed ended questions in our questionnaire to answer the research specific objectives. The open ended questionnaires helped to obtain additional information on the impact of management skills on labour productivity which helped to realize the specific objectives and also to qualify the study. The closed ended questionnaire helped to obtain the specific information on the impact of management skills on labour productivity which was used in quantifying the data.

3.3.2 Quantitative research approach

Quantitative research approach is where the researcher gathers numerical data using the questionnaires by assigning numerical values to responses which are in rank order (ordinal data), or measured in units of measurement (scale data) (Fellows & Liu, 2008; Creswell & Creswell, 2018). It is also described as a type of research methodology which tries to quantify the data and establish cause and effect on the relationship between variables with the help of statistical methods (Singh, 2006).

This type of approach focuses on gathering numerical data, which is used to construct graphs and tables, hypothesis testing and drawing empirically best conclusions from raw data (Creswell & Creswell, 2018). In this study quantitative approach was used to summarize and quantify responses of the various respondents on their bio-data and structured questions pertaining the specific objectives; characterization of construction management skills, establishment of the impact of construction management skills, determination of the relationship between management skills and labour productivity and strategies for improving construction management skills aimed at increasing labour productivity.

Quantitative approaches emphasize objective measurements and the statistical, mathematical, or numerical analysis of data collected through questionnaires and surveys. During data analysis, statistics were used to turn quantitative data into useful information by describing patterns, relationship and connections to help in decision making. Statistics can be descriptive or inferential. Descriptive statistics were used to help in summarizing the data whereas inferential statistics were used to identify statistically significant differences between the variables for the groups of data. The literature review was used to help establish a rationale for the research questions, ascertain the extent and depth of existing knowledge on management skills and productivity.

3.4 Description of the Research population

3.4.1 Population sampling

Population sampling is the process of taking a collection of all the objects, members that conform to a set of representative specifications of the population with sufficient size to warrant statistical analysis. Sampling is done to save time, money, effort while conducting a research and to reduce the impossibilities to test every single individual in the population (Fellows & Liu, 2008; Cooper & Schindler, 2016).

In this study, the population was considered to be local construction companies located in Kampala District, falling in the category of A-1 to A-5, presented in table 3.1 with their corresponding characteristics as categorized by UNABCEC. They were selected for this study because over 4percent building projects do not reach completion (UBOS, 2017). These building construction companies mostly face negative impacts on labour productivity which suits the study objectives and they were located within the researcher’s reach saving time and financial resources for data collection. The decision to limit the scope of the study to FLMs was made for the reasons: they manage the day-to-day work flow, the quality of work, direct communication of workers and problem solving at project sites. The local construction companies and the FLMs that took part in this research were selected based on simple random sampling. This enabled local construction companies and FLMs to have equal chances of being chosen.

3.4.2 Sample Size Determination

A sample is a subset of the population selected to be representative of the larger population and participate in the study (Kothari, 2004; Marczyk *et al*., 2015). The sample was representative of the population to ensure that findings are generalized from the research sample to the population as a whole. The general rule is to always use the largest sample possible because the larger the sample the more representative, the smaller sample produces less accurate results (Kothari, 2004; Singh, 2006).

In this study, the following statistical formulae in equations (3.1 and 3.2) were used to generate the sample size of local construction companies under study and Morgan chart discussed in section 3.5.3 was used in the determination of respondents sample size.

Sample size (n) = $\frac{\mathbf{Npqz^2}}{\mathbf{e^2(N-1)+pqz^2}}$ for finite population …………. (*Equation 3.1)*

Where: Z = is the normalized random variable at a specified level of confidence and in this study 95% Confidence Interval (C.I) was used.

P = is the estimated proportion of the variable/attributes that is present in the population

q = is a variable derived as (1-p).

According to Cochran at 95% C.I, the P = 0.5 and q = 0.5, they were used in this study.

e = is the margin of error between the sample mean and the population mean (5%) or (desired level of precision or sampling error)

n = is sample size

N = population size

The equation 3.1 was used in the determination of sample size from the population size of local construction companies from UNABCEC, where N= 89

Sample size (n) = $\frac{89x0.5x0.5x1.96^2}{0.05^2(89-1)+0.5x0.5x1.96^2}$ = 73 companies

The sample size obtained of 73 companies was big to save time and costs, it was corrected using Cochran`s equation 3.2 (Singh, 2006; Marczyk *et al*., 2015).

$n = \frac{n_0}{1+\frac{n_{0-1}}{N}}$ ……………………………………… …………………… (*Equation 3.2)*

Where, n is the adjusted sample size,$n_0 = 73$, which is the first obtained sample size and N = 89 which is local construction companies population sample. The adjusted sample size was obtained using equation 3.2 as, $n = \frac{73}{1+\frac{73-1}{89}}$ = 41, the sample size of 41 companies was obtained and it was used in this study.

3.5 Sampling Strategies

Sampling is the process of selecting a number of individuals for a study in such a way that the individuals represent the larger group from which they were selected (Kothari, 2004; Marczyk *et al*., 2015). The data was gathered from the selected group in order to make an inference that can be generalized to the population. There are several sampling strategies from a population which include: probability sampling techniques (i.e., Simple random, stratified, Systematic and Clustered sampling) and Non-probability sampling techniques (i.e., Convenience, Quota and purposive sampling). In this study, the stratified sampling technique, purposive and simple random samplings were used.

3.5.1 Simple Random Sampling

Simple random sampling is defined as a sampling technique where every individual in the population has an even chance and likelihood of being selected in the sample. The individuals are chosen at random and not more than once to prevent a bias that would negatively affect the validity of the result from the respondents (Kothari, 2004). Simple random sampling helped the researcher to select the number of local construction companies. Simple random sampling was used because it generalizes findings and reduces bias (Creswell, 2014) and FLMs who participated in this study, were purposively selected. These main informants were purposively sampled because they are thought to have construction skills and specialized knowledge in the building construction projects.

3.5.2 Stratified sampling

Stratified sampling is defined as a probability sampling technique where in the researcher divides the entire population into different subgroups (Strata), then randomly selects the final samples proportionally from the different strata (Kothari, 2004). It helped the researcher to sample in subgroup of companies within the population. The selection of building construction companies from different groups of companies employed stratified sampling technique to sample from each group of a company. The following formula of equation 3.3 was adopted to generate the required sample size

$$S = \frac{N_i x\, n}{N_T} \quad \text{.. } (\textit{Equation 3.3})$$

Where: S - is the desired sample size of local construction companies that participated from each group of local construction companies;

N_i - is the number of companies from each group of local construction companies;

N_T - is the summation of companies from all participating groups of construction companies;

n - is the sample size of companies from all participated local construction companies obtained from equation 3.2. The desired sample size (s) for category A-1, $S = \frac{N_i x\, n}{N_T}$ $= \frac{13 x\, 41}{89} = 6$, and for other companies were computed the same way as indicated in table 3.1.

Table 3.1: Sample elements from representative companies under study

Category of Companies as classified by UNABCEC	Annual contractual capacity UGX	No. of companies from UNABCEC	Desired no. of companies (S)	Sampling technique used
A-1	Above 10 Billion	13	6	Stratified sampling
A-2	5Billion -10Billion	15	7	
A-3	2.5Billion- 5Billion	9	4	
A-4	500million-2.5Billion	22	10	
A-5	Below 500m	30	14	
Total		**89**	**41**	

3.5.3 Selection of Respondents

The assumption made in the determination of sample size of managers of all construction companies under study was that each construction site had five FLMs (Project manager, Construction manager, Site manager, Health and safety manager and General foreman). This gave the respondent population size equal to 89 x5 = 445. The researcher used Morgan chart in appendix A15 to determine the respondents sample size equal to 205 as indicated in Table 3.2.

The researcher obtained column (ii) by using column (i) multiplied by five number of managers from each building construction company under study.

Table 3.2: Number of managers from companies under study

Grades of Companies obtained from UNABCEC	Desired no. of companies (S) (i)	Number of respondents (ii)	No. responses received
A-1	6	30	23
A-2	7	35	25
A-3	4	20	16
A-4	10	50	36
A-5	14	70	55
Total	**41**	**205**	**155**

3.6 Description of study area

The study area was restricted to Kampala and the choice was guided by two reasons.

1. Kampala is hot spot of less progress, uncompleted and abandoned building construction projects.
2. Kampala has most mushrooming complex designs of building construction projects coming up in relation to other parts of Uganda as evidenced in the appendix A10 herein.

3.7 Sources of data

Data source is one in which the research information are collected primary data by the researcher for a specific research study. Data sources are broadly classified into primary and secondary data, on which the researcher will rely to conduct this study (Kothari, 2004).

3.7.1 Primary Data Sources

Primary data are the information collected by the researcher first hand specifically for research assignment through various methods like questionnaires, interviews, field observations (Creswell & Creswell, 2018). In this study, the source of information was A-1 to A-5 Local building construction companies that were located in Kampala district, as they were indicated on the list of different building construction companies obtained from UNABCEC. The sample size was obtained through the procedure described in section (3.4), the table 3.A in appendixA11 shows the selected study building construction companies.

3.7.2 Secondary data sources

Secondary data is the data that has been published by different researchers and is readily available for other researchers perusing a similar study. They include books, industry survey, compilations from computerized databases, published printed sources, journals, published electronic sources, magazines and newspapers (Creswell & Creswell, 2018). In this investigation, journals, published theses and books were used as presented in chapter two.

3.8 Data collection instruments

These are tools used by the researcher to collect data from all participants in the sample. This study collected the data from participants using structured questionnaire, observational and interview guide. Data regarding construction management skills was obtained from local construction companies registered with UNABCEC as class A-1 to A-5 as indicated in Table 3.1 as the study companies and Project managers, construction managers, site engineers, general foremen and health and safety managers as respondents.

3.9 Data collection methods

Data collection is the process of gathering and measuring information on variables of interest in a systematic way that enables the researcher to answer stated research questions, test hypotheses and evaluate the results (Creswell & Creswell, 2018). There are several techniques used in the collection of primary data, however Yin (2009) indicate that, case study researches the appropriate data collection technique include questionnaires, interviews, observations and relevant documents. These methods were adopted in the data collection of this study. Through data collection the researcher was able deduce quality information that is a prerequisite for making informed decisions.

3.9.1 Questionnaire survey

In this research study, the technique used for data gathering was a questionnaire survey using structured survey approach and the respondents expressed their opinions when answering the questions. The structured questionnaire is a widely-used research technique for quickly and efficiently gathering and analysing data from a population under study (Creswell & Creswell, 2018). The questionnaire was designed based on construction management skills from literature review and validated by three respondent experts for questionnaires in the same field.

3.9.2 Questionnaire design

The questionnaire was designed to consist of five (5) sections based on the data was required to be collected to enable the researcher achieve the study specific objectives (see Appendix A10). Section A was general introduction designed to collect data regarding profile of repondents and introduce them to the focus of the study. The questions asked were aimed to salvage information that describes respondents age, experience , qualification of respondents who conduct different tasks in building construction projects.

Section B of the questionnaire was asked to seek opinions of participants on how construction management skills that affect labour productivity are categorized in the building construction industry.This section of the questionnaire comprised of closed-ended questions, constructed using five point Likert scale (1-Strongly Disagree; 2-Disagree;3-Neutral; 4-Agree and 5-Strongly agree) for the purpose of easy statistical analysis.The construction management skills were categorized based on a detailed review of literature by other researchers.

Section C of the questionnaire was asked to seek opinions of respondents on impact of construction management skills on labour productivity in the building construction industry.This section of the questionnaire comprised of closed- ended questions, constructed using five point Likert scale as in section B above for the purpose of easy statistical analysis.

Section D of the questionnaire was designed to seek opinions of participants on whether inadequate conceptual, interpersonal and technical construction management skills cause impacts on labour productivity.This section of the questionnaire comprised of closed- ended questions, constructed using five point Likert scale (1-Insignificant; 2-Minor; 3-Moderate; 4-High and 5-Severe) for the purpose of easy statistical analysis. The impacts which include poor quality work, contractual disputes, cost and time overruns were arrived at based on a detailed review of literature by other researchers.

Lastly, section E of the questionnaire was asked to get information from participants whether had strategies in their companies used to improve management skills with the aim of increasing labour productivity in the building construction projects. This section of the questionnaire comprised of closed- ended questions, constructed using five point Likert scale as in section B above for the purpose of easy statistical analysis.

3.9.3 Measurement of research opinions

This study collected opinions from participants about construction management skills and their effect on labour productivity; the opinions were measured on a point five likert scale as discussed in section 3.9.3. These scales acategorized into four (4) which include: nominal, ordinal, interval and ratio scale (Kothari, 2004; Creswell & Creswell, 2018). This study used ordinal or ranking scale. likert scale was considerd to be the most effective scale for obtaining respondents opinions because it can be used to produce hierachy of preferences (Kothari, 2004).

3.9.4 Validity of questionnaire

Validity is the extent to which differences found with a measuring instrument reflect true differences among those being tested (Kothari, 2004; Creswell & Creswell, 2018). Therefore, validity refers to test accuracy of measurement collected using questionnaire from the respondents and it is vital for a measurement to be valid in order for the results to be accurately applied and interpreted for the researcher.

The validation of the questionnaire was addressed by conducting a pilot study with participation of three respondent experts for questionnaires in the same field. Based on their responses, modifications were made and the second phase of the pilot study was conducted on five building construction project FLMs, none of those participated in the final survey. The questionnaire was then adjusted based on comments received from the second pilot study and the tool was validated and distributed to the respondents in the field for data collection.

Table 3.3: Validity test results

Management Skills	Number of respondents	Validity index value (V)
Conceptual Skills	143	0.923
Interpersonal Skills	147	0.948
Technical Skills	150	0.968
Average		**0.946**

The validity of the data collected was determined during analysis using SPSS as indicated in Table3.3. The validity index values range from 0 to 1, the closer an item to 1 the better as it is and the more relevant to the indicator of accuracy (Creswell & Creswell, 2018).

3.9.5 Reliability of questionnaire

Reliability is the extent to which an experiment or any measuring procedure yields the same results on repeated trials (Cooper & Schindler, 2016). Therefore, reliability refers to test consistency of the parameters used in the questionnaire. Internal consistency reliability test was carried by the researcher to have confidence of error-free in the parameters being used in the questionnaires. The reliability and internal consistency of the survey instruments were determined using Cronbach's alpha statistics through SPSS as indicated in Table 3.4. Cronbach's $\propto$ reliability correlation coefficient normally ranges from 0 to 1, the reliability of data is considered weak when Cronbach's $\propto$ is less than 0.3, moderate when between 0.3 to 0.7 and strong when more than 0.7 which indicates high level of internal consistency of the instrument and it is considered acceptable for research purposes (Creswell & Creswell, 2018).

Table 3.4: Reliability test results

Management Skills	**Number of questions**	**Cronbach's Alpha Reliability Analysis**
Conceptual Skills	13	0.847
Interpersonal Skills	17	0.915
Technical Skills	13	0.908
Average		**0.89**

3.9.6 Interview guide

An interview guide was used to collect qualitative data from the study participants about the impact of management skills on labour productivity. The interview guide was used because it permits the collection of in-depth qualitative data on the research topic under study (Boyce & Neale, 2006). From the interview guide steps to develop the model were analysed depending on the valid qualitative data collected.

3.9.7 Observation study

The researcher used this method to get first-hand information from observing the work going on at Bukoto church (O&M Barajrang construction ltd), Najjera construction of condominium apartments Near shell petrol station (Volcom Technical services ltd), Ntinda Bukoto road construction of Shopping mall (BAM construction ltd). This observation complemented the data collected in the questionnaires and interview guide. The model developed was dependent on the data collected using above methods.

3.10 Achievement of specific objectives

3.10.1 Characterizing management skills that affect labour productivity in building construction industry in Uganda

(iii) **Research Design**

To achieve this objective, the researcher used both qualitative and quantitative research design. The questionnaires constructed with five point Likert scale was used as the main instrument to collect the field data. The questions were closed-ended, to allow respondents give consistent responses for easy comparison and analysis of data by the researcher.

(iv) **Data collection procedure**

Characterization of construction project management skills on productivity in the building construction industry was based on literature discussed in chapter two. Closed-ended questions were used to obtain data from the survey respondents regarding their perception and it improves consistency of responses from respondents. This enabled the researcher to administer several questionnaires within the stipulated time.

(v) **Data Processing**

The data collected with questionnaires was quantitative. The quantitative data set obtained was cleaned, sorted, coded, classified and entered in the Software packages and scored using ordinal scale (5 point likert scale). Software packages such as R-studio and MS-excel simplified bulk quantitative data sets which would ordinarily require a lot of time when processed using manual techniques.

(vi) **Data analysis and presentation**

As mentioned before, MS-excel and R-studio Software packages were used.

The scores assigned to each management skill from the questionnaires by the respondents were entered and analyzed. The contribution of each of the management skills on productivity was scrutinized and the opinions (attributes) were ranked in their related categories using Relative Importance Index (RII).

$$\text{RII} = \frac{\sum w_i}{\text{AxN}} = \frac{5n_5+4n_4+3n_3+2n_2+1n_1}{5N} \quad \text{..} \quad (\textit{Equation 3.4})$$

$$0 \leq \textbf{RII} \leq \mathbf{1}$$ (Rajgor *et al.*, 2016)

Where:

W = the weight given to each management skill by the respondent {using 5point Likert scale which ranges from 1 is strongly disagree to 5 is strongly agree}.

A = the highest weight (in this case 5);

N = the total number of respondents;

Data was analyzed, grouped, ranked, presented in the table, interpreted and discussed as regards to characterization of management skills.

The average Relative Importance Index (RII) was computed by the researcher and used in this study as a baseline to determine significant and insignificant management skills. The management skills with RII above average were considered significant and those management skills with RII below average were considered non-significant on labour productivity. This approach was used in chapter four sections (4.3.1, 4.3.2, 4.3.3, 4.4 and 4.6). In this study, the researcher used significant values of construction management skills in the determination of the relationship between management skills and labour productivity (model development).

3.10.2 Determining the impact of management skills on productivity in the building construction industry

(vii) **Research design**

The research design was both qualitative and quantitative. The questionnaires constructed with five point likert scale technique were used to collect the field data. The questions were closed-ended, to improve on the consistency and minimise irrelevant answers from respondents which enabled the researcher to get quality and useful information for the study. The data obtained were coded and analysed using MS- Excel and SPSS software packages. Categories of management skills (Conceptual, Human and Technical skills) were ranked using Ordinal scale (5-point likert scale).

(viii) **Data Analysis and Presentation**

Data was analyzed as in section 3.10.1 and the impacts were measured from the information obtained from the questionnaires. The information was presented on bar graphs, pie charts and scatter graphs which were interpreted and discussed using simple statistical tests namely; percentages, frequencies and F-test for hypothesis testing as regards to impact of management skills on productivity in building construction industry.

Hypothesis testing

H_o : There is no significant relationship between construction management skills and productivity in the building construction industry.

H_1 : There is significant relationship between construction management skills and productivity in the building construction industry.

3.10.3 Establishment of existence of relationship between management skills and productivity in the building construction industry

(ix) **Research design**

Research design was quantitative; the data used to achieve this specific objective were obtained from the questionnaire constructed with five point Likert scale. The ordinal scale was used to change the data into numerical. All construction management skills that were considered significant in chapter four sections (4.3.1, 4.3.2 and 4.3.3) were used in model development and the coefficients of model summary that were significant during analysis displayed on console pane of the R-studio interface and discussed in section 4.5.

(x) **Data collection procedures**

The data collection instrument was the questionnaire. Closed-ended questions were used such that the responses from different respondents are easier to compare and save time during analysis. This enabled the researcher to obtain more information from the respondents.

(xi) **Data processing**

The data obtained from section (3.9.2 B and D) was numerical. Data were analyzed and the relationship between management skills and productivity were measured from the information obtained from the questionnaires. The data set was cleaned, coded, classified and entered into MS-excel. The data set file in MS-excel was saved as csv file, ready for importation commands using R-studio computer software package for analysis.

(xii) **Regression analysis and Data Presentation Procedure for model development**

The model can be developed using software like SPSS, R-studio, SAS, and MS- excel (Yan & Su, 2009; Chakkappan & Das, 2016). In this study, the model was developed using R-studio and MS-excel computer package soft wares. The data set descriptions were entered in the excel sheet in the form of rows and columns. The excel file was saved as command separated values (CSV), the file was then imported from excel to R system which is mainly command – driven. The R-studio interface is shown in the Figure 3.1, showing the working environment. The data was imported from excel to R system as: dataset <- read.csv ("filename", header = true").

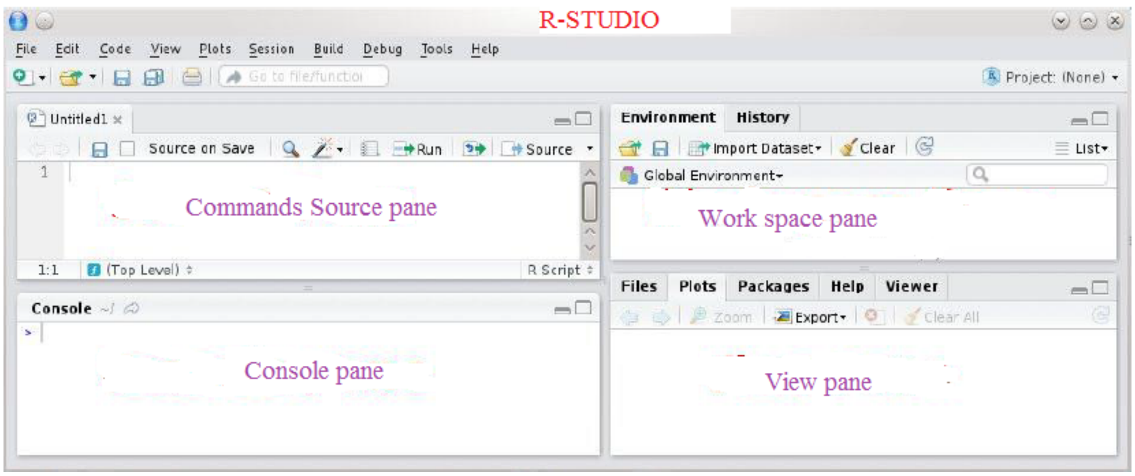


Figure 3.1: R-studio Interface

The model was developed by typing the command on the R-vector command source pane as: Modelfit = lm (Key performance Indicators~ conceptual skills + Interpersonal skills + Technical skills, data= file name). When the command was completed, the model coefficient summary appeared on console pane as shown in the chapter four section 4.5. Thus, the model coefficients explain the impact on dependent variable when there is unit change in the independent variables (Conceptual, Human and Technical skills). The regression model developed is presented in chapter four sections 4.5.1.

3.10.4 Regression model development of construction management skills and labour productivity

The model is in a mathematical expression with regression parameters which are used to derive construction management skills prediction equations that can be used according to the prevailing labour productivity condition on building construction projects.

3.10.5 Model Development

Step one in model development was to study the current situation of management skills on building construction projects to identify and analyse the problem and decide on the type of model required, its intended purpose and for whom it was to be developed. An investigative observational study using interview guide was conducted on three similar local building construction projects to establish construction management skills currently practiced by FLMs, which could be the cause of low labour productivity in building construction industry. The qualitative data collected using the interview guide helped in the model development.

3.10.6 Regression Model Formulation

The objective three of this study was to determine the relationship between construction management skills and labour productivity in building construction industry and be in the prediction of occurrence of low labour productivity on building construction projects. The researcher having established the cause of the problem in the current low labour productivity, the researcher's action was to design a desirable model that depicts reality thereby identifying achievable and desirable changes when implemented could consequently bring improvement in the current state of low labour productivity in building construction project. To achieve this purpose, the following assumptions were considered: if the initial input to the system is $\mathrm{Input}_{(\mathrm{ms})}$ and corresponding output is $\mathrm{Output}_{(\mathrm{ms})}$; then in the required model, using the same inputs i.e. $\mathrm{Input}_{(\mathrm{ms})} = \mathrm{Input}_{(\mathrm{LP})}$, the expected $\mathrm{Output}_{(\mathrm{LP})} \geq \mathrm{Output}_{(\mathrm{ms})}$+ predictably; In other words, if $\mathrm{Input}_{(\mathrm{ms})}$ is initial input of management skills and $\mathrm{Output}_{(\mathrm{ms})}$ is labour productivity produced through a process $P_{(ms)}$ i.e. when there is no intervention and similarly ($\mathrm{Input}_{(\mathrm{LP})} = \mathrm{Input}_{(\mathrm{ms})}$) is input of model and $\mathrm{Output}_{(\mathrm{LP})}$ is labour productivity produced through a process $P_{(LP)}$ (after intervention), then for the required model, $\mathrm{Output}_{(\mathrm{LP})} \geq \mathrm{Output}_{(\mathrm{ms})}$ (predictably), the next stage is determination of model parameters.

3.10.7 Determination of Model Parameters

The third step was to determine parameters (variables) to be included in the model. All models comprise of independent and dependent variables which must be identified and if possible quantified for use in the model together with their interrelationships. The dependent variable was labour productivity. The identified independent variables included: conceptual skills, interpersonal skills and technical skills which were the categorical variables to be included in the model. From literature reviewed and the responses received from the case study building construction projects, these were observed to be the most affecting labour productivity and therefore the justification of their choice of their inclusion in the model formulation and development. The exploratory scatter graphs enabled the researcher to determine that variables obtained were linearly or non- linearly are discussed in section 2.11.5.

3.10.8 Model verification

The researcher verified the model using Fisher F-test approach**.** According to Montgomery *et al.* (2012) indicate that, the observed F-value in statistics can be obtained using equation 2.2 as discussed in section 2.11.3. The overall fit of the model was checked by looking at model observed F-value and the associated p-value to confirm model significance. The greater the observed F-value than the F-value critical from F-distribution table the more strongly significant and the lower the computed F-value than critical value from F- distribution table the more insignificant the model, the model terms with p-value less than level of significance indicate that those model terms are statistically significant (Kothari, 2004; Creswell & Creswell, 2018).

3.10.9 Model validation

The regression model developed was validated by the split sample approach. The data was split into two parts, with 75% of the data randomly chosen for estimating the regression model and the remaining data used for validating the model. The computer package software R-studio was used in data analysis for model validation and the statistics parameters such as mean square error (MSE) and R^2 for both model fit and model split were determined to check their closeness that enabled the researcher to make appropriate judgment. The validity of the model was further checked using statistics students' t-test as discussed in section 2.11.4.

3.10.10 Possible strategies of improving management skills in the building construction industry

(xiii) **Research Design**

The research design was both qualitative and quantitative. The questions were closed-ended constructed with five point Likert scale to allow respondents give their opinions within the same limits and consistency of responses from respondents. The questions were assigned scores for levels of agreement (1-strongly disagree, 2-disaagree, 3-neutral, 4-agree and 5-strongly agree) for easy answering by respondents. The data obtained was coded and analysed using MS-excel and R-studio software packages.

(xiv) **Data Analysis and Presentation**

Data was analyzed as in section 3.10.1 and the strategies of improving management skills were developed from the information obtained from the questionnaires. The information was presented on bar graphs and pie charts which were interpreted and discussed using simple statistical tools namely; percentages, frequencies as regards to strategies of improving management skills on productivity in building construction industry.

3.11 Data trend determination/Data analysis

After analyzing the data for all research questions, the researcher determined the trend and relationships among the variables by using the data analysis techniques appropriately. There are two kinds of data analysis used: (i) Descriptive statistical data analysis which included: Measure of central tendency, Frequency distribution, measure of variability (Range and standard deviation) and measure of associations (Regression and Correlation). This enabled the researcher to describe the characteristics of a data set, make sense of the data, make conclusion about the data in order to make rational decision.

(ii) Inferential statistical data analysis which includes: F-test and Analysis of Variance were used to test for significant relationships among variables and find statistical support for the hypothesis.

3.12 Ethical issues and consideration

Ethics are the rules of behavior based on ideas about what are morally good and bad, in order to protect human participants and ensure that research is conducted in a way that serves interest of individuals, groups and society as a whole (Kumar, 2011). In this study, the researcher observed the following components of research ethical issues and considerations;

(i) Truthfulness was maintained (Fraud and misconduct, Data Fabrication, Data cooking, Plagiarism and Data trimming) were avoided.

(ii) Courtesy was observed: the researcher first attained formal permission from the head of company before participants were involved in the study.

(iii) Respect for human dignity was observed: the participants were protected from harm, loss of dignity and informed consent of participants before are involved in the study was observed.

(iv) Confidentiality was observed. The data collected and information that were disclosed to me, in a relationship of trust and with the hope that it would not be revealed except in ways that had been previously agreed upon.

(v) The ability of participant to disengage from the study at any point. The participants were not obliged to fill the questionnaire and they felt free to disengage at any time.

CHAPTER FOUR: PRESENTATION, ANALYSIS AND DISCUSSION OF RESULTS

4.1 Introduction

This chapter is about analysis, discussions and presentation of results from data obtained from respondents using questionnaires on the various specific objectives which include; establishment of characterization perception of management skills that affect productivity, establishment of impacts of construction management skills on productivity, determination of relationship between construction management skills and productivity and suggestive strategies for improving project management skills aimed at increasing productivity in the building construction industry.

4.2 Background characteristics of the respondents

This section shows background information of data collected. Total of 205 questionnaires were distributed to the respondents and total responses received were 155 giving a response rate of 76% as in Table 4.1. Amin (2005) indicate that, a response rate of 70 percent above is judged adequate for any research.

4.2.1 Gender of study respondents

The study revealed on the gender of the study respondents in building construction industry in Uganda and the findings are presented here below in Table 4.1.

Table 4.1: Gender of Respondents frequency

Respondents Gender	Frequency	Percent	Valid Percent
Male	130	83.9	84
Female	25	16.1	16
Total	155	100	100

It is observed from Table 4.1 that majority of the respondents were male with 84% and minority were female with 16% of the population. This implies that there are few females who are FLMs in the building construction industry as indexed by results from the respondents as shown in the Table 4.1 and Table 4.2 shows respondents age group.

4.2.2 Age group of sampled study respondents

The study explored on the age group of the study respondents in building construction industry in Uganda and the findings are presented in Table 4.2.

Table 4.2: Respondents Age group

Respondents Age Group	**Frequency**	**Percent**	**Valid Percent**
20-30 Years	60	38.7	39
31-40 Years	64	41.3	41
41-50 Years	31	20.0	20
Total	155	100.0	100

The observation from Table 4.2 indicates that majority of the sampled study respondents were in the age bracket between 31-40 years with 41%, followed by 20-30 years with 39% and lastly 41-50 years with 20% which implies that, majority of the FLMs in the building construction industry in Uganda are in the age bracket of 31-40 years as revealed by the results in the questionnaire. The information in the questionnaire and interview guide (Appendix A12 & A13) indicates that large number of FLMs graduated in recent years to meet the increasing demand in building construction industry and they still have inadequate management skills that may negatively affect labour productivity and Figure 4.1 shows their academic qualifications.

4.2.3 Level of academic qualifications of the study respondents

The study revealed on the level of education of the respondents and the findings are presented in the Figure 4.1.

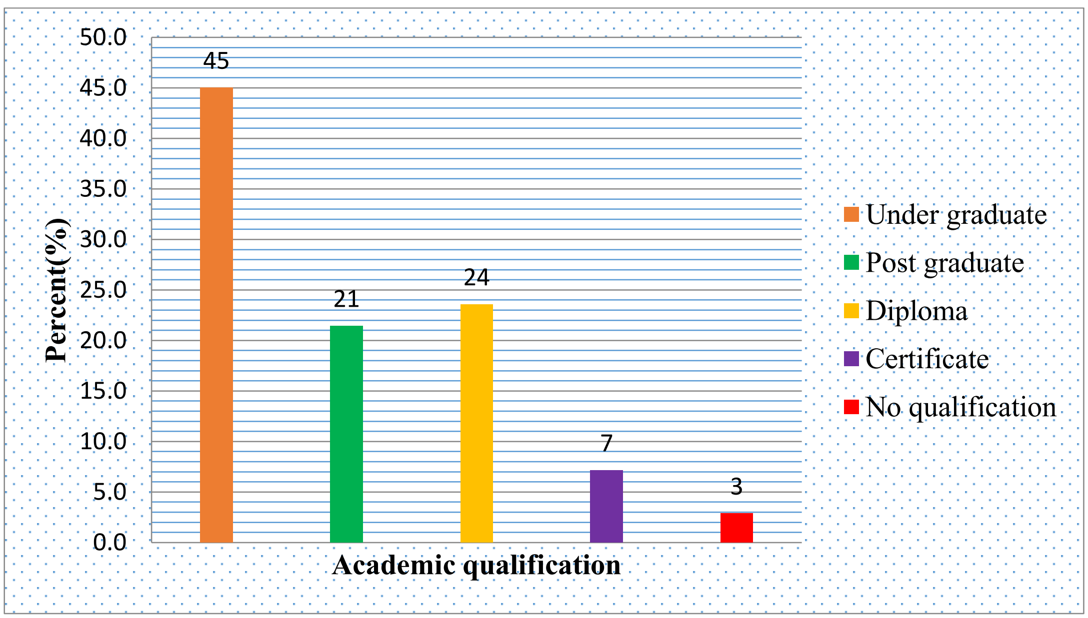


Figure 4.1: Level of academic qualifications of the respondents

It observed from Figure 4.1, that majority of the respondents were under graduates with 45%, followed by Diploma with 24%, Post graduate with 21%, certificate with 7% and lastly those with no qualification at 3%. This implies that majority of the respondents were educated and they could therefore be relied upon to provide dependable information on the topic under study.

From analysis of interpersonal skills (AppendixA7) bigger number of respondents they are neutral on most significant skills that affect labour productivity for example conducting site meetings had 28%, problem solving had 26%, motivation had 27% and good temper had 32%, this indicate that they have qualifications but may not have the management skills required to effectively execute projects. This results in negative impact on labour productivity and Figure 4.2 shows their designations in the company.

4.2.4 Designation of the respondents

The study investigated on the designation of the respondents and findings are presented here in Figure 4.2. It is observed from Figure 4.2 that, the majority of the respondents were General Foremen with 44%, followed by Site managers with 25%, Project managers with 14%, and construction managers with 9% and lastly Health and safety manager with 8%. This implies that majority of the respondents were general foremen who provide knowledge concerning technical skills to check on the level of labour productivity in the building construction industry.

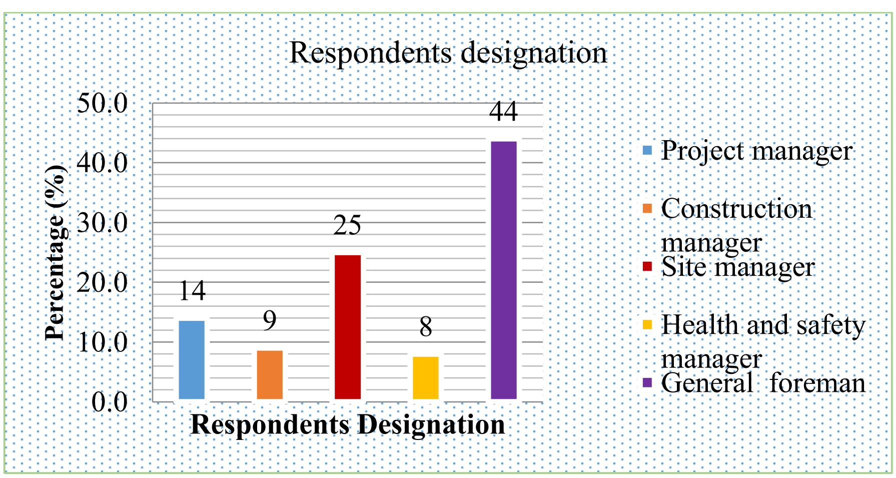


Figure 4.2: Designation of the respondents

The findings indicate, general foremen of lower position are mostly engaged, who may not have required management skills to effectively execute projects to the required contract specifications. This may result in reduced labour productivity and Figure 4.3 shows the years of experience of each respondent in the building construction industry.

4.3 Experience of the respondents

The study explored on the experience of the study respondents in the building construction industry in Uganda and the findings are presented here in Figure 4.3.

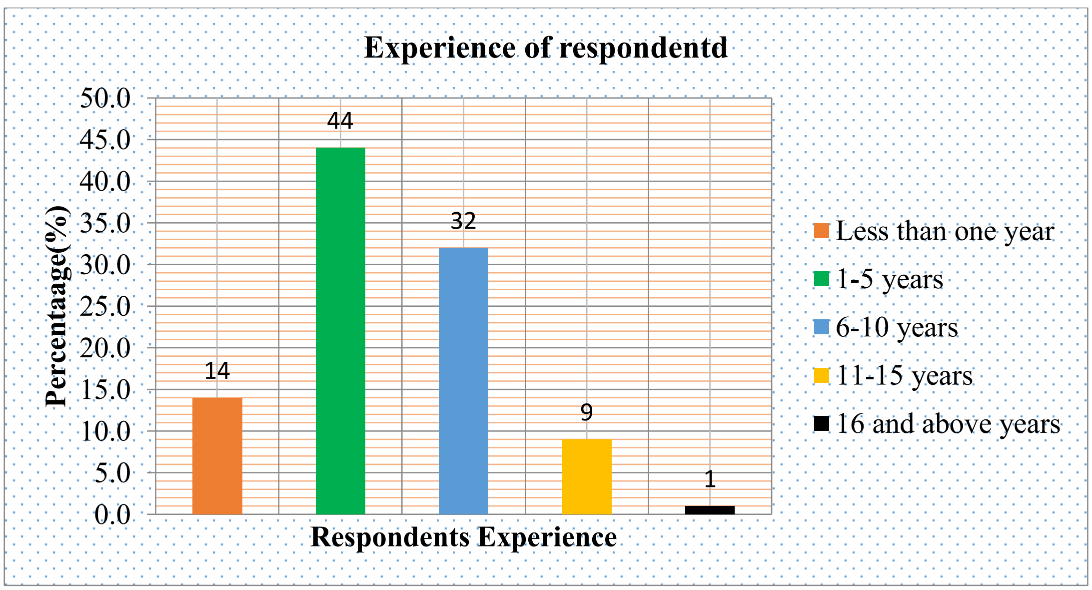


Figure 4.3: Years of experience of the respondents

It is observed from Figure 4.3 that, majority of the respondents had experience between 1-5 years with 44%, followed by 6-10 years with 32%, less than one year with 14%, 11-15 years with 9% and lastly 16 and above years with 1%. This indicates that majority of the respondents had experience of 1-5 years. The findings indicate that a bigger number of FLMs 44% had experience from 1-5 years which is inadequate experience to acquire required management skills to effectively execute building projects which is in agreement with a research from Gull (2017) and Valence (2012). Gull (2017) and Valence (2012) indicate that employees that stay long within the same professional field, gain more skills which are relevant to their work and gain experience which may lead to positive or negative impact on productivity. From the interview guide it was shown that the number of projects worked on determined the experience in the construction management skills.

4.4 Characterization of management skills that affect productivity in the building construction industry

The first objective was to characterize construction management skills that affect productivity in the building construction industry in Uganda. To achieve this objective, the respondents were requested to give their opinion on categorization of the construction management skills that affect labour productivity in the building construction industry on the questionnaire constructed on a five point likert scale and the findings are presented in Figure 4.4, Tables 4.3, 4.4 and 4.5.

The study undertaken established three categories of construction management skills which include: technical skills rated number one with 36%, followed by interpersonal skills rated number two with 32.0% and conceptual skills rated number three with 31% as it is indicated in Figure 4.4. This finding is in line with similar studies from (Katz, 1974; Robbins *et al*., 2013) who emphasized that FLMs require more of technical skills followed by interpersonal skills and less conceptual skills. It is also in line with a research by Seyedinejat *et al*., (2014) who stated that technical skills are more significant for FLMs whereas conceptual skills are more significant to top managers.

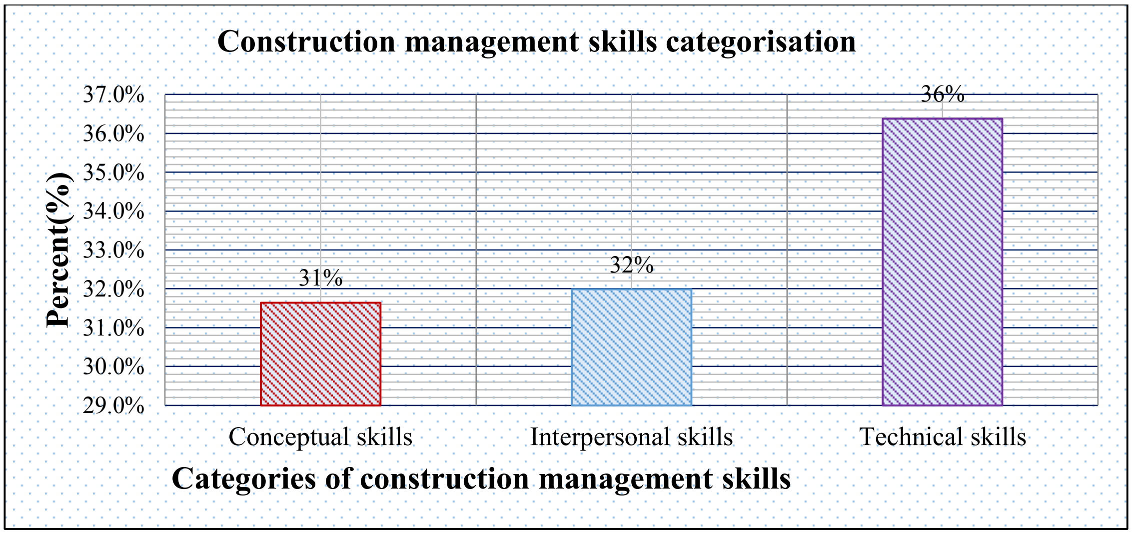


Figure 4.4: Respondents perception on categories of construction management skills

More so, the researcher observed that on those building sites there was evidently no construction management skills system being practiced to improve labour productivity. This was evidenced on some of the abandoned and collapsed building projects in Kampala Uganda (appendix A.9). Even when workers are given the right materials to make concrete, they mix them incorrectly, as if they lack technical skills.

The researcher, after all these observations, concluded that by modifying the current construction management skills practiced which cause low labour productivity was the appropriate strategy for improving current situation that could bring about a difference in labour productivity. This could be achieved through characterizing construction management skills, ensuring only FLMs with required skills are accepted on building construction projects, improvement in quality and level of supervision and ensuring that skilled and committed labour force are engaged to carry out different tasks on the building project.

4.4.1 Technical related construction management skills

The study investigated on the technical related construction management skills that affect labour productivity in the building construction industry and the findings are presented here in Table 4.3. Average RII was computed and the researcher used this value as the baseline to determine significant and non-significant values of RII.

Table 4.3: Technical related construction management skills

Technical Skills	RII	Ranking
Construction Material & equipment utilization	0.906	1
Plan Interpretation	0.891	2
Knowledge of Green & Sustainable Construction	0.872	3
Knowledge of Construction Operation	0.871	4
Operational Planning	0.846	5
Managerial Knowledge & experience	0.839	6
Knowledge of Project Closure Out	0.837	7
Computer Skills	0.822	8
Estimating Skills	0.819	9
Safety and Health Hazards Identification	0.819	9
Scheduling	0.811	11
Proficiency in Construction IT	0.808	12
Evaluation of Performance	0.781	13
Average RII	**0.840**	

Those construction management skills with RII above 0.840 were considered significant and those below were considered insignificant. From the summary of results in Table 4.3, it can be observed that the significant technical construction management skills that have significant effect on labour productivity in building construction projects in

Uganda include: construction material & equipment utilization ranked number one with RII = 0.906, followed by Plan interpretation ranked number two with RII= 0.891, followed by Knowledge of green & sustainable construction ranked number three, with RII = 0.872. Other technical skills considered significant and above the baseline point were knowledge of construction operation and operational planning.

The researcher decided from analysis that technical skills with relative importance index below 0.84 to be considered insignificant. These are managerial knowledge and experience, knowledge of project closure out, computer skills, estimating skills, safety and health hazards identification, scheduling, proficiency in construction information technology and evaluation of performance. This is in line with research from Ghalandari, 2012; Zadeh *et al*., 2016) who highlighted that FLMs require more construction technical skills to be able manage the building construction projects and less significant to middle and top construction managers. However, this was disagreeing with findings by Mostafa *et al*., (2012) who ranked managerial knowledge and experience number one followed by Performance evaluation in Iran whereas in Uganda are considered insignificant. This may be explained by level of technology used in that country, unlike Uganda where more manual labour construction methods are commonly used.

4.4.2 Interpersonal related construction management skills

The study explored on the interpersonal related construction management skills that affect labour productivity in the building construction industry and the findings are presented here in Table 4.4. From the summary of results in Table 4.4, it can be observed that the significant interpersonal construction management skills that contribute most effect on labour productivity in building construction projects in Uganda were; desire to learn ranked number one with RII = 0.814, followed by supervision ranked number two with RII = 0.777, followed by time Management ranked number three with RII=0.771. Other interpersonal skills considered significant were Problem solving, report generation, teamwork, communication skills, controlling conflicts, conducting a meeting, delegation of authority and creativity.

Table 4.4: Interpersonal related construction management skills

Interpersonal Skills	RII	RANKING
Desire to learn	0.814	1
Supervision	0.777	2
Time Management	0.771	3
Problem solving	0.769	4
Report generation	0.766	5
Teamwork	0.761	6
Communication Skills	0.755	7
Controlling conflicts	0.754	8
Conducting a meeting	0.746	9
Delegation of authority	0.746	9
Creativity	0.743	11
Openness to feedback	0.728	12
Motivation	0.719	13
Reliability	0.694	14
Self- confidence	0.693	15
Listening ability	0.689	16
Good temper	0.684	17
Average RII	**0.742**	

From Table 4.4, the research established from analysis that interpersonal construction management skills with RII below 0.742 were considered insignificant in affecting labour productivity in the building construction industry in Uganda and these were: openness to feedback, motivation, reliability, self- confidence, listening ability and good temper. This is in line with research from (Seyedinejat *et al*., 2014; Zadeh *et al*., 2016) who emphasized that FLMs require more construction interpersonal skills for easy to manage the building construction projects and more significant to middle and top construction managers. However this was differing from findings by Ogunsanmi, (2016) of Nigeria and Mostafa *et al*., (2012) of Iran who ranked good-temper number one followed by communication skills whereas in Uganda good-temper was considered insignificant while communication skills are considered significant ranked number seven. This may be explained by level of education of the workers in that country, unlike Uganda where both formal and informal levels of education are still applicable. The next section discusses conceptual construction management skills

4.4.3 Conceptual related construction management skills

The study revealed on the conceptual related construction management skills that affect labour productivity in the building construction industry and the findings are presented here in Table 4.5. From the summary of results in Table 4.5, it can be observed that the significant conceptual construction management skills that have significant effect on labour productivity in building construction projects in Uganda were; strategic planning ranked number one with RII =0.872, followed by time management ranked number two with RII =0.831, followed by decision making ranked number three with RII = 0.783. Other conceptual construction management skills considered significant were problem solving, critical thinking and discipline.

Table 4.5: Conceptual related construction management skills

Conceptual Skills	**RII**	**RANKING**
Strategic Planning	0.872	1
Time Management	0.831	2
Decision Making	0.783	3
Problem Solving	0.774	4
Critical thinking	0.738	5
Discipline	0.726	6
Creativity	0.697	7
Leadership	0.694	8
Mental stability	0.687	9
Prediction Ability	0.680	10
Complex Situation Diagnosis	0.662	11
Goal Making	0.637	12
Delegation	0.632	13
Average RII	**0.724**	

The study undertaken established from analysis that the RII baseline point for conceptual construction management skills was 0.724 and RII values below it were considered insignificant. They include: creativity, leadership, mental stability, prediction ability, complex situation diagnosis, goal making and delegation. This is in line with a similar studies by (Robbins *et al*., 2013; Seyedinejat *et al*., 2014) who highlighted that FLMs require some conceptual skills to be able manage the building construction projects and more significant to top managers. However this was differing from findings by Ogunsanmi, (2016) and Mostafa *et al*., (2012) who ranked discipline number one followed by creativity in Iran whereas in Uganda discipline was considered significant ranked number six while creativity was considered insignificant. This may be explained by level of education of the workers in that country, unlike Uganda where both formal and informal level of education are still applicable. The next section discusses the impact of construction management skills on productivity in the building construction industry.

4.5 The impact of construction management skills on productivity in the building construction industry;

The second objective of the research study was to establish the impact of construction management skills on productivity in the building construction industry in Uganda. To achieve this objective, the respondents were requested to respond to the impacts of construction management skills on labour productivity in the building construction industry on the questionnaire constructed on a five point likert scale and the findings are presented in Table 4.6.

According to the analysis of the responses from the different respondents on the impacts of management skills that affect labour productivity, it was observed from Table 4.6 that majority of the respondents perceived increased contractual dispute ranked number one with RII = 0.754, followed by Poor quality work ranked number two with RII = 0.746, followed by Time overrun ranked number three, with RII= 0.730, followed by Cost overrun ranked number four, with RII = 0.721 to be the most significant impacts on labour productivity since their RII values were above the baseline point of 0.720.

The study undertaken established analysis for the impact of management skills on labour productivity for RII values less than 0.720 were considered insignificant and they included: Building failure, Projects cancellation and Projects abandonment. This implies that FLMs should control on the level of contractual dispute, quality of work, costs and time to be able improve on the level of labour productivity which is line with a research from Rahman *et. al*., (2013) and (Vaardini *et al*., 2016) who stated that contractual dispute, quality work, cost and time are key for FLMs to improve on the level of productivity. However, this was differing from findings by Vaardini *et. al*., (2016) who ranked cost overrun number one whereas in Uganda it was considered significant ranked number four. This may be explained by technology used in that country, unlike Uganda where intensive labour methods are practiced more than mechanized methods. The next section discusses regression model to establish the relationship between construction management skills and productivity in the building construction industry in Uganda.

Table 4.6: Impacts of construction management skills on Productivity

Impacts of management skills on labour productivity	**RII**	**RANKING**
Increased contractual dispute	0.754	1
Poor quality work	0.746	2
Time overrun	0.730	3
Cost overrun	0.721	4
Building failure	0.708	5
Projects cancellation	0.705	6
Projects abandonment	0.676	7
Average RII	**0.720**	

4.6 Regression model for establishment of relationship between construction management skills and productivity in the building construction industry

The third objective of the research study was to determine the relationship between construction management skills and productivity in building construction industry in Uganda. According to the data collected from the respondents on the questionnaires, the researcher run a regression model on different management skills and the corresponding impacts on labour productivity in terms of quality, time and cost to determine the relationship between management skills and productivity in play and also determine statistical significance of the estimated relationship between the impacts of inadequate management skills and each management skill i.e. the degree of confidence on how the true relationship is close to the estimated statistical relationship and the respondent determined different models as in Tables (4.7, 4.9 and 4.11).

4.6.1 Regression model of management skills and Labour productivity quality

After running the regression model for quality several iterations, the most reliable model was then extracted from the R-studio console pane and displayed in Table 4.7. The multiple regression equation for the quality is presented in equation 4.1.

$Prod_{(Q)}$= -22.724- 4.156CS + 2.074IS + $3.342TS$ …………………… *(Equation 4.1)*

Where: $Prod_{(Q)}$*= productivity quality, CS = conceptual skills, IS =Interpersonal skills and TS= Technical skills.*

Table 4.7: Model of management skills and Labour Productivity (quality)

Model coefficients				
	Estimate	Std. Error	t-value	Pr(>|t|)
Intercept	-22.7241	222.5682	-0.102	0.92359
Conceptual skills	-4.1558	1.0218	-4.067	0.01526 *
Interpersonal skills	2.0738	0.4461	4.648	0.00967**
Technical skills	3.3422	0.6206	5.385	0.00575**
Significant codes	0 '***' 0.001 '**' 0.01 '*' 0.05 '. ' 0.1 ' ' 1			
Residual standard error: 16.88 on 4 degrees of freedom				
Multiple R-squared: 0.9366		Adjusted R-squared: 0.889		
F-statistics: 19.68 on 3 and 4 df,		p-value : 0.007385		
t-value critical(t_{Crit}) = 2.776		F- value critical(F_{Crit}) = 6.59 on 3 and 4 df		

(xv) **Model analysis**

The equation 4.1 represents the relationships of conceptual, interpersonal and technical construction management skills and how they affect labour productivity quality while keeping other intervening variables constant. The model shows which management skills have positive or negative effect on the outcome variable which is indicated by a negative or positive value of the model coefficients. These model coefficients represent the expected change in response of labour productivity per unit change in CS when all remaining management skills are held constant.

It is observed from Table 4.7 that, technical skills have most significant impact on labour productivity. The equation indicates that, the unit change in TS while holding CS and IS constant produces an increase of *3.342* units of labour productivity, also a unit change in IS while holding TS and CS constant produce an increase of 2.074 units of labour productivity while a unit change in CS, holding IS and TS constant leads to a decrease of 4.156 units of labour productivity. This is in line with a research from (Seyedinejat *et al*., 2014; Ghalandari, 2012) who claimed all first line construction managers require technical skills to be the most effective in order to increase labour productivity.

(xvi) **Model verification**

The researcher verified the model using the following approach. The overall fit of the model was checked by looking at model F-value and the associated p-value to confirm model significance. The greater the observed F-value than the F-value critical from F-distribution table as appended in appendix A8 the more strongly significant and vice versa (Blaikie, 2003; Kothari, 2004; Creswell & Creswell, 2018). It is observed from Table 4.7 that, F- ratio statistics computed value (F_{comp}) = 19.68 is greater than critical value F-distribution F_{Crit} = 6.59, it indicates that, the overall model is relatively strongly significant. It is supported by low p-value = 0.007385 which shows high significance for the regression model at 95% confidence,

Model predictors with probability value less than 5% indicate that those terms are statistically significant. From the R-studio results, the three variables studied conceptual, interpersonal and technical skills are found to have significant effect on labour productivity. It is supported by model terms with observed t-values greater than t-value critical from the table as appended in appendix A8 are statistically significant as indicated in Table 4.7.

(xvii) **Model Fitness Test**

The fitness of the model was tested as follows, the regression equation and the coefficients of determination of R^2 where evaluated. The predicted and adjusted R^2 values are supposed to be in reasonable agreement (closer to each other). Higher values of R^2 are desirable. The closer R^2 value is to1,the stronger the model is and the better it predicts the response (Blaikie, 2003). In this model, the value of R^2 was 0.9366 which means that the variation of 94% in labour productivity in terms of quality is attributed to these construction management skills and the only 6% of the total variation is not explained by the model, which may due to other management skills that have not been incorporated in the study. The value of adjusted coefficient of determination R^2= 0.889 is also high which further support the significance of the model (Blaikie, 2003).

(xviii) **Model validation**

The regression model developed was validated by the split sample approach. The data was split into two parts, with 75% of the data randomly chosen for estimating the regression model and the remaining data used for validating the model. The study by Thomas and Thomas (2017) and Hair *et al*. (2014) indicate that small difference between the actual and predicted R-squared values are good indications that the model has good predictive ability. In addition, the decrease in value of estimated R^2 and predicted R^2 less than 0.1(10%) indicate a stable model, valid and judged to have close agreement (Kleinbaum *et al*., 2008 & Montgomery *et al*., 2012). To measure the overall predictive fit of the regression model, the R squared for both actual model and predicted model were computed as indicated in Table 4.8.

Table 4.8: R-squared for actual and predicted models

Actual R^2	predicted R^2	Actual R^2- predicted R^2	Remarks
0.9366	0.9184	0.0182	Very close
Actual Adj. R^2	PredictedAdj. R^2	ActualAdj. R^2- predicted Adj. R^2	
0.889	0.8695	0.0195	Very close

The results from Table 4.8 indicate that there is a close agreement between actual and predicted model under study and therefore this close agreement confirms the validity of the model. Therefore the model developed is valid, reliable and can be applied on local construction sites under similar conditions of management skills.

4.6.2 Regression model of management skills and Labour productivity time

The results of statistical analysis in Table 4.9 indicate the regression model coefficients which were generated using R-studio and the multiple regression model of labour productivity time is given by

$Prod_{(T)}$ *= 208.546 -2.971 CS +1.691IS +2.126TS………………………(Equation 4.2)*

Where: $Prod_{(T)}$ *= productivity time, CS = conceptual skills, IS =Interpersonal skills and TS= Technical skills.*

Table 4.9: Model of management skills and labour productivity (time)

Coefficients				
	Estimate	Std. Error	t-value	Pr(>|t|)
Intercept	208.5462	221.3586	0.942	0.38939.
Conceptual skills	-2.9707	1.0326	-2.877	0.03471 *
Interpersonal skills	1.6913	0.6172	2.740	0.04078*
Technical skills	2.1258	0.4435	4.793	0.00491**
Significant codes	0 '***' 0.001 '**' 0.01 '*' 0.05 ' . ' 0.1 ' ' 1			
Residual standard error: 17.27 on 5 degrees of freedom				
Multiple R-squared: 0.8792		Adjusted R-squared: 0.8067		
F-statistics: 12.13 on 3 and 5 df,		p-value : 0.009881		
t-value critical(t_{Crit}) = 2.571		F- value critical(F_{Crit}) = 5.41 on 3 and 5 df		

(xix) **Model analysis**

The equation 4.2 represents the relationships of conceptual, interpersonal and technical construction management skills and how they affect labour productivity time while keeping other intervening variables constant as discussed in section4.5.1.

It is observed from Table 4.9 that, technical skills have most significant impact on labour productivity time. Indicating that, the unit change in TS while holding CS and IS constant produce an increase of *2.126* units of labour productivity time, also a unit change in IS while holding TS and CS constant produce an increase of *1.691* units of labour productivity while a unit change in CS, holding IS and TS constant leads to a decrease of *2.971* units of labour productivity time. More so, for zero variation in the three predictors results into a constant productivity at 208.546.

(xx) **Model verification**

The researcher verified the model as discussed in section 4.5.1. It is observed from Table 4.9 that, F- ratio statistics computed value (F_{comp}) = 12.130 is greater than critical value F-distribution F_{Crit} = 5.410, it indicates that, the overall model is relatively strongly significant. It is supported by low p-value = 0.009881 which shows high significance for the regression model at 95% confidence. This explains that there is a significant relationship between the management skills and productivity in building construction industry in Uganda. This is in line with a research from (Vaardini, 2016; Ullah *et al.*, 2017) who stated that technical skills are highly required by FLMs to improve on the time variations between actual project time and predicted project time.

Model predictors with probability value less than 5% indicate that those terms are statistically significant. From the R-studio results, the three variables studied conceptual, interpersonal and technical skills are found to have significant effect on labour productivity. It is supported by model terms with observed t-values greater than t-value critical from the table are statistically significant as indicated in Table 4.9. The fitness of the model was tested as discussed in section 4.5.1. In this model, the value of R^2 was 0.8792 which means that the variation of 88% in labour productivity in terms of time is attributed to these construction management skills and the only 12% of the total variation is not explained by the model, which may be due to other management skills that have not been incorporated in the study.

(xxi) **Model validation**

The regression model developed was validated as discussed in section 4.5.1(iv).

Table 4.10: R-squared for actual and predicted models

Actual R^2	Predicted R^2	Actual R^2- predicted R^2	Remarks
0.8792	0.8652	0.014	Very close
Actual Adj. R^2	Predicted Adj. R^2	ActualAdj. R^2- predicted Adj. R^2	
0.8067	0.7641	0.0426	Very close

The results from Table 4.10 indicate that there is a close agreement between actual and predicted model under study and therefore this close agreement confirms the validity of the model. Therefore, the model developed is valid, reliable and can be applied on local construction sites under similar conditions of management skills.

4.6.3 Regression model of management skills and labour productivity Cost

The results of statistical analysis in Table 4.11 indicate the regression model coefficients which were generated using R-studio and the multiple regression model of labour productivity cost is presented in equation 4.3.

$Prod_{(C)}$=*307.270 -3.801 CS + 2.181 IS +2.303 TS ………………….…(Equation 4.3)*

Where*:* $Prod_{(C)}$*= labour productivity cost, CS = conceptual skills, IS = Interpersonal skills and TS= Technical skills.*

Table 4.11: Model of management skills and labour productivity (cost)

Model Coefficients				
	Estimate	Std. Error	t-value	Pr(>|t|)
Intercept	307.2704	200.0338	1.536	0.18511.
Conceptual skills	-3.8005	0.9331	-4.073	0.00961* *
Interpersonal skills	2.1813	0.4008	5.443	0.00284**
Technical skills	2.3029	0.5578	4.129	0.00909**
Significant codes	0 '***' 0.001 '**' 0.01 '*' 0.05 ' . ' 0.1 ' ' 1			
Residual standard error: 15.61 on 5 degrees of freedom				
Multiple R-squared: 0.9076		Adjusted R-squared: 0.8522		
F-statistics: 16.37 on 3 and 5 df, p-value : 0.005108				
t-value critical(t_{Crit}) = 2.571 F- value critical(F_{Crit}) = 5.41 on 3 and 5 df				

(xxii) **Model analysis**

The equation 4.3 represents the relationships of conceptual, interpersonal and technical construction management skills and how they affect labour productivity cost while keeping other intervening variables constant as discussed in section 4.5.1. It is observed from Table 4.11 that, technical skills have most significant impact on labour productivity. Indicating that, the unit change in TS while holding CS and IS constant produce an increase of 2.303 units of labour productivity, also a unit change in IS while holding TS and CS constant produce an increase of 2.181 units of labour productivity while a unit change in CS, holding IS and TS constant leads to a decrease of 3.801 units of labour productivity. For zero variation in the three predictors results into a constant productivity at 307.270.

(xxiii) **Model verification**

The researcher verified the model using the approach discussed in section4.5.1. It is observed from Table 4.11 that, F- ratio statistics computed value (F_{comp}) = 16.370 is greater than critical value F-distribution F_{Crit} = 5.410, it indicates that, the overall model is relatively strongly significant. It is supported by low p-value = 0.005108 which shows high significance for the regression model at 95% confidence. This explains that there is a significant relationship between the management skills and productivity in building construction industry in Uganda. This is in line with a research from (Vaardini, 2016; Ullah *et al.*, 2017) who stated that technical skills are highly required by FLMs to improve on the cost variations between actual project cost and predicted project cost.

Model predictors with probability value less than 5% indicate that those terms are statistically significant. From the R-studio results, the three variables studied conceptual, interpersonal and technical skills are found to have significant effect on labour productivity. It is supported by model terms with observed t-values greater than t-value critical from the table are statistically significant as indicated in Table 4.11. The fitness of the model was tested as discussed in section 4.5.1. In this model, the value of R^2 was 0.9076 which means that the variation of 91% in labour productivity in terms of cost is attributed to these construction management skills and the only 9% of the total variation is not explained by the model, which may be due to other management skills that have not been incorporated in the study.

(xxiv) **Model validation**

The regression model developed was validated using the approach discussed in section 4.5.1(iv). The results from Table 4.12 indicate that there is a close agreement between actual and predicted model under study and therefore this close agreement confirms the validity of the model. Therefore, the model developed is valid, reliable and can be applied on local construction sites under similar conditions of management skills.

Table 4.12: R-squared for actual and predicted models

Actual R^2	predicted R^2	Actual R^2- predicted R^2	Remarks
0.9076	0.9133	-0.0057	Very close
Actual Adj. R^2	Predicted Adj. R^2	Actual Adj. R^2- predicted Adj. R^2	
0.8522	0.8482	0.004	Very close

4.7 Strategies for improving project management skills aimed at increasing productivity in the building construction industry

The fourth objective of the study was to suggest strategies for improving construction management skills aimed at increasing productivity in the building construction industry in Uganda. Average RII was computed and the researcher used this value as the baseline to determine significant and non-significant values of RII. Those strategies with RII above 0.719 were considered significant and those below were considered insignificant.

From the summary of results in Table 4.13, it can be observed that the significant strategies that have significant effect on improving FLMs construction management skills include: Taking refresher courses ranked number one with RII = 0.778, followed by Motivation courses ranked number two with RII=0.765, followed by Responsibility delegation ranked number three, with RII = 0.739. Other strategies considered significant and above the baseline point were Transparency, Attend workshops and conferences and Good communication system.

The researcher decided from analysis that strategies with relative importance index (RII < 0.719) to be considered insignificant. These are Take Leadership course, trust your people and Read management books. This is in line with Benator and Thumann (2003) and Ogunsanmi (2016) who emphasized that in order for first line construction managers to improve productivity, they require training and re-training in different short courses.

Table 4.13: Strategies for improving construction management skills

Strategies for improving project management Skills	**RII**	**Ranking**
Taking refresher courses	0.778	1
Motivation courses	0.765	2
Responsibility delegation	0.739	3
Transparency	0.735	4
Attend workshops and conferences	0.732	5
Good communication system	0.728	6
Take Leadership course	0.699	7
Trust your people	0.679	8
Read management books	0.637	9
Average RII	**0.719**	

4.8 Chapter Four Summary

This chapter discussed the data analysis from the respondents for the various specific objectives. The management skills that affect labour productivity were analyzed using RII and ranked and the results revealed that technical skills are most significant skills followed by interpersonal skills and then conceptual skills. Each construction management skill had various sub skills which were also ranked as discussed in section 4.3. The impact of construction project management skills on productivity in the building construction industry were also analysed using RII and ranked as in section 4.4, the relationship between construction management skills and parameters of measuring labour productivity i.e. time, quality and cost were determined using R studio and the results showed a strong impact of management skills on labour productivity. Strategies for improving project management skills aimed at increasing productivity were also determined and ranked and taking refreshers was the most significant since it was ranked number one with RII= 0.778.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents conclusions and recommendations made based on the analysis and findings of the study. This study investigated the impact of construction management skills on the productivity in the building construction industry in Uganda.

5.2 Conclusions of the study

The main aim of this study was to establish the impact of construction management skills on labour productivity in the building construction industry in Uganda. The literature in Chapter Two was used to identify the existence of construction management skills that affect productivity in building construction projects in previous related publications. Questionnaire survey was used to identify the impacts and the relationship of construction management skills on productivity in building construction projects. While observations helped to establish the impact of construction managements on labour productivity. The interviews helped to characterise the construction management skills which all lead to the suggested strategies for improving construction management skills aimed at increasing labour productivity.

Project managers, Construction managers, Site managers, Health and safety managers and General foremen were the respondents tasked to give their opinion and perceptions on the impact of management skills that affect productivity. The frequency of occurrence of the construction management skills with their impacts on labour productivity were obtained through the survey conducted. The data gathered from the survey was analysed using MS-Excel, SPSS and R-studio, the results are presented in frequency tables, pie charts and Rank tables as seen in previous chapter.

Objective one: to characterise construction management skills that affect labour productivity in the building construction industry

Objective one of the study sought to characterise perceptions of management skills that affect labour productivity in the building construction industry which was a criteria to create awareness to the respondents about the impact of management skills on labour productivity. According to the methodology, data collected was analysed using MS excel and SPSS and the percentages of the weights of the responses on which management skill was most significant was obtained. It revealed that most of the respondents' perceived technical skills as the most significant management skill with frequency of 36 percent rated number one followed by interpersonal skills with frequency of 32 percent rated number two and lastly conceptual skills with frequency of 31 percent, rated number three.

Based on the findings from analysis of responses from the questionnaire survey, it was concluded that FLMs require more of construction technical skills to be able improve labour productivity in the building construction industry in Uganda.

Therefore, characterisation of construction management skills that affect labour productivity was achieved as analysed as above (Technical skills, Interpersonal skills and Conceptual skills).

The objective two: To establish the impact of construction management skills on labour productivity.

The identified impacts with their weights were ranked using RII and the values revealed that; increased contractual dispute identified as the most significant impact with RII value of 0.754, ranked number one, followed by Poor quality work, Time overrun, Cost overrun, Project abandonment, Building failure and Project cancellation in that order. These affect the construction industry since this leads to reduced labour productivity.

Based on the study findings from building construction professional responses from the questionnaire survey and interview guide, it was concluded that contractual disputes, poor quality work, time and cost overruns had significant impact on labour productivity. This helped the researcher to realize the objective two.

Objective three: To determine the relationship between construction management skills and labour productivity (quality, time and cost).

It was achieved through analysing the data collected from the respondents on the questionnaires using R-studio software package. The results showed that, there is a strong effect and this indicates that the proportions of variability in the ideal management skills are associated with labour productivity in terms of quality model, adjusted R^2 = 0.889, Time model, adjusted R^2 = 0.8067 and Cost model, adjusted R^2 = 0.8522 respectively as they are indexed by multi-linear model in Table (4.7, 4.9 and 4.11). It is further supported by their low p-value < 0.05 which shows high significance of construction management skills on labour productivity in Uganda.

The study therefore concluded that there is significant impact of construction management skills of FLMs on labour productivity in terms of quality, time and cost in the building construction industry in Uganda.

Objective four: To suggest strategies for improving construction management skills aimed at increasing labour productivity in the building construction industry.

The goal was to find an appropriate strategy for improving the labour productivity of construction FLMs in Uganda, with emphasis on the most critical construction management skills taking into account the impact on quality, time and cost.

Construction company top managers highlighted that numerous issues affect labour productivity even with the advanced technology and new construction management skills. By improving labour productivity, construction top managers can complete construction projects very fast with good quality work, lower construction costs and within scheduled time. The study findings indicated numerous strategies that successful construction top managers use to improve labour productivity which include: responsibility delegation, taking refresher courses, motivation courses, transparency, attending workshops and conferences, good communication system, taking leadership courses, trusting your workers, continuous retraining of Construction FLMs.

Based on the above findings of this study, it was concluded that: taking refresher courses, motivational courses, good communication system, attendance of workshops and conferences and transparency were the strategies which could improve FLMs construction management skills. Lastly, research hypotheses were carried out and the findings from analysis indicate that p-values of the quality model, time model and cost model are less than level of significance of 5 percent, supported by their coefficient of R^2 which are above 0.70 which portrays a significant relationship between management skills and labour productivity. It was therefore concluded that there is a significant relationship between construction management skills and labour productivity in the building construction industry.

5.3 Recommendations of the study

One of the most important issues when it comes to building construction industry particularly in developing countries like Uganda are quality, cost and time. Since FLMs are the technical arm of the construction projects every effort is made by contractors to employ them on the building construction projects so as to increase labour productivity.

This study sought to establish management skills influencing labour productivity and develop regression model to be used in prediction of the relationship between the management skills and labour productivity. It was also to aid building construction industry contractors in making practical and achievable management skills on the upcoming similar building projects and suggest strategies that can be used to mitigate the effect of construction management skills on labour productivity in building construction industry.

The following recommendations have been suggested to improve labour productivity in this country:

- The contractors and clients should first identify construction FLMs with prerequisite technical skills and interpersonal skills since they have been identified as the most significant by building construction professionals.

- For contractors to minimize the impact of inadequate management skills like contractual dispute, poor quality work, time overrun, they should employ experienced personnel to execute construction projects with at most care with aim of improving quality, minimizing cost and reducing on the project duration.

- First line construction managers should acquaint themselves with the regression model in order to be in position to predict and forecast the impacts of technical, interpersonal and conceptual skills on the quality, duration and cost of the building project.

The model developed showed that a unit change in one of the predictors (technical skills) and holding others predictors constant will lead to an increase in labour productivity. Therefore, this model will help to show the importance of the impact of management skills in the building construction industry and so contractors need to adopt it so as to increase labour productivity on building construction sites.

5.4 Recommendations for Further Research

This research focused on the impact of management skills on labour productivity in building construction industry. Further research is recommended on the following;

❖ Issues related to materials and technology productivity in the construction industry as to related to productivity. These are also important factors of productivity.

- Issues related to top construction managers and their management skills in relation to productivity in building construction industry. This is because top managers make decisions that can affect construction in building construction projects which in turn affects productivity.

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APPENDICES

Appendix A 1: Model Summary of quality vs. management skills

```
Call:
lm(formula = Quality_1 ~ Conceptual_skill + interpersonal_skill + 
    Technical_skill)

Residuals:
      1       2       3       4       5       6       7       8 
  3.469  -9.072   2.063  17.204   1.510   5.735 -26.138   5.229 

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)   
(Intercept)         -22.7241   222.5682  -0.102  0.92359   
Conceptual_skill     -4.1558     1.0218  -4.067  0.01526 * 
interpersonal_skill   2.0738     0.4461   4.648  0.00967 **
Technical_skill       3.3422     0.6206   5.385  0.00575 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 16.88 on 4 degrees of freedom
Multiple R-squared:  0.9366,    Adjusted R-squared:  0.889 
F-statistic: 19.68 on 3 and 4 DF,  p-value: 0.007385
```

Appendix A 2: Model Summary of time vs. management skills

```
Call:
lm(formula = Time_1 ~ Conceptual_skill + interpersonal_skill + 
    Technical_skill)

Residuals:
      1       2       3       4       5       6       7       8 
 17.108 -17.248  -0.948  11.732  -6.349   9.889 -23.897   3.097 

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)   
(Intercept)         208.5462   221.3586   0.942  0.38939   
Conceptual_skill     -2.9707     1.0326  -2.877  0.03471 * 
interpersonal_skill   1.6913     0.6172   2.740  0.04078 * 
Technical_skill       2.1258     0.4435   4.793  0.00491 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 17.27 on 5 degrees of freedom
Multiple R-squared:  0.8792,    Adjusted R-squared:  0.8067 
F-statistic: 12.13 on 3 and 5 DF,  p-value: 0.009881
```

Appendix A 3: Model Summary of cost vs. management skills

```
Call:
lm(formula = Cost_1 ~ Conceptual_skill + interpersonal_skill +
    Technical_skill)

Residuals:
       1        2        3        4        5        6        7        8
 13.4630  -9.4757   0.5988   0.3875   1.3169   5.4548 -27.7603  10.8230

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)         307.2704   200.0338   1.536  0.18511
Conceptual_skill     -3.8005     0.9331  -4.073  0.00961 **
interpersonal_skill   2.1813     0.4008   5.443  0.00284 **
Technical_skill       2.3029     0.5578   4.129  0.00909 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 15.61 on 5 degrees of freedom
Multiple R-squared:  0.9076,    Adjusted R-squared:  0.8522
F-statistic: 16.37 on 3 and 5 DF,  p-value: 0.005108
```

Appendix A 4: Model predicted summary of quality vs. management skills

```
Call:
lm(formula = Quality_1 ~ Conceptual_skill + interpersonal_skill
    Technical_skill)

Residuals:
       1        2        3        4        5        6        7
  5.9342 -11.7060   0.6470  15.1042   3.0487   0.3298 -28.9650

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)          41.0270   227.0720   0.181  0.86372
Conceptual_skill     -3.9618     1.0592  -3.740  0.01343 *
interpersonal_skill   1.9450     0.4550   4.275  0.00790 **
Technical_skill       3.1643     0.6331   4.998  0.00411 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 17.72 on 5 degrees of freedom
Multiple R-squared:  0.9184,    Adjusted R-squared:  0.8695
F-statistic: 18.76 on 3 and 5 DF,  p-value: 0.003759
```

Appendix A 5: Model predicted summary of time vs. management skills

```
Call:
lm(formula = Time_1 ~ Conceptual_skill + interpersonal_skill +
    Technical_skill)

Residuals:
       1        2        3        4        5        6        7
 16.6779 -16.7888  -0.7011  12.0982  -6.6177  10.8321 -23.4038

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)         197.4274   253.4074   0.779   0.4794
Conceptual_skill     -3.0045     1.1634  -2.582   0.0612 .
interpersonal_skill   1.7223     0.7066   2.437   0.0714 .
Technical_skill       2.1483     0.5080   4.229   0.0134 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 19.22 on 4 degrees of freedom
Multiple R-squared:  0.8652,    Adjusted R-squared:  0.7641
F-statistic: 8.556 on 3 and 4 DF,  p-value: 0.03251
```

Appendix A 6: Model predicted summary of cost vs. management skills

```
Call:
lm(formula = Cost_1 ~ Conceptual_skill + interpersonal_skill +
    Technical_skill)

Residuals:
       1        2        3        4        5        6        7
 11.9607  -7.8704   1.4615   1.6673   0.3791   8.7488 -26.0377

Coefficients:
                    Estimate Std. Error t value Pr(>|t|)
(Intercept)         268.4201   214.4337   1.252  0.27886
Conceptual_skill     -3.9187     0.9845  -3.980  0.01640 *
interpersonal_skill   2.4113     0.5979   4.033  0.01570 *
Technical_skill       2.2598     0.4298   5.257  0.00627 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 16.27 on 4 degrees of freedom
Multiple R-squared:  0.9133,    Adjusted R-squared:  0.8482
F-statistic: 14.04 on 3 and 4 DF,  p-value: 0.01369
```

Appendix A 7: Respondents Rating

	Respondents Gender	Frequency	Percent	Valid Percent
Valid	Male	130	83.9	83.9
	Female	25	16.1	16.1
	Total	155	100.0	100.0

	Respondents Age	Frequency	Percent	Valid Percent
Valid	20-30 Years	60	38.7	38.7
	31-40 Years	64	41.3	41.3
	41-50 Years	31	20.0	20.0
	Total	155	100.0	100.0

	Respondents Level of Education	Frequency	Percent	Valid Percent
Valid	Under graduate	63	40.6	45.0
	Post graduate	30	19.4	21.4
	Diploma	33	21.3	23.6
	Certificate	10	6.5	7.1
	No qualification	4	2.6	2.9
	Total	140	90.3	100.0
Missing	System	15	9.7	
Total		155	100.0	

	Respondents Designation	Frequency	Percent	Valid Percent
Valid	Project manager	20	12.9	14.1
	Construction manager	13	8.4	9.2
	Site manager	36	23.2	25.4
	Health and safety manager	11	7.1	7.7
	General foreman	62	40.0	43.7
	Total	142	91.6	100.0
Missing	System	13	8.4	
Total		155	100.0	

	Respondents Experience	Frequency	Percent	Valid Percent
Valid	Less than one year	20	12.9	14.3
	1-5 years	61	39.4	43.6
	6-10 years	44	28.4	31.4
	11-15 years	13	8.4	9.3
	16 & above years	2	1.3	1.4
	Total	140	90.3	100.0
Missing	System	15	9.7	
Total		155	100.0	

CONCEPTUAL SKILLS					
	STRONGLY DISAGREE	**DISAGREE**	**NEUTRAL**	**AGREE**	**STRONGLY AGREE**
TIMEMGT	2	3	16	82	52
PROBLEMSOLVING	0	2	24	106	20
DECISIONMAKING	0	7	47	53	48
PREDICTIONABILITY	3	12	58	69	10
CREATIVITY	0	28	42	67	18
MENTALSTABILITY	0	43	23	68	21
COMPLEXSITUATIONDI	3	23	34	68	18
DISCIPLINE	0	43	15	53	44
DELEGATION	0	62	24	51	18
GOALMAKING	0	48	23	51	25
CRITICALTHINKING	0	13	48	68	26
LEADERSHIP	0	38	39	45	33
STRATEGICPLANNING	0	3	8	74	70

INTERPERSONAL SKILLS					
	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
COMMUNICATIONSKILLS	3	30	21	46	55
TIMEMGT_A	0	25	18	52	57
SELFCONFIDENCE	0	41	25	50	36
RELIABILITY	3	43	23	50	36
GOODTEMPER	0	30	50	55	20
LISTENINGABILITY	3	30	39	61	22
CREATIVITY_A	0	17	37	74	27
CONDUCTINGAMEETING	0	7	44	88	16
PROBLEMSOLVING_A	0	4	41	85	25
REPORTGENERATING	0	13	27	88	27
TEAMWORK	6	8	23	76	39
SUPERVISION	3	15	21	74	42
OPENNESSTOFEEDBACK	0	25	20	86	22
CONTROLLINGCONFLICTS	0	22	27	71	35
MOTIVATION	3	19	42	65	26
DELEGATIONOFAUTHORITY	3	20	19	87	26
DESIRETOLEARN	0	3	39	57	56

TECHNICAL SKILLS					
	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
PLAN INTERPREETATION	3	3	5	54	90
MANAGERIAL KNOWLEDGE	3	8	5	79	60
CONSTRUCTION MATERIAL	0	4	11	39	101
KNOWLEDGE OF CONSTRUCTION OPERATION	3	6	10	50	86
SCHEDULING	0	13	20	58	62
COMPUTER SKILLS	3	7	26	38	78
KNOWLEDGE OF GREEN & SUSTAINABLE CONSTRUCTION	0	8	12	51	84

OPERATIONAL PLANNING	0	11	10	66	68
ESTIMATING SKILLS	0	6	32	58	59
EVALUATION OF PERFORMANC	3	11	27	71	43
KNOWLEDGE OF PROJECT CLOSURE OUT	0	8	24	54	69
PROFICIENCY IN CONSTRUCTION IT	0	9	23	76	47
SAFETYAND HEALTHY HAZARDS ID	6	3	16	75	55

Appendix A 8 : Crtitical Values for the F-Distribution

CRITICAL VALUES FOR THE F- DISTRIBUTION

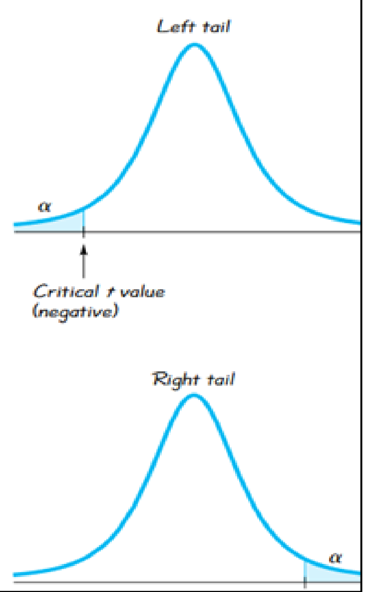
F Values for $\alpha = 0.05$

	d_1								
d_2	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.3	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46

Appendix A 9: t- Distribution: Critical t-Values

TABLE A-3 *t* Distribution: Critical *t* Values

	Area in One Tail				
	0.005	0.01	0.025	0.05	0.10
Degrees of Freedom	**Area in Two Tails**				
	0.01	0.02	0.05	0.10	0.20
1	**63.657**	31.821	**12.706**	6.314	3.078
2	**9.925**	6.965	**4.303**	2.920	1.886
3	**5.841**	4.541	**3.182**	2.353	1.638
4	**4.604**	3.747	**2.776**	2.132	1.533
5	**4.032**	3.365	**2.571**	2.015	1.476
6	**3.707**	3.143	**2.447**	1.943	1.440
7	**3.499**	2.998	**2.365**	1.895	1.415
8	**3.355**	2.896	**2.306**	1.860	1.397
9	**3.250**	2.821	**2.262**	1.833	1.383
10	**3.169**	2.764	**2.228**	1.812	1.372
11	**3.106**	2.718	**2.201**	1.796	1.363
12	**3.055**	2.681	**2.179**	1.782	1.356
13	**3.012**	2.650	**2.160**	1.771	1.350
14	**2.977**	2.624	**2.145**	1.761	1.345
15	**2.947**	2.602	**2.131**	1.753	1.341
16	**2.921**	2.583	**2.120**	1.746	1.337
17	**2.898**	2.567	**2.110**	1.740	1.333
18	**2.878**	2.552	**2.101**	1.734	1.330
19	**2.861**	2.539	**2.093**	1.729	1.328
20	**2.845**	2.528	**2.086**	1.725	1.325
21	**2.831**	2.518	**2.080**	1.721	1.323
22	**2.819**	2.508	**2.074**	1.717	1.321



Appendix A 10: Uganda National Association of Building and Civil Engineering Contractors

UNABCEC is a voluntary, non-political association established by federation of Uganda employers to identify, promote, mouthpiece and safeguard the interests of building and civil engineering contractors and related material suppliers in the Uganda construction industry. The objectives of UNABCEC are:

Form a strong, self-reliant body to champion and defend the common interests of contractors and material suppliers, set standards and assure the execution of quality work to clients through evolution and adaptation of technologies and strict adherence to a code of conduct, grade and categorize contractors and material suppliers according to current capabilities, evolve and adapt a code of quality standards and conduct for the construction industry, develop machinery for the settlement of disputes and contentions between contracting.

Appendix A 11: Selected study building construction companies (UNABCEC, 2018)

Selected study building construction companies			
NO.	Company Name	Head office location	Selection Criteria
Class A-1			
1	ABUBAKER TECHNICAL SERVICES Site location :Seeta	Kigombya Mukono	Random selection
2	AMBITIOUS CONSTRUCTION LIMITED Site location: Naalya estate	Swaminarayan Close,Wankulukuku Road, Nalukolongo	
3	ARMPASS TECHNICAL SERVICES Site location: Mbalwa kiira	Kyadondo, Mbalwa-Namugongo	
4	BABCON UGANDA LIMITED Site location: Kitintale	Kome Crescent Luzira	
5	ROKO CONSTRUCTION LTD Site location: Nakivubo	Bombo road Kawempe	
6	PEARL ENGINEERING COMPANY LIMITED Site location: Nakasero	Nsambya Road-Kabalagala behind shell petrol station	
7	PIONEER CONSTRUCTION LTD Site location: Lugogo	5th street industrial area. Kampala	
8	NATIONAL HOUSING & CONSTRUCTION Co. Site location: Naalya estate	7th street, industrial area	
Class A-2			
9	AFRO BUILD (U) LTD Site location: Kyanja	Ntinda -Kisasi	Random selection
10	MUMA CONSTRUCTION LTD Site location: Kisasi	Ntinda- Kulambiro	
11	ROCKTRUST CONTRUCTORS (U) LTD Site location: Biiko Nile road	Nile Road Njeru town council	
12	RODO CONTRACTORS LTD Site location:Mbuya	Old kireka road Mbuya 11 zone 1	
13	UGANDA MARTYRS HOUSING & CONSTRUCTION Site location: Najjera one	Kampala- Uganda	
14	WILLS INT. ENGINEERS & CONTRACTORS Site location: Bweyogerere	Wills house- movit road, Nyanama	
15	LIVECO ENGINEERING AND INVESTMENT LTD Site location: Luwumu street	Kampala	
16	NICONTRA LIMITED Site location: Kololo	Martyrs way, Ntinda	
Class A-3			
17	LUSA CONSTRUCTION AND COMPANY LTD Site location: Kabaka jjagara road	Ring Road Lubiri	
18	GABIKAN ENGINEERING LTD Site location: Kisasi	Kisakye shopping mall Ntinda	
19	GETS TECHNICAL SERVICES (GTS) LIMITED Site location: Wandegeya	Kampala	

20	ADT AFRICA LTD Site location: Bweyogerere	Namanve	
Class A-4			
21	HOME BUILDERS LTD Site location: Gayaza town	Kyanja Gayaza rd.	Random selection
22	KINGSTONE ENGINEERING & CONSTRUCTION CONSULTANT LTD Site location: Mukono	Namanve Industrial Area	
23	MUGOYAPLUS TECHNICAL SERVICES LTD Site location: Najjera two	Akamwesi complex room E43	
24	RMF ENGINEERING LTD Site location: Kisasi	Kiwatule road	
25	DAVOG TECHNICAL SERVICES LTD Site location: Ntinda- Kiwatule rd.	Valley Drive, Ntinda Minister's Village	
26	WIM SERVICES LTD Site location: Lumumba Avenue	Kisozi house, Kyaggwe road	
27	STARLITE ENGINEERING LTD Site location: Luzira	Kitintale Luzira Road	
28	REDDYS' ENGINEERING AND SERVICES LTD Site location: Kawempe	KAWEMPE BOMBO ROAD	
29	ARS CONSTRUCTION COMPANY (U) LTD. Site location: Buhuke town	Jinja road	
30	BOLT CONSTRUCTION COMPANY LIMITED Site location: Entebbe Town	Cynthia house Kawuku, Kisubi Entebbe Road	
31	ADAPT TECHNICAL SERVICES LTD Site location: Kisasi northern by pass rd.	Kyadondo Kisasi	
A-5			
32	ALLIED ENTERPRISES COMPANY LTD Site location: Nsambya	Kampala Pilkington Road	Random selection
33	AL-MUBARAK CONTRACTING Site location: Kirinya	Bweyogerere	
34	DACOSI LIMITED Site location: Ntinda	Ntinda- Kulambiro Road	
35	ETABCO PANAFRICA LIMITED Site location: Bukoto	Old Kira road, Bukoto Kampala	
36	FLEXIHOME LIMITED Site location: Kyaluwajara	Plot 15, Ntinda Road	
37	JAMI CONSTRUCTION COMPANY LTD Site location: Bugolobi	7th Street Kampala	
38	LUBBE CONTRACTORS LTD Site location: Bweyogerere	Bweyogerere	
39	MALT (U) LTD Site location: Kawempe	Nsooba Zone, Kawempe Division	
40	REENBOOG CONSTRUCTION SERVICES LTD (Site location: Bugolobi)	3rd Floor Krish Mall. Kampala	
41	TEDMACK ENG WORKS LTD Site location: Kiira-Bulindo rd.	Buwate Kiira Municipal Council	

Appendix A 12: Buildings collapsed in Kampala due incompetent engineers using

Appendix A 13: Questionnaire

KYAMBOGO UNIVERSITY

P.O.BOX 1, KYAMBOGO-KAMPALA, UGANDA

FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

RESEARCH QUESTIONNAIRE

Dear respondents,

I am Natukunda Nathan a post graduate student from Kyambogo University conducting a research titled: "**study of the impact of management skills on productivity in the building construction industry in Uganda**" as a requirement for the award of the degree of Master of Science in Construction Technology and Management of Kyambogo University.

You have been identified as a resourceful person in this study and i am therefore kindly requesting you to fill this questionnaire; the information provided will be treated with the highest level of confidentiality. The opinions you express and the information you provide for this study will be kept confidential and only used purely for academic purposes. Therefore, your contribution is highly appreciated. You are not obliged to fill this questionnaire and feel free to disengage at any time.

Section A: General information (*Tick in appropriate box*).

1. Gender
   - Male ☐ Female ☐
2. Age
   - 20- 30years ☐ 31-40years ☐
   - 41-50years ☐ 51 and above years ☐
3. Academic qualifications
   - Under Graduate ☐ Post graduate ☐
   - Diploma ☐ Certificate ☐
   - No- qualification ☐

Others specify……………………………………………………………………

4. Designation/Job Title

Project manager ☐ Construction manager ☐

Site manager ☐ Health and safety manager ☐

General foreman ☐

Others

specify……………………………………………………………………………

5. Experience in the building construction industry.

Less than a year ☐ 1- 5years ☐

6- 10years ☐ 11-15years ☐

16 and above years ☐

6. What was your engagement in the building construction industry?

…………………………………………………………………………………

SECTION B: **Characterization of management skills that affect Labour productivity in the building construction industry**

7.Give your views on project management skills that affect labour productivity in building construction industry. Kindly indicate (Tick) your degree of agreement/disagreement with these skills using a scale of 1 – 5 *in appropriate box*.

(1 is the lowest score - 5 is the highest score throughout)

1 - Strongly disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree						
No.	**Management skills that affect Labour productivity in building construction**	**Data measurement**				
1	**Conceptual skills**	**1**	**2**	**3**	**4**	**5**
	Time management					
	Problem solving					
	Decision making					
	Prediction ability					
	Creativity					
	Mental stability					
	Complex situation diagnosis					
	Discipline					
	Delegation					
	Goal making					
	Critical thinking					
	Leadership					
	Strategic planning,					

	Others specify					

1 - Strongly disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree

No.	**Management skills that affect Labour productivity in building construction……………………**	**Data measurement**				
2	**Human/Interpersonal skills**	**1**	**2**	**3**	**4**	**5**
	Communication skills					
	Time management					
	Self- confidence					
	Reliability					
	Good temper					
	Listening ability					
	Creativity					
	Conducting a meeting					
	problem solving					
	Report generation					
	Team work					
	Supervision					
	Openness to feed back					
	Controlling conflicts					
	motivation					
	Delegation of authority,					
	Desire to learn					
Others specify						

	1 - Strongly disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree					
No.	**Management skills that affect Labour productivity in building construction…………….**	**Data measurement**				
3	**Technical skills**	**1**	**2**	**3**	**4**	**5**
	Plan interpretation					
	Managerial knowledge & experience					
	construction material and equipment utilization					
	Knowledge of construction operation					
	Scheduling					
	Computer skills					
	Knowledge of green and Sustainable construction					
	Operational planning					
	Estimating skills					
	Evaluation of performance					
	Knowledge of project closure out					
	Proficiency in construction IT					
	safety and health hazards identification					
Others specify						

SECTION C: Impact of management skills on the Labour productivity in the building construction industry.

8. The following are the impacts of management skills on labour productivity in the building construction industry? *(Tick in appropriate box)*

	1 - Strongly disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree					
	Impact of management skills on Labour productivity in the building construction.	**Data measurement**				
No.	**Impacts**	**1**	**2**	**3**	**4**	**5**
A	Increased contractual dispute					
B	Poor quality work					
C	Time overrun					
D	cost overrun					
E	Projects abandonment					
F	Building Failure					
G	Projects cancellation					

Others specify						

SECTION D: (i) Inadequate conceptual skills lead to the following impacts on Labour productivity ***(Tick in appropriate box)***

1 - Insignificant; 2 - Minor; 3 - Moderate; 4 - High; 5 - Severe

No.	**Impacts**																																		
	Contractual dispute					**Poor quality work**					**Time overrun**					**Building Failure**					**Cost overrun**					**Project abandonment**					**Project cancellation**				
Data Measurement	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Conceptual Skills																																			
Time Management																																			
Problem solving																																			
Decision making																																			
Ability of prediction																																			
Creativity																																			
Mental stability																																			
Complex situation diagnosis																																			
Discipline																																			
Delegation																																			
Goal making																																			
Critical thinking																																			
Leadership																																			
Strategic planning																																			
Others specify																																			

SECTION D: (ii) Inadequate Interpersonal skills lead to the following impacts on Labour productivity (*Tick in appropriate box)*

1 - Insignificant; 2 - Minor; 3 - Moderate; 4 - High; 5 - Severe

No.	**Impacts**																																		
	Contractual dispute					**Poor quality work**					**Time Overrun**					**Building Failure**					**Cost overrun**					**Project abandonment**					**Project cancellation**				
Data measurement	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Interpersonal Skills																																			
Communication skills																																			
Time Management																																			
Self- confidence																																			
Reliability																																			
Desire to learn																																			
Listening ability																																			
Creativity																																			
Conducting a meeting																																			
Problem solving																																			
Report generation																																			
Team work skills																																			
Supervision skills																																			
Openness to feed back																																			
Delegation of authority																																			
Motivation																																			
Others specify:																																			

SECTION D: (iii) Inadequate Technical skills lead to the following impacts on Labour productivity ***(Tick in appropriate box)***

1 - Insignificant; 2 - Minor; 3 - Moderate; 4 - High; 5 - Severe

No.	Impacts																																		
	Contractual dispute					**Poor quality work**					**Time overrun**					**Building failure**					**Cost overrun**					**Project abandonment**					**Project cancellation**				
Data Measurement	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
Technical Skills																																			
Knowledge of construction operation																																			
Scheduling																																			
Computer skills																																			
Knowledge of green & sustainable construction																																			
Estimating skills																																			
Evaluation of performance																																			
Knowledge of project closure out																																			
Proficiency in construction IT																																			
Safety and health hazards identification																																			
Operational planning																																			
Others specify																																			

SECTION E: What are the possible measures of improving management skills aimed at increasing Labour productivity in the building construction industry?

9. What are the challenges faced in management of building construction projects in the industry?

…………………………………………………………………………………………………

…………………………………………………………………………………………………

10. Suggest the possible factors responsible for the cause of the above mentioned challenges

…………………………………………………………………………………………………

…………………………………………………………………………………………………

11. Is there any measure used in this company to improve management skills aimed at increasing labour productivity?

Yes ☐ No ☐

12. In your opinion, what are the possible measures used in this company of improving management skills aiming at increasing labour productivity? ***(Tick in appropriate box)***

1 - Strongly disagree; 2 - Disagree; 3 - Neutral; 4 - Agree; 5 - Strongly Agree						
No.	**Measures used to improve management skills through training**	**Data measurement**				
	Strategies'	1	2	3	4	5
A	Take leadership course					
B	Read management books					
C	Taking refresher courses					
D	Trust your people					
E	Communication					
F	Transparency					
G	Motivation courses					
H	Responsibilities Delegation					
I	Attend workshops and conferences					
Others specify						

13. Specify some professionals' development program training needed mostly by first line managers

…………………………………………………………………………………………………

14. Indicate any other general information towards objective achievement of this research

………………………………………………………………………………………………

Appendix A 14: Interview guide

KYAMBOGO UNIVERSITY

P.O.BOX 1, KYAMBOGO-KAMPALA, UGANDA

FACULTY OF ENGINEERING

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

INTERVIEW GUIDE

Dear respondents,

I am Natukunda Nathan a post graduate student from Kyambogo University conducting a research titled: "**study of the impact of management skills on productivity in the building construction industry in Uganda**" as a requirement for the award of the degree of Master of Science in Construction Technology and Management of Kyambogo University.

You have been identified as a resourceful person in this study and i am therefore kindly requesting you to fill this guide. The information provided will be treated with the highest level of confidentiality. The opinions you express and the information you provide for this study will be kept confidential and only used purely for academic purposes. Therefore, your contribution is highly appreciated. You are not obliged to fill this guide and feel free to disengage at any time.

Section A: General information (*Tick in appropriate box*).

1. Gender
   Male ☐ Female ☐
2. Age
   20- 30years ☐ 31-40years ☐
   41-50years ☐ 51 and above years ☐
3. Academic qualifications
   Under Graduate ☐ Post graduate ☐
   Diploma ☐ Certificate ☐
   No- qualification ☐

Others specify…………………………………………………………………

4. Designation/Job Title
   Project manager ☐ Construction manager ☐

Site manager ☐ Health and safety manager ☐

General foreman ☐

Others specify……………………………………………………………………………

5. Experience in the building construction industry.

   Less than a year ☐ 1- 5years ☐

   6- 10years ☐ 11-15years ☐

   16 and above years ☐

6. What was your engagement in the building construction industry?

   ……………………………………………………………………………………

7. How many projects have you been engaged in/ worked on to date?

   ……………………………………………………………………………………

   ……………………………………………………………………………………

   ……………………………………………………………………………………..

8. Of the projects engaged/ worked on, how many were; *(Tick in appropriate box*).

Completed	None	☐	1- 5	☐	5 and above	☐
Incomplete	None	☐	1- 5	☐	5 and above	☐
Stalled from start	None	☐	1- 5	☐	5 and above	☐
Completed beyond estimated time	None	☐	1- 5	☐	5 and above	☐

9. What were the reasons for the situations in question eight above?

   ……………………………………………………………………………………

   ……………………………………………………………………………………

   ……………………………………………………………………………………

   ……………. ……………………………………………………………………..

Appendix A 15 : Morgan chart of Sample size vs. Population size.