KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

Causal relationship between project schedule problems and communication in construction

by

Micheal Beyaw (Bsc. Construction Technology and Management)

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DECLARATION

I hereby declare that this submission is my own work towards the MSc. Project Management and that to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any other degree of the university or any other university, except where due acknowledgement has been made in the text.

MICHEAL BEYAW **(**PG1156317)
Student

……..
Signature

……..
Date

Certified by
DR. EMMANUEL ADINYIRA
Supervisor

.....……..
Signature

……...
Date

Certified by
PROF. BERNARD K. BAIDEN
Head of Department

…….....
Signature

..……...
Date

ABSTRACT

Most of the factors that affect project schedule performance arise from ineffective communication among project stakeholders as the form of communication adopted has an effect on the flow of the project. Therefore, the study aimed at establishing the causal relationship between project schedule problems and communication in construction project management. Four (4) objectives were established which were to identify the factors that affect project schedule problems in construction project management, to identify the factors that affect communication in construction project management, to establish if there is relationship between factors of project schedule problems and communication in construction project management and to determine the extent of impact between project schedule problems and communication in construction project management. With these objectives, an extensive literature review was conducted from which variables on schedule problems and communication were identified. Using the quantitative research method, the variables were subsequently used in the development of a structured questionnaire. The questionnaire was distributed and fifty-four (54) was retrieved and used for the analysis of the study. The analysis was done using the mean score ranking and the multiple regression analysis. From the analysis, it was realized that, the most significant schedule problem as indicated by the respondents was project managers competence. The ranking of its sub-criteria in descending order were poor project manager technical capability, poor skills in leadership of PM, poor organizing skills and relations of PM with other contractors on site and lack of confidence to take decisions and enforce those decisions by the PM's team on site. The second ranked factor was monitoring, feedback and coordination. The third most significant schedule problem was owner's competence. The ranking of its sub-variables are as follows; Poor timing of decision by the owner/consultant, poor monitoring and feedback by client and inadequate training of human resources in the appropriate skill required for the execution of works. With the second objective of the study, the most significant factor that affects effective communication was the communication medium used. The second most significant factor was the timing of the communication. The third ranked factor was the establishment of a formal and visible communication system. The third and fourth objective wanted to measure the relationship between communication and schedule problems. In order to make inference of the relationship and the extent of impact, the beta values, significance level and t-statistic values were calculated using the SPSS software version 20. The calculation was done at a confidence level of 10% ($\alpha = 0.10$; two-tailed test). The results indicated that, there is a significant relationship between communication factors and schedule problems in the Ghanaian construction industry. With these findings, it was recommended that, a project manager must endeavor to adopt the appropriate communication medium at any particular point in time to expedite the communication process. Also, the client and his advisors should be very keen in selecting a suitable project manager for the project as the selection of an incompetent project manager can affect the delivery of the project. Finally, an appropriate monitoring and reporting tools should be adopted during the construction phase of a project.

Keywords: Communication, schedule problems, schedule performance, project manager

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DEDICATION

I wholeheartedly dedicate this work to God for his protection; my family (my wife- Beatrice and daughter Idaline) for their unconditional love and my friends (Prince Addison and Wisdom Ahiawodzie).

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

The construction industry has been in existence for a very long time. It possesses numerous benefits that aids the development of every country (Rameezdeen, 2005). In Ghana, statistics has shown that, the construction industry is the largest growing sector. In 2015, the Ghana Statistical service indicated that, the Ghanaian construction industry experienced a growth rate of 30.6%. According to Agyakwa-Baah (2007), the Ghanaian Construction Industry is directly linked to the Ghanaian economy because the Government of Ghana is the biggest client in the industry. Therefore, any underperformance causes a gross loss of state resources. It is therefore imperative that the construction processes are expedited as much as possible. One of the significant setbacks confronting the Ghanaian construction industry is delays in the delivery of construction projects (Fugar et al., 2010). Research has shown that, difficulties in communication can cause delays in construction (Jessop, 2001). Therefore, it is significant to study the relationship between the concept of communication and project schedule.

Communication is an important tool in all the sectors of the economy. According to Spitzberg (2010), the concept of communication has been researched extensively in various sectors. This shows the huge significance of communication for the survival of an organization. Kester et al., (2008), argued that, communication is an imperative tool to the smooth operation of an activity. It also aids in the achievement of an organization's objectives and boost performance. Keyton et al. (2013), described communication as the flow of information from one person to another.

Olu (1999) described communication as the process by which people attempt to share meanings through symbolic messages. Communication comprises transmitting information from one individual to another. Some scholars of communication take this as a working definition and also a means of circumscribing the field of communication theory. In an organizational context, communication can be described as the conceptual planning and managing of information in an organization (Monge and Poole, 2005). Organizational communication includes the sending and receiving of messages through various layers of authorities with the use of various systems of sending messages. Communication can be carried out in various formats. They include the use of speech, sigs, behavior, symbols, signals and so on. Effective and frequent communication throughout the life cycle of a project is vital as they interact by way of teams.

The form of communication adopted has an effect on the flow of the project. Project schedule can be described as the time period stipulated for the completion and handing over of a project. The performance of a project in terms of schedule is affected by numerous factors. According to Jha (2011), these factors may include bureaucratic interference, thorough understanding of client's needs, high degree of trust among project stakeholders, timely intervention from management team and availability of resources as planned. There are other factors that may affect the duration of a construction project. The absence of business edge in the activity of its acquirement work. Contracts for the both construction and consultancy services take exceptionally long periods to reach monetary conclusion and are liable to pointless delays (Agents, 1998). Westring (1997) characterizes the reasons for the postponements of negotiations prior to award of contract, delays in the planning of specialized particulars and illustrations, delays in assessment, a broad system of controls, audits and endorsements, and land disputes.

Most of these factors that affects project schedule performance arise from ineffective communication among project stakeholders.

With regards to this background, this study is being conducted to ascertain the causal relationship between project schedule problems and communication in construction.

1.2 PROBLEM STATEMENT

According to the PMI (2000), completing project on time is an important project success measurement criterion. Thus, completing a project on time for usage speaks well of the contractor's capabilities. However, most projects suffer from excessive delays and time extension especially in developing countries like Ghana. Therefore, numerous studies have been carried out in the country to assess the causes of these delay (*see* Fugar et al., 2010; Asamoah-Duodu et al., 2013 Amoatey et al., 2015).

Much attention is given to the duration for the completion of work neglecting the quality of work being executed on the job, with the implementation of methods to increase the rate of production, there is also a problem with the quality of works, low quality of works leads to failures and rework (Woodward, 1997). In a larger scale, construction project delays in public assets like schools, may also result in social harm given the fact that this kind of infrastructure is usually needed urgently. Westring (1997) ascribes the reasons for the postponements to broad post-award negotiations, delays in the readiness of special details and illustrations, delays in assessment, a broad arrangement of controls, surveys and endorsements, and land proprietorship question. Most of these factors that affect project schedule performance arise from ineffective communication among project stakeholders. Most of the research conducted in Ghana failed to acknowledge that fact and hence failed to ascertain the relationship between the two (2)

concepts. Therefore, the intent of this study is to ascertain the causal relationship between project schedule problems and communication in construction.

1.3 RESEARCH QUESTIONS

This research seeks to answer the following questions;

1. What are the factors that affect project schedule in construction project management?
2. What are the factors that affect communication in construction project management?
3. Is there a relationship between factors of project schedule problems and communication in construction project management?
4. To what extent is the impact between project schedule problems and communication in construction project management?

1.4 AIM OF THE STUDY

The aim of this research is to establish the causal relationship between project schedule problems and communication in construction project management.

1.5 OBJECTIVES OF THE STUDY

In order to achieve the above stated aim of the research, the following specific objectives are articulated:

1. To identify the factors that affect project schedule in construction project management;
2. To identify the factors that affect communication in construction project management;
3. To establish if there is a relationship between factors of project schedule problems and communication in construction project management; and
4. To determine the extent of impact between project schedule problems and communication in construction project management.

1.6 SIGNIFICANCE OF THE STUDY

The execution of a construction project successfully, especially in terms of time is very significant to every stakeholder of a construction project. The outcome of this study will aid construction managers to ascertain the significant factors of communication that affects project schedule. This study will also add to literature in terms of quantifying the influence of communication factors on project schedule. This study will aid construction practitioners to ascertain the significance of communication in the construction industry and aid them in drawing proper structures for communication on and off site.

1.7 SCOPE OF THE STUDY

This research will be limited to only construction firms. This is basically due to fact that they are in-charge of all the construction activities on site and their activities has a huge impact on the outcome of the project. Furthermore, only D1K1 and D2K2 construction firms in the Accra metropolis will be contacted for information. These categories of contractors are mostly involved in huge projects therefore they are most suitable for a research of this caliber.

1.8 RESEARCH METHODLOGY

The research adopts the quantitative research method. The quantitative research method uses numeric data and analyze using mathematical formulas. Furthermore, this research adopts the explanatory research design and the deductive research approach. This study is a survey research strategy and utilizes only D1K1 and D2K2 as respondents for the study.

1.9 STRUCTURE OF THE REPORT

The chapter one (1) constitutes the general introduction to the study. The introduction of the study touches on the background of the research, the problem statement, research aim, research objectives, the scope, significance of the study and the methodology. The chapter two (2) involved a comprehensive review of literature pertaining to the study. The chapter three (3) gave an elaborate discussion on the methods, approaches and strategies employed for this study. It also discusses the type, method and processes of collating and analyzing the data. The chapter four (4) provided a report on the analysis of the data collected from the respondents. It establishes the procedures adopted for the analysis and a discussion of the results of the analysis. The chapter five (5) summarized and gave a conclusion to the entire report. This includes a discussion on how the objectives were achieved, the findings and recommendations made.

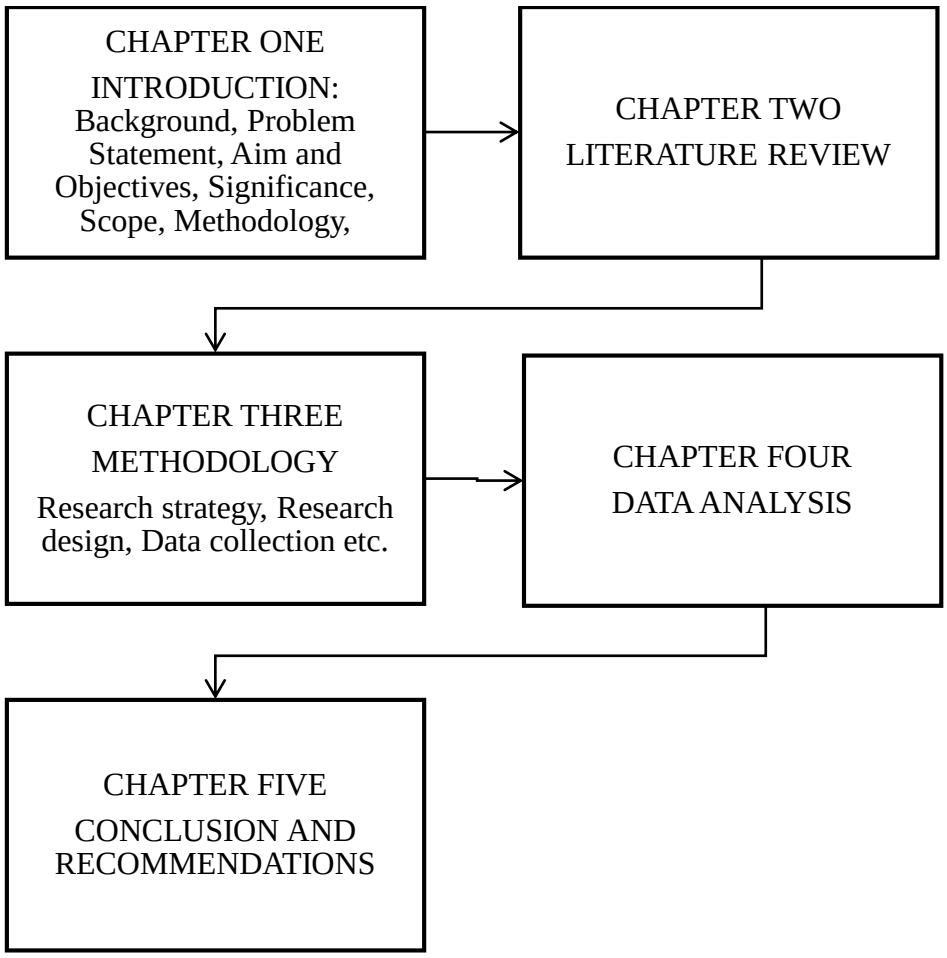

Figure 1.1: Structure of the report

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter reviews literature pertaining to subject area of study. It begins with a thorough discussion on the concept of project success which leads to a discussion on project schedule and the factors that affect construction project scheduling. This followed by a discussion on the concept of communication and the factors that affect communication.

2.2 OVERVIEW OF THE CONSTRUCTION INDUSTRY

The construction industry plays a vital role in every country and Ghana is no exception. In Ghana, it contributes approximately 8.2% to the gross domestic product (GDP) (Owusu-Manu and Badu, 2011). Majority of most significant projects in Ghana are awarded to very few foreign based firm rather than locally based contractors due to the far-flung culture of underperformance on the part of the local contractors (Chileshe and Yirenkyi-Fiank, 2012). Ofori (2012), examined the challenges facing Ghanaian construction firms. In his research, he identified problems like the inability to secure adequate working capital, inadequate project management skills and poor workmanship as significantly affecting the progress of the Ghanaian construction industry. Badu and Owusu-Manu (2011), explained that, construction firms in Ghana find it difficult in accessing financing for projects, therefore, they normally opt for debt financing which usually is accompanied by high interest rates.

Furthermore, delays in payment is a significant problem facing the Ghanaian construction industry. Adams (2008), postulated that, the holdups in the payment of contractors for the successful completion of works are very common and forms a major cause in the delays in the

completion most construction of projects in Ghana. Delays in construction projects may lead to high increase in the cost of construction due to high rates of inflation. It is therefore not surprising that, construction projects in Ghana recorded an average cost overrun of 60% to 180% (Kpamma and Adjei-Kumi, 2010). Also, the health and safety standards of the Ghanaian construction industry are not strictly enforced, exposing construction workers who work in generally unsafe environments to hazards (Ankomah et al., 2010). According to Ofori-Kuragu (2013), the problems that affects the performance Ghanaian contractors includes poor access to credit, delays in payment, cumbersome payment process, bias in contract awards among others.

These problems facing the Ghanaian construction industry affects the performance of the industry especially in terms of project cost performance. However, the experiences of other construction industries in the world can serve as a deterrent to the stakeholders of Ghanaian construction industry (Ofori et al., 2016). Useful lessons can be drawn from the experiences of other nations by benchmarking against such nations to guide our construction industry.

2.3 THE CONCEPT OF CONSTRUCTION PROJECT SUCCESS

Construction project success and factors for measuring project success is one of the most widely researched topics in project management (Ashley et al. 1987; Pinto and Slevin, 1989; Chua et al, 1999; Chan et al. 2001; Abraham 2003; Zhang, 2005). Construction projects are unique and temporary in nature and so are their management. According to the PMBOK (2003), project management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements. However, project requirements vary from one project to another or from one person to another. Therefore, the concept of construction project success is hard to define as its definition is dependent on individual's perception (Zoltan, 2017).

Construction project management has evolved over the years so as the concept of project success as more researchers have developed huge interest in these fields. Researchers have uncovered that, stakeholders of construction projects of construction projects have different objectives depending on the type and stage of the project (de Wit, 1986). Even during the time of evolution of project management in the 1950s, managers discerned that the success of a project basically involves meeting cost, schedule and budget goals (Freeman and Beale, 1992; Dvir and Lechler, 2003). Gaddis (1959), indicated that, there is a constant conflict between the achievement of budget and time requirement, therefore, project managers should try as much as possible to balance the emphasis between them. In the mid-1980s, researchers began to differentiate between project success and project management success. According to de-Wit (1986), the criteria for success which depends exclusively on cost on cost, schedule and quality basically measure the efficiency of the effort of the management of the project.

Pinto and Slevin (2001) realized that, the idea of project success was not clearly apprehended by project managers and loosely discussed in literature. Furthermore, they indicated that, some projects are initially perceived as failures but as time passes they are viewed as a huge success. A study conducted by Ashley et al. (1987), indicated that, budget performance, schedule performance, client satisfaction and project manager/team satisfaction are the most frequently used success criteria in literature. However, based on technical validity, organizational validity and organizational effectiveness, Pinto and Slevin (2001) introduced the project implementation success criteria. However, they also indicated that, schedule and cost performance are very significant success criteria but not the only success criteria. According to Lavagnon (2009), several authors assume that everyone knows the meaning of “project success” and “project failure” but there is only one certainty in project management that success is ambiguous,

inclusive and a multidimensional concept whose definition is tied to the context or the viewpoint of the stakeholder. The various viewpoints and perspectives is the major reason for the same project to be considered successful by one and unsuccessful by another (Lim and Mohamed, 1999). For internal stakeholders (owner, developer, contractor), project success is basically regarded as the achievement of some pre-determined goals which may include parameters such as time, cost and quality. However, external stakeholders (end users, general public) do not necessarily have similar pre-determined goals regarding project success and thus the perception of project success or failure differs from one person to another.

Lim and Mohamed (1999), categorized project success into macro and micro viewpoints. The definitions of these viewpoints and summarized in table 2.1.

Table 2.1: Differences between the macro and micro viewpoint of construction project success

MACRO	**MICRO**
Is the original project concept achieved?	Is the construction cost, time, quality etc limits met?
Done at the operational phase	Done at the construction phase
Done by end-users	Done by parties involved in construction

Source: *Lim and Mohamed, (1999).*

The macro viewpoint limits construction project success to end-user satisfaction only as it tries to determine whether the initial project concept was achieved. The micro viewpoint will limit construction project success to the construction phase only as focus on construction goals like time, cost and quality. Many researchers in determining the success of a project focus on the

construction phase as it during this phase that the set goals like time, cost and quality become most significant. Nevertheless, there are various situations where a project takes long time to planned, designed, tendered, adjudicated and awarded. Consequently, during the construction phase, various inadequacies will manifest themselves which affects its performance (Lim and Mohamed 1999). Therefore, inferring from the discussion above, the criteria for measuring project success may include project cost performance, project schedule performance, project quality performance and health and safety performance.

The cost of project includes not only the tender sum but also cost from inception to completion. The cost performance of a project mainly arises from broad site investigation enhanced by profound effective planning which successively clarifies the scope. Chan and Chan (2004) described construction schedule as the time taken for the completion a project. The schedule of a project is normally arranged to allow the building to be used by a date determined by the client. According to Egemen and Mohamed (2005), completing a project to meet the required quality standards is one of the major criteria in measuring project success. Quality is achieved when the legal, aesthetic and functional requirements of a project of the customers/client is achieved (Tang et al., 2005). Quality involves meeting or exceeding the expectations of clients. Health can be defined as the protection of bodies and minds of individuals from illnesses. Safety is attained when a project is completed successfully without major accidents and injuries (Auffan et al., 2009). The International Labour Organization (ILO) (2001), defines health and safety as the prevention and maintenance of the mental and social well-being of workers and the prevention of illness caused by working conditions.

However, this study will only focus on schedule performance which falls within the micro viewpoint of project success.

2.3.1 Project schedule performance

Chan and Chan (2004) described construction schedule as the length of time for completion of a project. The delays in the successful completion of construction projects are seen as one of the most frequently occurring setbacks in the construction industry (Al-Kharashi and Skimore, 2009). The consequences of delays are tremendous and affects all people and organizations involved in the project. The owner may be affected drastically if delaying the start time of the project will be an obstacle to him obtaining the expected project revenue and will increase financial costs. Furthermore, the owner may confront several other problems arising from the commitments accepted based on the delivery date set up in the contract (Marzouk et al., 2010). On the side of the contractors, prolonging the project start time primarily ensues in them having to deal with cost overruns due to extra cost on personnel, increase in cost of materials, increase of financial cost and paying penalties included in the contract (Singh, 1997). This can consequently affect the reputation of contractors in wining further contracts.

Project schedule under-performance can also affect project quality due to the inability of the construction team to control the quality of work when the primary target is completing the project on time. When this is the case, workers are normally propelled to work overtime and to increase the rate of production, which very often results in failures and reworks (Woodward, 1997). In a larger scale, construction project delays in public assets like schools, may also result depriving the community of its amenities which are usually needed urgently. In other to avoid all this complications and setbacks, project managers and contractors should endeavor to enforce management processes that improve on the quick completion of projects.

2.3.2 Factors that affect project schedule performance

There are numerous factors that may affect schedule performance of a construction project. A study conducted by Iyer and Jha (2006), identified critical factors that affects project schedule performance. They include, commitment of all project participants and the competence of the owner of the project, the competence of the project manager, positive owners and top management, supervising, response and coordination, and favorable working conditions. Table 2.2 shows a summary of the factors and sub-factors that affect project schedule performance.

Table 2.1: Factors that affect project schedule performance

Item	**Variables**
A	**Project Manager's competence**
1	*Leadership style of PM*
2	*organizing ability and rapport of PM with other contractors on site*
3	*Confidence to take decisions by the PM's team on site*
4	*Technical capability of project manager*
B	**Supportive owners and top management**
1	*Understanding operational difficulties by the owner's engineer*
2	*Selection of PM with proven track record at an early stage by top management*
3	*Availability of resources*

4	*Developing and maintaining a good line of communication*
C	**Monitoring, feedback and coordination**
1	*Efficient supervising and response by the project team members*
2	*Supportive nature of PM and project participants*
3	*Apprehension of the responsibilities by various project participants*
D	**Favorable working condition**
1	*Duration and nature of work well defined in the tender*
2	*Friendly social environment*
3	*Friendly climatic condition at the site*
4	*Observation and feedback by client*
E	**Commitment of all project participants**
1	*Favorable governmental and economic environment*
2	*Positive attitude of all parties to the project*
3	*Power to delegate authority to various members of his team by PM*
F	**Owner's competence**
1	*Timely decision by the owner/consultant*

2	*Observation and feedback by client*
3	*Human resource training in the appropriate skill*

Source: Iyer and Jha (2006).

2.4 THE CONCEPT OF COMMUNICATION

The concept of communication has been described by many researchers as it has gained much recognition among various authors. Obamiro (2008), simply described communication as the exchange of information between sender and a receiver. This definition shows the two major components of communication, thus a sender and a receiver. A much complication description of communication given by Forlarin (2003), defined communication as the means by which a thought is transferred from one person to another. Therefore, communication is only complete if there is a transfer of knowledge or thought among the parties. Communication is a fundamental component in the structure and nature of an organization. Communication is a very significant mechanism for attaining desegregation and coordination of the specialized units and their activities at different levels in the organization.

In an organization, there are four (4) categories of communication. These are downward flows, upwards flows, horizontal flows and lateral flows. Downward communication is a form of communication from head to assistants. This form of communication can breakdown due to several reasons like poor organization, confusion about messages and personal reasons. Poor interpersonal relationship between heads and assistance can cause a breakdown in downward communication. Upward communication is a form of communication that comes from assistance to heads. Similarly, they may breakdown due to poor organization, confusion and messages and personal reasons. Also, poor interpersonal relationship between heads and assistance can cause a

breakdown in upward communication. Subordinates may be tempted to give inaccurate information due to reasons like hiding errors or does not want to border the boss with trivial issues. Horizontal communication is a form of communication between people on the same hierarchy. This kind of communication can break down due to difference in location.

A typical communication process consists of seven (7) steps. These are the message, encoding, transmitting, receiving, decoding, understanding and feedback (Shannon and Weaver, 1949). There are various mediums within which the seven (7) communication steps can be undertaken. One of the most common medium is face-to-face (Stryker and Santor, 2012). Research has shown that face to face communication is an efficient medium of communication for problem solving. A study conducted by Gorse and Emmitt. (2007), indicated that, architects and engineers prefer face-to-face communication as is deemed as most efficient. A more recent and advance medium for communication is video conferencing. This tool is very efficient for team members who are situated at other locations. Face-to-face communication is not possible if the team members are located at different locations. The video conferencing tool permits audio and visual communications. Additionally, the authors Gorse and Emmitt,(2007) stated that videoconference tool bridges gaps and aids in long distance project management. Emails, project documents and telephones are other available medium for communication. Project documents such as design drawings, tender documents and contract documents are unconventional means of communication that can affect project delivery. The medium selected for communication can affect the effectiveness of communication.

2.5 FACTORS THAT AFFECT COMMUNICATION

Proper and effective communication in the construction industry is known to have a vital influence on the execution of construction projects. Previous studies have highlighted the

relevance of efficacious communications to the success of a project. However, a number of factors hinders the flow of effective communication. These factors are shown in table 2.2.

Construction projects include various team members. Generally, members of the project team are transitory; their insight and aptitudes are particular and divided; they have distinctive authoritative cultures; the organizations and the general population are regularly engaged with the task at various times (Blyth, 2001). The professions have likewise built up their own particular traditions and working propensities freely (Watkinson, 1992). These different foundations and dynamic structure of these groups prohibit the improvement of basic communications for these very complex projects (Thomas et al., 1999). For the most part there is absence of trust and relationships move toward becoming ill-disposed. Construction projects have the bad repute of divided, detachment of design and construction activities, absence of coordination and the development business has turned out to be more belligerent (Emmitt and Gorse, 2003). With the exception of the expanding number of experts, Information Technologies (IT) applied in the present construction projects add to the immense test to the communication between members in construction projects as well. Today, IT is evolving along four principle lines including institutionalization, representation, communication, and consolidation (Mead, 1999). New and developing Information and communication Technologies (ICT) have changed and developed the multifaceted nature of communication activities in the construction industry, for example, web, interactive media, virtual reality, and broadband communication systems, and so forth. (Anumba and Evbuomwan 1999). ICT provides chances to solve issues related to coordination associaed with construction segregation (Walker and Peansupap, 2004). These advances may result in more effective data exchange. Nonetheless, it additionally brings some

new issues, for example, data over-burden and so on. How powerful communication is under these advancements condition require attention.

Hence, these variables make project communication between project members in construction project facilitate complex which ought to be investigated in both scholastic and pragmatic territories.

2.6 SUMMARY OF CHAPTER

This chapter basically reviewed literature pertaining to the subject area of study. The review began with the ideology of construction project success. From the review, it was identified that, the

Table 2.2: Factors that affect the effectiveness of communication

SN	**FACTORS**
1	The timing of the communication
2	The number of companies involved in the project
3	A formal and visible communication system
4	The quality of the information content
5	The project group culture
6	The complicated nature of the project

7	The size of the construction project
8	The timescale for project completion
9	The communication medium used
10	The project organizational structure

Source: Author's construct, (2018).

concept of construction project success had evolved drastically. Also, schedule performance, cost performance and quality performance are among the earliest criteria identified for measuring construction project success. The review continued with a discussion on project schedule performance and the factors that affect schedule performance. Six (6) factors were identified with sub-factors. Also, the concept of communication was reviewed followed by the factors that affect construction project communication. From the review, it was identified that effective communication on construction sites affects the performance of the project, however, there are numerous factors that affect the effectiveness of communication. Ten (10) factors were identified from literature.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology details the procedures and method needed to establish the required knowledge for the study. This aided in the achievement of the aim of the study. This chapter basically describes the research design, research method, study population, sample size, sampling technique, data analysis process and the ethical considerations made.

3.2 RESEARCH DESIGN

A research design details out the plan used to answer the established research questions (Spencer-Oatey, 1993). There are two (2) basic types of research design. These are the descriptive research design and the explanatory research design. According to De-Vaus (2001), the descriptive research design answers the question What is going on? Thus, the descriptive research design gives a vivid description of a phenomenon or a concept. However, De-Vaus (2001), indicated that, the explanatory research design answers the question why is it going on? Thus, the explanatory research design indicates the causal relationships and why one phenomenon is affected by another phenomenon. Zikmund et al. (2012), indicated that, explanatory research can also be described as causal research as it is conducted in other to examine the extent and nature of cause-and-effect relationship.

The aim of this study is to establish the causal relationship between project schedule problems and communication in construction project management. Therefore, at the end of this study, a causal relationship will be established between communication and schedule problems.

Therefore, based on the description of the two research designs above, the explanatory research design was deemed most suitable.

3.3 RESEARCH METHODS

Kowalczyk (2016), indicated that, a researcher has the option of three (3) basic research methods to choose from when carrying out a research. The choice of a research method depends on a number of factors including the type of data used for the research (numerical/textural); the research problem; the researcher's experience and the reporting audience (Creswell, 2003). These research methods are quantitative, qualitative and mixed research methods.

According to Kowalczyk (2016), the quantitative research method is a research method in which numbers are used to explain the findings. The use of number implies that, the researcher has to have knowledge on both descriptive and inferential statistics parameter such as means and standard deviations. Quantitative research methods are mostly used when the researcher wants to study how a specific variable affects another, disregarding the effects of the other variable. According to Creswell (2003), quantitative research begins with a theory followed by collection of data to support or oppose the theory, make revisions and conduct additional tests.

Qualitative research method has been in existence only for a few decades (Creswell, 2003). Qualitative research, contrary to qualitative research method use descriptive procedures to generate meaning and understanding of the concept being studied (CRQ, 2015). In this research method, the researcher may be part of the research instrument. According ro Creswell (2003), this research method is mostly used if the researcher is not sure of which variables to control.

The mixed research method is relatively new and still under development (Creswell, 2003). Mixed research method involves the combination of both quantitative and qualitative methods in

the same study. In mixed research method, a research combines both quantitative and qualitative methods to provide a better understanding of the problem. However, in a business setting, the mixed research method would be more expensive compared to using either of the research methods in isolation.

In order to accomplish the said aim of the study, numerical data must be used in order to apply mathematical parameters like means, standard deviations and regression. Therefore, the quantitative research is deemed more appropriate for the study.

3.4 RESEARCH POPULATION, SAMPLE SIZE AND SAMPLING TECHNIQUE

The population of a study depicts the universe from which a sample can be selected. For this study, the population is D1K1 and D2K2 construction firms in the Accra metropolis. The number of D1K1 and D2K2 building contractors based on the Ministry of Works and Housing in the Accra Metropolis is one hundred and twenty-eight (128) as at 2014 in the Greater Accra Region. This category of construction firms was selected because they are well-established companies and exhibit an organized structure in the firm.

In order to obtain a sample, the Kish Formula was used.

$$n = \frac{n'}{\left(1 + \frac{n'}{N}\right)}$$

$$n' = \frac{s^2}{v^2}$$

Where

v = the standard error of sampling distribution = 0.05

s^2 = the maximum standard deviation of the population

Total error = 0.10 at a confidence interval of 95%

$s^2 = p(1-p)\ where\ p = 0.50$

$= 0.50(1 - 0.50)$

$= 0.25$

p = the proportion of the population elements that belong to the defined region.

$$n' = \frac{s^2}{v^2}$$

$$= \frac{0.25}{0.05^2} = 100$$

N = 128

Therefore

$$n = \frac{100}{\left(1+\frac{100}{128}\right)} = \frac{100}{(1+1.205)} = 56.15 \approx 56.$$

The sample size is fifty-six (56), extra ten (10) was added to cater for non-responsiveness.

The respondents were reached using the simple random sampling technique. The convenient sampling technique is a non-probability sampling technique where respondents are selected because of their convenient accessibility and proximity to the researcher. Thus, this sampling technique was deemed most appropriate for the research.

3.5 QUESTIONNAIRE DEVELOPMENT AND ADMINISTRATION

Questionnaires distribution is a very common way of gathering information from respondents. The questionnaire as shown in the appendix of the study consisted of two sections (section A and section B). The section A concentrated on the background of the respondent. In the section A, the respondents were asked to indicate their category, their years of experience, their level of education and number of projects handled.

The section B was formulated based on the objectives of the study. The section B consisted of three (3) questions. The first question concentrated on schedule problems. The respondents were asked to indicated significance of the schedule of problems in the Ghanaian construction industry using the five-point Likert scale of 1 = Not significant; 2 = Slightly significant; 3 = Moderate; 4 = Significant; 5 = Very significant.

The second question concentrated on significance of the factors that affect communication in the Ghanaian construction industry. Similarly, the five-point Likert scale of 1 = Not significant; 2 = Slightly significant; 3 = Moderate; 4 = Significant; 5 = Very significant was utilized.

Finally, the last question concentrated on the impact of communication factors on schedule performance. The five-point Likert scale of 1 = No impact; 2 = Minimal impact; 3 = Moderate impact; 4 = High impact; 5 = Very high impact was adopted.

The questionnaire was self-administered by the researcher. It was also supplement by e-mail distribution. The data collected lasted for two (2) weeks. In all, sixty-six (66) questionnaires were distributed and fifty-four (54) was retrieved for the analysis.

3.6 ANALYTICAL TOOLS

Each of the objectives of the study were analyzed separately using the responses gathered from the questionnaire administration. The collected data was first entered into the Statistical Package for Social Science (SPSS) version 20 and subsequently analyzed using the mean score ranking and linear regression analysis. The objective one and two were analyzed by ranking using the mean score tanking tool. The objective three and four were analyzed using the regression method. Regression analysis is used to study the relationship between two or more factors/variables. Also, the regression analysis method can be adopted to observe changes in the

dependent variable with changes in the independent variables. It must be noted that, the parameters in the regression equation are obtained using the least square method. The following assumptions were made for the regression analysis;

1. The blunder term takes after typical conveyance with mean of zero (0) and steady variance.
2. There is no correlation between independent variables and error terms.
3. The error term is same for all values of independent variable

There are two (2) fundamental forms of regression. These are simple linear regression and multiple linear regression. The multiple linear regression was adopted for this study as linear regression is used to study the relationship between one independent and one dependent variable. However, since this study as more than one independent variables, the multiple regression analysis was used as its study the relationship between one dependent variable and multiple independent variables.

3.7 EHICAL CONSIDERATIONS

According to Bryman (2007), ethical consideration is a very significant part of a research. It is very crucial for the researcher to ensure that no harm comes to his respondents. In order to ensure good ethics, permission for conducting the study was first sort from each respondent. Furthermore, each selected respondent was informed about the purpose of the study. They were also informed that, they can refuse to participate in the study.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 INTRODUCTION

This chapter analyze the data collected from the respondents in order to accomplish the four (4) objectives of the study. The objectives were to identify the factors of project schedule problems in construction project management, to identify the factors of communication in construction project management, to establish if there is relationship between factors of project schedule problems and communication in construction project management and to determine the extent of impact between project schedule problems and communication in construction project management. The initial aspect of achieving the objectives involved the review of literature which was used to develop a questionnaire to collect data from the respondents. The next part of achieving the objectives is the analysis of data collected. The data was analyzed using the mean score ranking and the multiple regression analysis. Prior to the analysis of the objectives, the background of the respondents was analyzed using percentages. The outcome of the analysis is discussed in this chapter.

4.2 BACKGROUND OF THE RESPONDENTS

The background of the respondents is summarized in table 4.1. The first question of the demographics wanted to ascertain the category of the respondents. The options were D1K1 and D2K2 as they were the main target for the study. 59.20% of the respondents were D2K2 whiles 40.80 of the respondents were D1K1.

The second question was designed to ascertain the number of years of experience of the respondents. The years of experience of respondents gives an indication of his familiarity and

knowledge of the processes of the firm. From the responses, majority of the respondents had more than six (6) years of experience.

Table 4.1: Background of the respondents

DESCRIPTION	**PERCENTAGE**
Category of construction firm	
D1K1	40.80
D2K2	59.20
Years of experience	
Below 5 years	3.70
6-10 years	51.90
11-15 years	40.70
16-20 years	3.70
Above 20 years	0.00
Education Level	
HND	16.70
BSc	68.50
Post graduate	14.80
Number of projects	
Below 5	3.70
6-10	35.20

11-15	16.70
16-20	38.90
Above 20	5.60

Source: Field survey, (2018).

This gives an indication that, the responses given by the participants will be highly dependable.

The third question asked the respondents to indicate their highest level of education. This also gives an indication of the knowledge level of respondents. Majority of the respondents had Bsc degree forming 68.50% of the respondents.

The last question under the background of the respondents wanted to ascertain the number of construction projects the participant has being involved in. The options were below 5, 6-10, 11-15, 16-20 and above 20. The majority of the respondents indicated that they had executed 16-20 projects.

4.3 OBJECTIVE ONE: SCHEDULE PROBLEMS

The first objective of the study sought to identify the factors of project schedule problems in construction project management. Chan and Chan (2004) described construction schedule as the duration for completing a project. The delays in the delivery of construction projects are seen as one of the most frequently occurring problems in the construction industry (Al-Kharashi and Skimore, 2009).

Table 4.2: Schedule problems

DESCRIPTION	MEAN	RANK
Project Manager's competence	**4.09**	**1ST**
Poor project manager technical capability	4.26	1st
Poor Leadership quality of PM	4.12	2nd
Bad Coordinating ability and rapport of PM with other contractors on site	4.00	3rd
Lack of authority to take day-to-day decisions by the PM's team on site	3.98	4th
Monitoring, feedback and coordination	**3.94**	**2ND**
Lack of understanding of the responsibilities by various project participants	4.02	1st
Ineffective monitoring and feedback by the project team members	3.92	2nd
Negative attitude of PM and project participants	3.88	3rd
Owner's competence	**3.85**	**3RD**
Poor Timing of decision by the owner/consultant	3.90	1st
Poor Monitoring and feedback by client	3.86	2nd
Human resource training in the appropriate skill	3.79	3rd
Supportive owners and top management	**3.62**	**4TH**
Selection of inexperienced contractor	3.88	1st
Operational difficulties by the owner's engineer	3.60	2nd
Poor line of communication	3.54	3rd
Inadequate/Unavailability of resources	3.46	4th
Commitment of all project participants	**3.43**	**5TH**
Negative attitude of all parties to the project	3.55	1st
Power to delegate authority to various members of his team by PM	3.42	2nd

Unfavorable political and economic environment	3.33	3rd
Favorable working condition	**3.01**	**6TH**
Poor definition of scope and nature of work	3.42	1st
Poor monitoring and feedback by client	2.91	2nd
Unfavorable social environment	2.87	3rd
Unfavorable climatic condition at the site	2.85	4th

Source: Field survey, (2018).

Therefore, the respondents were asked to indicate how significant the schedule problems are in construction project management. Their responses were rated with the five-point Likert scale and analyzed using the mean score ranking. The schedule problems had sub-criteria. The mean of each criteria was computed as an average of the means of the sub-criteria.

The most significant schedule problem as indicated by the respondents was project managers competence. The ranking of its sub-criteria in descending order were poor project manager technical capability, poor leadership style of PM, bad organizational ability and relations of PM with other contractors on site and lack of confidence to take day-to-day decisions by the PM's team on site.

The second ranked factor was monitoring, feedback and coordination. Similarly, the ranking of the sub-criteria in descending order were lack of understanding of the responsibilities by various project participants, ineffective supervision and response by the project team members and negative attitude of PM and project participants.

The third most significant schedule problem was owner's competence. The ranking of its sub-variables are as follows; Poor timing of decision by the owner/consultant, poor monitoring and feedback by client and inadequate training of human resource training in the appropriate skill.

4.4 OBJECTIVE TWO: FACTORS THAT AFFECT COMMUNICATION

The second objective of the study wanted to identify the factors of communication in construction project management. Proper and effective communication in the construction industry is known to affect the execution of construction projects. Various investigations have featured the significance of efficacious communication to extend project success. Therefore, the respondents were asked to indicate the significance of the communication factors using the five-point Likert scale of 1 = Not significant 2 = Slightly significant 3 = Moderate 4 = Significant 5 = Very significant. Their responses were analyzed using the mean score ranking. The most significant factor that affects effective communication was the communication medium used. The second most significant factor was the timing of the communication. The third ranked factor was the establishment of a formal and visible communication system. Construction projescts include numerous project members. Generally, project members are transitory; their insight and abilities are exceptional and fragmented; they have diverse authoritative cultures; the organizations and the general population are frequently engaged in the project at various times (Blyth, 2001). The professions have likewise built up their own particular traditions and working propensities freely (Watkinson, 1992). These various foundations and dynamic synthesis of these groups ruin the improvement of basic communication for these complex activities (Thomas et al., 1999).

Table 4.3: Factors that affect communication

DESCRIPTION	MEAN	RANK
The communication medium used	4.12	1ST
The timing of the communication	3.89	2ND
A formal and noticeable communication framework	3.76	3RD
The project organizational structure	3.56	4TH
The size of the construction project	3.44	5TH
The project group culture	3.40	6TH
The number of companies involved in the project	3.35	7TH
The complexity of the project	3.22	8TH
The timescale for project completion	3.18	9TH
The quality of the information content	3.12	10TH

Source: Field survey, (2018).

4.5 OBJECTIVE THREE AND FOUR: REGRESSION ANALYSIS

The third objective of the study was to establish if there is relationship between factors of project schedule problems and communication in construction project management. The forth objective was to determine the extent of impact between project schedule problems and communication in construction project management. With these two objectives, the respondents were asked to rate the impact of the communication factors on schedule performance in the Ghanaian construction

industry using the scale of 1 = No impact 2 = Minimal impact 3 = Moderate impact 4 = High impact 5 = Very high impact.

In order to make inference of the relationship and the extent of impact, the beta values, significance level and t-statistic values were calculated using the SPSS software version 20. The calculation was done at a confidence level of 10% ($\alpha = 0.10$; two-tailed test). Therefore, when the *t*- value is above 1.65, we can conclude that, there is a significant relationship. The Beta values shows the extent of the relationship. Beta values closer to 1 shows a significant relationship and vice-versa. From the values shown in table 4.4, the communication medium, the timing of the communication and the project organizational structure shown significant relationship with schedule performance. However, the project group culture showed a significant negative relationship with schedule performance. The results indicated that, there is a significant relationship between communication factors and schedule problems in the Ghanaian construction industry. There are a numerous factors that may affect the duration of a construction project.

Table 4.4: Regression analysis

DESCRIPTION	**T-STATISTIC**	**BETA (B)**	**SIG**
The communication medium used	2.342	0.346	0.005
The timing of the communication	1.793	0.239	0.080
The project organizational structure	1.778	0018	0.082
A formal and visible communication system	0.265	0.044	0.792
The size of the construction project	0.159	0.019	0.874

The project group culture	-3923	-0.530	0.00
The number of companies undertaking a project	-1.370	-0.201	0.178
The complexity of the project	-1.645	-0.226	0.107
The timescale for project completion	-0.845	-0.120	0.403
The quality of the information content	-774	-0.0103	0.443

Source: Field survey, (2018).

The lack of commercial edge in the exercise of its procurement function. Contracts for both works and consultancy services take very lengthy periods to reach financial closure and are subject to unnecessary delays (Agents, 1998). Westring (1997) attributes the causes of the delays to extensive post-award negotiations, delays in the preparation of technical specifications and drawings, delays in evaluation, an extensive system of controls, reviews and approvals, and land ownership disputes. Most of these factors that affects project schedule performance arise from ineffective communication among project stakeholders as the form of communication adopted has an effect on the flow of the project.

4.6 CHAPTER SUMMARY

The data analysis was conducted with mean score ranking and multiple regression analysis. The first and second objective were analyzed using the mean score ranking. The third and fourth objective was analyzed using the regression analysis. With the first objective, it was realized that the most significant schedule problem as indicated by the respondents was project managers competence. The ranking of its sub-criteria in descending order were poor project manager technical capability, poor leadership style of PM, bad organization ability and relationship of PM

with other contractors on site and lack of confidence to take day-to-day decisions by the PM's team on site. The second ranked factor was monitoring, feedback and coordination. The third most significant schedule problem was owner's competence. The ranking of its sub-variables are as follows; Poor timing of decision by the owner/consultant, poor monitoring and feedback by client and inadequate training of human resources in the skill appropriate for the project.

With the second objective of the study, the most significant factor that affects effective communication was the communication medium used. The second most significant factor was the timing of the communication. The third ranked factor was the establishment of a formal and visible communication system.

The third and fourth objective sought to measure the relationship between communication and schedule problems. In order to make inference of the relationship and the extent of impact, the beta values, significance level and t-statistic values were calculated using the SPSS software version 20. The calculation was done at a confidence level of 10% ($\alpha = 0.10$; two-tailed test). The results indicated that, there is a significant relationship between communication factors and schedule problems in the Ghanaian construction industry.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The study begun with the aim of establishing the causal relationship between project schedule problems and communication in construction project management. Four (4) objectives were established which were to identify the factors that affect project schedule problems in construction project management, to identify the factors that affect communication in construction project management, to establish if there is relationship between factors of project schedule problems and communication in construction project management and to determine the extent of impact between project schedule problems and communication in construction project management. With these objectives, an extensive literature review was conducted from which variables on schedule problems and communication were identified. The variables were subsequently used in the development of a structured questionnaire. The questionnaire was distributed and fifty-four (54) was retrieved and used for the analysis of the study. The analysis was done using the mean score ranking and the multiple regression analysis. This chapter discusses the summary of the findings, limitations, further studies, conclusion and make recommendations.

5.2 SUMMARY OF FINDINGS

The data analysis was done using mean score ranking and multiple regression analysis. The first and second objective were analyzed using the mean score ranking. The third and fourth objective was analyzed using the regression analysis. From the analysis, it was realized that, the most significant schedule problem as indicated by the respondents was project manager's competence. The ranking of its sub-criteria in descending order were poor project manager technical

capability, poor skills in leadership of PM, poor organizing skills and relations of PM with other contractors on site and lack of confidence to take decisions and enforce those decisions by the PM's team on site. With the first objective, it was realized that the most significant schedule problem as indicated by the respondents was project managers competence. The ranking of its sub-criteria in descending order were poor project manager technical capability, poor leadership style of PM, bad organization ability and relationship of PM with other contractors on site and lack of confidence to take day-to-day decisions by the PM's team on site. The second ranked factor was monitoring, feedback and coordination. The third most significant schedule problem was owner's competence. The ranking of its sub-variables are as follows; Poor timing of decision by the owner/consultant, poor monitoring and feedback by client and inadequate training of human resources in the skill appropriate project.

With the second objective of the study, the most significant factor that affects effective communication was the communication medium used. The second most significant factor was the timing of the communication. The third ranked factor was the establishment of a formal and visible communication system.

The third and fourth objective sought to measure the relationship between communication and schedule problems. In order to make inference of the relationship and the extent of impact, the beta values, significance level and t-statistic values were calculated using the SPSS software version 20. The calculation was done at a confidence level of 10% ($\alpha = 0.10$; two-tailed test). The results indicated that, there is a significant relationship between communication factors and schedule problems in the Ghanaian construction industry.

5.3 LIMITATIONS

This section discusses the limitations to the study;

1. The study was limited to only D1K1 and D2K2 construction firms in the Accra metropolis;
2. The study was limited to only schedule performance success criteria. There are other success criteria like cost budget, quality, health and safety to mention a few
3. This study was also limited to the number of dependent variables that could be used. The regression analytical tool adopted could only be used for one dependent variable at a time.

5.4 CONCLUSION

This study fundamentally demonstrated that, there is a significant relationship between communication and schedule problem in the Ghanaian construction industry. Communication is a key component in a hierarchical structure of an organization and its functioning. Communication is an extremely critical component for accomplishing consolidation and coordination of the activities of specific units at various levels in the organization. Therefore, if the communication process is not expedited in an organization it can affect the overall performance the organization especially schedule as indicated in the study. Project schedule under-performance can also affect project quality since the project members generally commit less time to quality control when the primary concern is finishing the task on time. At the point when this is the situation, laborers are regularly pushed to work extra time and to expand the production rate, which all the time involves disappointments and revamps. In a bigger scale, construction projects delays in public resources like schools, may likewise result in social harm given the way that this sort of project is typically required earnestly. In other to avoid all this

complications and setbacks, project managers and contractors should endeavor to enforce project management processes that improve on the quick delivery of projects through effective communication.

5.5 RECOMMENDATION

With the findings of the study, the following recommendations were made;

1. A project manager must endeavor to adopt the appropriate communication medium at any particular point in time to expedite the communication process;
2. The client and his advisors should be very keen in selecting a suitable project manager for the project as the selection of an incompetent project manager can affect the delivery of the project; and
3. Appropriate monitoring and reporting tools should be adopted during the construction phase of a project

5.6 FURTHER STUIES

Based on the limitations of the study, the following recommendations for further studies were made;

1. Similar studies can he conducted using other stakeholders in the construction industry;
2. Further studies can be conducted using other performance criteria or a combination of construction performance variables;
3. Further studies can also be conducted using a different analytical tool that can incorporate more than one dependent variable like the Structural Equation Model.

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KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY
COLLEGE OF ART AND BUILT ENVIRONMENT
DEPARTMENT OF CONSTRUCTION TECHNOLOGY AND MANAGEMENT

SURVEY QUESTIONNAIRE

CAUSAL RELATIONSHIP BETWEEN PROJECT SCHEDULE PROBLEMS AND COMMUNICATION IN CONSTRUCTION

Dear Sir/ Madam

I am an Msc student at Kwame Nkrumah University of Science and Technology, Department of Construction Technology and Management currently undertaking a research on schedule problems and communication**.**

Your experience and knowledge in the area of the research is very important and much appreciated. The information you shall provide shall be STRICTLY CONFIDENTIAL and for academic purposes only and findings from this research will be made available to you on request.

I appreciate your effort and time very much in advance.

Yours Sincerely,

Beyaw, MSc. Student, KNUST (0244956500)
Dr Emmanuel Adinyira Project Supervisor, Department of Construction Technology and Management (KNUST)

APPENDIX

SECTION A

RESPONDENT'S PROFILE

1. Please indicate your category in the Construction industry?

[ ] D1K1

[ ] D2K2

[ ] D3K3

[ ] D4K4

2. Please indicate your years of experience in your profession?

[ ] Below 5 years

[ ] 6-10 years

[ ] 11-15 years

[ ] 16-20 years

[ ] Above 20 years

3. What is your highest level of education?

[ ] HND

[ ] BSc

[ ] Post Graduate

Other; Please specify…….

4. Please indicate the number of projects you have handled?

[ ] Below 5

[ ] 6-10

[ ] 11-15

[ ] 16-20

[ ] Above 20

SECTION B

SCHEDULE PROBLEMS

1. Please indicate how significant the following problems affects construction schedule in the Ghanaian construction industry. Please use the response scale below:

1 = Not significant 2 = Slightly significant 3 = Moderate 4 = Significant 5 = Very significant

No.	Variables	1	2	3	4	5
A	**Project Manager's competence**					
1	Poor Leadership quality of PM					
2	Bad Coordinating ability and rapport of PM with other contractors on site					
3	Lack of authority to take day-to-day decisions by the PM's team on site					
4	Poor project manager technical capability					
B	**Supportive owners and top management**					
5	Operational difficulties by the owner's engineer					
6	Selection of inexperienced contractor					
7	Inadequate/Unavailability of resources					
8	Poor line of communication					
C	**Monitoring, feedback and coordination**					
9	Ineffective monitoring and feedback by the project team members					
10	Negative attitude of PM and project participants					
11	Lack of understanding of the responsibilities by various project participants					
D	**Favorable working condition**					
12	Poor definition of scope and nature of work					
13	Unfavorable social environment					

14	Unfavorable climatic condition at the site					
15	Poor monitoring and feedback by client					
E	**Commitment of all project participants**					
16	Unfavorable political and economic environment					
17	Lack of commitment of all parties to the project					
18	Inability to delegate authority to various members of his team by PM					
F	**Owner's competence**					
19	Poor Timing of decision by the owner/consultant					
20	Poor Monitoring and feedback by client					
21	Inadequate training of human resources in the skill demanded by the project					

2. Please indicate the significance of these factor that affect communication in the Ghanaian construction industry. Please use the response scale below:

1 = Not significant 2 = Slightly significant 3 = Moderate 4 = Significant 5 = Very significant

No.	**Variables**	**1**	**2**	**3**	**4**	**5**
1	The timing of the communication					
2	The number of companies involved in the project					
3	A formal and visible communication system					
4	The quality of the information content					
5	The project group culture					

6	The complexity of the project					
7	The size of the construction project					
8	The timescale for project completion					
9	The communication medium used					
10	The project organizational structure					

3. Please rate the impact of the following communication factors on schedule performance in the Ghanaian construction industry using the scale below. Please use the response scale below:

1 = No impact 2 = Minimal impact 3 = Moderate impact 4 = High impact 5 = Very high impact

No.	**Variables**	**1**	**2**	**3**	**4**	**5**
1	The timing of the communication					
2	The number of companies involved in the project					
3	A formal and visible communication system					
4	The quality of the information content					
5	The project group culture					
6	The complexity of the project					
7	The size of the construction project					
8	The timescale for project completion					
9	The communication medium used					
10	The project organizational structure					