INFLUENCE OF PROJECT MANAGEMENT INFORMATION SYSTEM ON PROJECT PERFORMANCE IN THE CONSTRUCTION INDUSTRY: A CASE OF NAIROBI COUNTY, KENYA.

BY

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A Research Project Report Submitted in Partial Fulfillment of the Requirements for the Award of the Degree of Master of Arts in Project Planning and Management, University of Nairobi.

2014

DECLARATION

This Project Report is my original work and has not been presented for an award in any other University.

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L50/60552/2013

Signed**:** _____ Date: _____

This Project Report has been submitted for examination with my approval as the university supervisor

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DEDICATION

This research project report is lovingly dedicated to my parents, Mrs. Grace Osero, and Mr. Charles Ogero, whose love for me knows no bounds and whose tireless efforts, sacrifice and devotion to their first born ensured that their daughter is now qualified to be a “master” in her own right. You are a constant source of inspiration; you have given me the drive and discipline to tackle any task with enthusiasm and determination. You believe in the richness of learning. This research project report is also dedicated to my Brothers Nelson and Leon and Sisters Janice and Maureen; you have been a constant source of support, both emotionally and morally. You have given me unequivocal and overwhelming support throughout. You are my joy and guiding light.

ACKNOWLEDGEMENT

I am indebted in the preparation of this research project report to my supervisor Professor Christopher Gakuu, whose guidance and timely advice made me complete this research project report in good time. I sincerely appreciate your effort and words of encouragement. Thank you for your support, your patience with me throughout and your understanding.

I offer my gratitude to the various lecturers at the University of Nairobi, School of Continuing and Distance Education, department of Extra Mural Studies who taught me. I thank them for their skilful ways in which they devotedly taught and supported me throughout my course work. They knowingly and unknowingly led me to an understanding of some of the more subtle challenges to our ability to thrive. I wish to also acknowledge my study group in my Masters class for continued co-operation and solidarity. They played such an important role along the journey as we mutually engaged in making sense of the various challenges we faced and provided encouragement to each other at those times when it seemed impossible to continue.

Special thanks go to the Project Managers and Project Supervisors in the construction sites that were visited for devoting their valuable time to fill in the questionnaires and respond to the interviews conducted during data collection. Without your co-operation this study would not have succeeded. I would also like to appreciate my friends for assisting me in the formatting and editing of the document.

To all I say, thank you.

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ABBREVIATIONS AND ACRONYMS

CPM:	Critical Path Method
EDM:	Electronic Document Management
ENR:	Engineering New Record
ERP:	Enterprise Resource Planning
IS:	Information System
ISSM:	Information System Success Model
IT:	Information Technology
PERT:	Programme Evaluation Review Technique
PMBOK:	Project Management Body of Knowledge
PMI:	The Project Management Institute
PMIS:	Project Management Information Systems
R&D:	Research and Development
SPSS:	Statistical Package for Social Sciences
TAM:	Technology Acceptance Model
WBS:	Work Breakdown Structure

ABSTRACT

Construction projects are commonly acknowledged as successful when they are completed on time, within budget, and in accordance with specifications and to stakeholders' satisfaction. Many of the projects exceed the original cost; get cancelled prior to completion, while others fail on terms of the delivered functionality. While large amounts of time and resources are dedicated to selecting and designing projects, it remains of paramount importance that projects be adequately managed in organizations if they are to achieve their performance objectives. The purpose of the study was to establish the influence of Project Management Information System on project performance in the construction industry; a case of Nairobi County, Kenya. The Objectives of this study were to determine the influence of: the system, quality information, the system user and the system use on performance of construction projects. Descriptive survey was used this enabled the researcher obtain the opinions of project managers in their natural setting and it is also good for management decision making. The target population of the study was 98 from which a sample size of 80 was determined from the Krejice and Morgan table (1970), purposive sampling was used to select the sample from the target population. After data collection, the questionnaires were cleaned, coded and organized out which 76% of the self-administered questionnaires were analyzed. Validity of the research instrument was ascertained by seeking the opinions of experts in the field of study; 10% of target population was selected to test the reliability of the research instruments. Cronbach's alpha test was utilized in assessing reliability of research instrument an alpha value of 0.9584 was obtained, thus the research instrument used was reliable.Descriptive statistics and Correlation (using the Karl Pearson's coefficient of correlation) was used to analyse the data and establish the relationship between the dependent variables and the set of independent variables using the SPSS version 20 software. The four independent variables (the system, quality of information, the system user and the system use) were found to have a strong and positive correlation with the dependent variable (project performance). The research also found out that the use of the system to generate quality information needed by the user (project manager) to perform project tasks helped the project managers perform their tasks in a more professional manner thus increasing the performance of the project. It was therefore concluded that the use of Project Management Information System helped in the improving performance of project while respecting the projects constraints of time, budget and quality specification while meeting the project objectives. Future studies could evaluate performance from the client's perspective, that is, evaluate if the impacts of the Project Management Information System on project outcomes provide an adequate solution to the client's problem, bring true advantages to the organization in terms of quality of product/services offered, greater output volume, quicker delivery, and better strategic positioning, and provide tangible benefits such as increased sales and revenues

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Globalization and the internationalization of markets have increased competitive pressures on business enterprises. This has led companies to engage in projects that are vital to their performance, if not their survival. The evolution of worldwide competitive markets has led to a fact that projects in an ordinary business such as engineering, information technology; construction, etc. need to be highly managed, in terms of planning, scheduling, organizing, monitoring, and controlling (Liberatore and Johnson, 2003). In order to accomplish this, organizations must manage projects within selected time, budget, and in high performance while managing project risk.

Although project management systems assist an organization decrease product and service development time to market, exploit restricted resources, and enlarge global market rivalry, project managers still need to utilize tools that helps in overcoming various challenges such as: uncontrollable time and budget restrictions; inconsistent project teams; unpredictable of firms resources; lack of clarity in prioritizing projects; delays in project decisions making; and lack of clarity in collaboration among project team members. Therefore, while projects managers continue to struggle with these problems, they are obligated at the same time to make decisions in such a way that risk is controlled, uncertainty minimized and where every decision made by them will ideally be beneficial to the project. This can be accomplished when the enterprise acquires a Project Management Information System as a mean to provide top managers with the essential tools that aid the decision making process with regards to selecting, planning, organizing, and controlling projects and portfolios.

The project management systems currently employed in the construction industry can be divided into two types. The first one is off-the-shelf commercial software, where projects are managed using Gantt Charts, the Program Evaluation and Review Technique (PERT) (Kerzner, 2005) and the Critical Path Method (CPM) (Woolf, 2007). These management techniques have quickly spread into many private enterprises. Thus, a lot of the related commercial software packages cater for the aforementioned techniques; examples include Microsoft Project, Primavera Project Planner and SAP. The second type of project management system is custom in-house software, when commercial software does not meet the particular requirements of an engineering project or firm; some firms will develop custom

in-house project management software to meet their needs. Examples of this include Bechtel (Schmitz, 1991), Parsons Brinckerhoff (2004), Kajima (Nagasaki, *et.al*. 2000).

Traditional project management systems mainly provide text, basic graphs, and complicated network schedules for controlling projects and making decisions. Today's projects are becoming ever more complex and time driven, especially as the amount of project information and active project participants increases. Thus, we require more effective project tools for integration, management and communication. The question then arises about multi-dimensional information integration, management, and visualization of engineering projects. It therefore follows that an effective project management system should not only provide sufficient and comprehensive information to facilitate project management, but also provide the various visualization tools to assist with information distribution and communication.

Among various IT solutions, the internet-based (or web-based) Project Management Information Systems has been highlighted because of its strong advantages such as low cost compared with traditional communication methods, location-free access, speedy and reliable data transfer and storage, and efficient information sharing among parties (Tam *et.al*., 1999).

In Korea and Japan web based Project Management Information Systems is one of the most widely used tools that supports and enhances the collaboration and communication between construction project participants. The reason for the swift adoption of web-based Project Management Information Systems in the Korean and Japan construction industry closely relates not only to the above-mentioned advantages, but also to the well-established internet infrastructure and users' familiarity with web-based computing environment (Jung et al., 2004b). Besides these technical reasons, the Korean construction management guidebook specifies the use of Project Management Information System by construction managers hired by government or government agencies for efficient information management has strongly facilitated the adoption of web-based Project Management Information Systems in the Korean construction industry.

In England, there are two types of Project Management Information Systems in the construction field: One is that which is developed and used by individual construction companies. The other is the ASP (Application Service Provider)-based Project Management Information System which is developed for general construction projects but can be customized for specific construction projects. The former can be considered as one of the

information systems (e.g. MIS and ERP systems, etc.) used in a company exclusively, while the latter are generally used by various project participants such as client, architect, constructor, sub-contractor and construction manager, and their quality is considerably more dependent on the capability of service providers (Stewart & Mohamed, 2004).

In South Africa, ERP systems are being used by construction companies to improve responsiveness in relation to customers, strengthen supply chain partnerships, enhance organizational flexibility, improve decision making capabilities and reduce project completion time and lower costs. These information systems are designed to integrate and partially automate many of the company's business processes such as human resources, financial management, manufacturing, procurement, construction, operations and maintenance.

In Kenya, the construction industry is a crucial sector for growth of the economy. According to the Kenya National Bureau of statistics (KNBS; 2012) the construction industry contributed 3.8%, 4.1 %, 4.3% and 4.1 % towards Gross Domestic Product (GDP) for the years 2008, 2009, 2010 and 2011 respectively. This is an average of 4.1 % as compared to 10% for the developed economies (Hillebrandt, 2000). In Nairobi, many construction firms have got computer based material management systems (MMS), which stores, sort, combine and print data files pertaining to materials requisition, purchasing, vendor evaluation and warehouse inventories.

The use of these systems not only gives the firms competitive edge against their competitors but also enhances the effectiveness of construction projects throughout their life cycle and across the different construction business functions. According to (Kaiser et al., 2010) the use of Project Management Information System is based on the belief that their cost will be offset by the benefits that come along with it. They continue to say that the broadening of Project Management Information System scope enables organizations to not only manage individual projects but whole project portfolios. In general, Project Management Information System support most of the project life cycle phases from the idea generation, risk management, stakeholder management to the management of knowledge created long after the project completion.

1.2 Statement of the Problem

Construction projects are commonly acknowledged as successful when they are completed on time, within budget, and in accordance with specifications and to stakeholders' satisfaction. Many of projects exceed the original cost; get cancelled prior to completion, while others fail on terms of the delivered functionality. While large amounts of time and resources are dedicated to selecting and designing projects, it remains of paramount importance that projects be adequately managed in organizations if they are to achieve their performance objectives. For instance according to latest reports from the Ministry of Public Works, contractors give poor service through poor documentation, poor decision making and extension of time variation during project implementation leading to stalling of projects or total failure a case in mind is the management of Thika Super highway project whose construction budget was initially Ksh27 billion eventually consumed Ksh31 billion. A project manager simply cannot make and execute meaningful decisions without relevant and timely information (Cleland 2004b).

Projects need to be managed, that is, they need to be planned, staffed, organized, monitored, controlled, and evaluated (Liberatore, 2004). In order to succeed, companies must deliver projects on time, within budget and meet specifications while managing project risks. Peters identified that project management has long been considered an important characteristic of successful companies (Peters, 1982) and is more than ever necessary to efficiently and effectively manage these projects and to support project managers in their decision-making. Cleland states that project managers necessitate accurate and timely information for the management of a project. Project planning, organizational design, motivation of project stakeholders, and meaningful project reviews simply cannot be carried out without information on the project together with how it relates to the larger organizational context in which the project is found. (Cleland 2004b).

However, with Project Management Information System being increasingly used by project managers in all types of industry, not much is known on the characteristics of these systems that contribute to project performance. Thus the purpose of this study was to explore the influence of Project Management Information System on performance of projects in construction industry in the county of Nairobi with regard to the System, quality of information, the System user and the System use during the entire project life cycle to increase project performance rate.

1.3 Purpose of the Study

The purpose of the study was to establish the influence of Project Management Information System on project performance in the construction industry: A case of Nairobi County, Kenya.

1.4 Objectives of the Study

This study was guided by the following research objectives:

i. To determine the influence of Project Management Information System software on the performance of construction project;
ii. To establish the influence of quality information on the performance of construction project;
iii. To assess the influence Project Management Information System user on performance of construction project;
iv. To determine the influence of Project Management Information System use on performance of construction projects

1.5 Research Questions

The study was guided by the following research questions:

i. How does the Project Management Information System software affect performance of construction projects?
ii. To what extent does the quality of information Influence the performance of construction projects?
iii. In what ways does the Project Management Information System user influence performance of construction projects?
iv. To what extent does the Project Management Information System use influence the performance of construction projects?

1.6 Significance of the Study

It is hoped this study will contribute to the existing body of knowledge to researchers and academicians seeking secondary data on the factors that influence Project Management Information System on project performance. It is also hoped that it will contribute to the wider global debate on the impact of information technology on management of construction projects. It is also hoped that its findings and recommendations will inform current practice and the relevant authorities like the National Construction Authority (NCA), Kenya National

Highway Authority (KENHA), Ministry of Public Works and Nairobi City Council on actions that need to be taken to in order to improve the performance rate of construction projects.

1.7 Delimitation of the Study

The study was delimited to the geographical boundaries of Nairobi County. It was also delimited to the Project Managers, Construction Managers and Project Supervisors working on construction sites in Nairobi. The study also focused on the variables under study, i.e. the System, information quality, the system user and the system use.

1.8 Limitations of the Study

Time was a major challenge of the study getting access and appointments to the respondents was difficult since they did not having time to fill in the questionnaires due to their busy office schedules. The researcher overcame this by booking appointments with the respondents in advance before distributing the questionnaires as well as agreeing with them on the best time to get back the questionnaire. Transport was also another challenge encountered, getting around the city and distributing the questionnaires on time was quite difficult. The researcher overcame this by engaging the services of two assistants who helped in distributing the questionnaire to the relevant people. Financial constraints was also another challenge, the researcher overcame this by getting financial assistance from family and friends.

1.9 Assumptions of the Study

The researcher assumed that the respondents were available and willing to fill in the questionnaires. The researcher also assumed that the questionnaires would be filled truthfully and returned on time. The researcher had also assumed that funds required for the research would be available on time. The researcher further assumed that access to relevant research data throughout the study would be granted on time.

1.10 Definitions of Significant Terms as Used in the Study

Construction Project: It refers to ventures that are involved with erection, repair and demolition of buildings and Civil Engineering structures (roads, dams etc.).

Project Management Information System:	It refers to the tools and techniques used to gather, integrate, and disseminate the outputs of project management processes. It is used to support all aspects of the project from initiating through closing, and can include both manual and automated systems.
Project Management Information System use:	This refers to the extent to which various system functions and their associated tools are used by the project manager.
Project Management Information System User:	This refers to the individual that will manipulate the system in order to achieve the relevant outcome. In this case this refers to the project manager of the respective construction project
Project performance:	It refers to project achievements and in particular on the successful accomplishment of the project with regards to cost, time and quality.
The System:	It refers to interrelated components; with an identifiable boundary and which collectively accomplish certain objectives.
Quality Information:	This refers to the quality of outputs the information system produces, which can be in the form of reports or online screens.

1.11 Organization of the Study

The study is organized into five chapters. This study is organized as follows: chapter one presents the concept of project management information system. The chapter begins by describing the role of project management information system on performance of projects in the construction industry globally, and then the Kenyan context followed by the case of Nairobi County, Kenya. Chapter two presents a review of literature in relation to the themes of the study while chapter three presents the methodology that will be used in collecting and analyzing data. Chapter four consists of presentation of the collected data, analyses of the data and interpretation of the findings. It also provides the major findings and results of the study as directed by the objectives of the study. Chapter five presents the discussion of key data findings, conclusion drawn from the findings highlighted and recommendation made there-to.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Reviewed literature is organized according to the themes of the study. It also looks at theoretical framework and the conceptual framework of the study. It further looks at the operational variables that will be used in the study.

2.2 The System Software and Project Performance

The nature of information systems has changed considerably during the last decade; they are, still developing from single-user/single-project management systems to complex, distributed, multi-functional systems that no longer only cover project planning (scheduling and resource management) (Ahleman 2006). Interdependence between information technologies and project management has reached its highest level since many years. It is perceptible in the increase number of project management packages and the adoption of various management solutions such as Executive Support Systems (ESS), Decision Support Systems (DSS), Knowledge Management System (KMS), Management Information Systems (MIS), Supply Chain Management (SCM), Business Intelligent Systems (BIS), virtual reality (VR), and risk management (RM) tools.

A number of business and technical forces are changing the fundamentals of project management. First, advanced Information and Communication Technologies (ICT) enable cooperation in a distributed mode. Technologies like groupware and video conferencing are increasingly becoming feasible for organizations to use in international projects (Manheim, 1993). Second, globalization of markets and competition necessitate integration of global managerial and business processes in corporations (Nohria, 1997). This corporate integration is achieved by people working from geographically distributed sites in a given project (Hamlin 1994). Corporations expect organizational teams to cooperate on an international scale, dealing with business problems with a global impact. Third, organizations are increasingly adopting a strategy of global sourcing, not only in innovative sectors like microelectronics and the semi-conductor industry, but also in the area of financial and business services as well as manufacturing and engineering operations. As these strategies require intensive cooperation between the organizations involved in these exchanges, projects including professionals from multiple organizations will occur (Bergestrom, 1996).

Fourth, cooperation from distributed sites around the world enables organizations to benefit from differences of time zones between locations. Improvement of project cycle time becomes feasible in such a distributed environment. Fifth, multinationals increasingly organize their Research and Development (R&D) activities around globally distributed centers of excellence (Chiesa, 1995 & Kuemmerle, 1997). Coordination of activities between these centers and integration with business operations require close cooperation of professionals. Thus, multinational organizations tap into local sources of competence and leverage this knowledge on a global scale (Grant, 1996). Globally distributed projects enable realization of these benefits and increase corporate performance. The confluence of these trends has given rise to new forms of organizations which, enabled by advanced Information Communication Technology (ICT), are labeled `virtual organizations' (Ciborra, 1996 & Fulk, 1995).

Project Management Information System in construction can be largely categorized into three types of information systems: those that are self-developed and used in construction firms; systems based on a widely distributed application service provider (ASP); and specialized systems used in specific capital projects (Moon, 2003). The architectural, engineering, and construction (AEC) industry is characterized by fragmentation which exists both within individual phases as well as across project phases (Howard et.al., 1989). Because of this fragmentation, participants from various organizations who are involved in a project phase or in different project phases are facing ineffectiveness and inefficiency in their coordination, collaboration and communication processes. As a tool to reduce the problems generated by this fragmentation, Information Technology (IT) is routinely and extensively used in the construction industry (Nitithamyong *et.al*, 2004). Powerful project management software has become a prerequisite to manage the projects more efficiently and effectively, and aid the project managers in their decision-making (Havelka *et.al*, 2006). The advantage of an information system is that it helps to promote productivity by effectively processing and providing necessary information to an organization and supporting their efficient work performance.

The importance of information has been emphasized for enhancing communication, and the efficient management of construction information has been emerging as an element that determines the success of a project that involves many stakeholders (Lee *et.al*, 2010). Thus, in construction projects, various types of IS, such as construction management or business

software, have been developed, applied, and widely used in the Korean construction industry, in particular, project management information system is extensively utilized due to its numerous advantages (Yoon *et.al*. 2006) .

The information requirements for all stakeholders drive the design and development of the Project Management Information System's contents and requirements. The project manager and project team will be the primary users of the system, but it will need to consider stakeholders such as senior management, customers, and functional managers. It provides the framework for collecting information needed to manage the project (plan, organize, evaluate, and control the use of resources on the project), organizing project background information and interface with larger organizational information systems to permit smooth, efficient interchange of information in support of organizational and project objectives and goals, storing and processing project information (Thomsen 2011).

An important purpose also served by a Project Management Information System is that it can track at the work package level early identification of schedule slippage or significant cost overruns on detailed work areas. Early identification of small problems permits the attention to detail before there are major impacts on higher-order work. This is especially important on large projects or projects that have a very rigorous schedule to meet the enterprise's or customer's goals. The system in place should be prospective and capable of providing intelligence on both the current and probable future progress and status of the project (Thomsen 2011). An effective system provides the information that demonstrates when the project is on track or when it has exceeded the allowable limits of performance, hence it should be able to track the progress of: Tasks, Durations, Costs, committed or spend, and Resources.

PERT analysis allows the user to see the effects of various scenarios in a project to aid project managers in their decision making process. Clements (2006) states that conducting a PERT analysis without the Project Management Information System software is extremely time-consuming. The system helps the project manager to prepare and plan for certain contingencies and to assess consequences (Clements, 2006).

2.2.1 Project Management Information System

In the project management literature, the definition of project has been discussed by numerous literatures, for instance, PMI (2000) define projects as 'a temporary (definitive

beginning and definitive end) endeavor undertaken to create a unique (projects involve doing something that has not been done before) product or service'. (Cleland, 2004) describe a project as "a combination of organizational resources pulled together to create something that did not previously exist and that will provide a performance capability in the design and execution of organizational strategies". Some authors describe Project Management tool as "software for project management" (Fox, Murray *et al*., 2003), while others view them as "systematic procedures or practices that project managers use for producing specific project management deliverables" (Milosevic, 2003). Thus the core of a Project Management Information System is usually project management software which involves wide alteration, configuration or customization before to its applied. Besner, (2009) declared that projects nowadays are most often used in information technology (IT), software development, business process reorganization and research and development.

Essentially, the task of Project Management Information System has been described as "subservient to the attainment of project goals and the implementation of project strategies", it supplies project managers with "essential information on the cost, time performance parameters of a project and on the interrelationship of these parameters" (Raymond L., 1987). In the information technology (IT) industry, Gartner Research estimates that 75% of large IT projects managed with the support of a project management information systems will succeed, while 75% of projects without such support projects will fail (Light, *et.al*., 2005). However, literature still shows only a small number of researches on the utilization of Project Management Information System that highlight the demographics of project management tools and to assessing particular functions of these tools to maintain a particular tasks during project management life cycle such as planning, communicating and reporting, managing risks, scheduling, estimating costs, and managing documents (Herroelen, 2005; Love and Irani 2003).

Information systems are developed using Information technology to assist people in performing their tasks. Project Management Information System is an example of these Information Systems and are widely regarded as an important building block in project management. These systems have continued to evolve from just being planning, scheduling and resource management information systems to complex, distributed, multi-functional systems that can easily generate information necessary to make decisions, improve the efficiency of implementation among other functions within the project life cycle. What sets

Project Management Information System apart from other classes of information system is the highly volatile nature of their usage context i.e. project environments, and as such they need to be more customizable in their functionality than most other enterprise information systems (Ali *et al*., 2008).

Notwithstanding the theoretical and practical importance of Project Management Information System to the project management field, there have been as of yet few studies on the actual use and impacts of these systems, thus highlighting the need to extend project management theory in relation to the developing practice in this regard. Empirical studies of Project Management Information System have been mostly limited to describing the demographics of project management software usage and to evaluating specific applications of these systems or software modules to support project management tasks such as planning, communicating and reporting, managing risks, scheduling, estimating costs, and managing documents.

Project management software usage has also been found to have many drawbacks and limitations, both in theory when compared to an ideal Project Management Information System by researchers and in practice as perceived by project managers. An IS-based conceptualization and definition of project management software facilitates the import of knowledge from the IS field or discipline, knowledge that can provide a deeper understanding of the Project Management Information System usage phenomenon and help in answering questions on the factors that explain the use and non-use of Project Management Information System, and on the actual impacts of these systems on project managers and project performance.

2.3 Quality of Information and Project Performance

The quality of information that has been used to make decision among other things in a project can greatly affect the outcome of the project; if wrong/ inadequate information is generated it will lead to wrong decisions being made and consequently negatively affect the outcome of the project. Project Management Information System should provide project team members with useful information that can be used in decision making by storing, keeping, processing and managing the information resources (Lee *et al*. 2011). According to Swanson (1974, cited in Lee *et al*., 2011) the quality of information generated by the Project Management Information System determines the quality of the system itself. Zmud (1979,

cited in Lee *et al*., 2011) insists that accuracy and timeliness of the information are critical determinants of information quality.

Kim (2007, cited in Lee *et al*., 2011) concludes important factors that determine the quality of information include ability to understand, accuracy, availability, precise, currency, conciseness, consistency, interpretation and fidelity. Managers can be overwhelmed by the amount of information available for decision making which may lead to them being unaware of inaccuracies or losing sight of relevant information thus leading to poor decision making. The use of Project Management Information System is advantageous since it provides relevant and correct information that may be required in the day to day running of a project.

Information provides the intelligence for managing a project. Information must be processed so that decisions can be made and executed with a high degree of assurance so that the results will contribute to the project's performance. In the project planning role, information provides the basis for generating project action plans, schedules, network diagrams, projections, and other elements of planning. Information is essential to promote understanding; establish project objectives, goals, and strategies; develop mechanisms for controls; communicate status; forecast future performance and resources; recognize changes; and reinforce project strategies. Matthew argues the project planning function establishes a structure and a methodology for managing the information resources, which encompass defining, structuring, and organizing project information, anticipating its flow, reviewing information quality, controlling its use and source, and providing a focal point for the project's information policies (Matthews 2004).

2.4 The Project Management Information System user and Project Performance

User satisfaction is "the result of the individual taking outcomes that have been received and evaluating them on a pleasant-unpleasant continuum" (Seddon & Kiew, 1994). As already mentioned earlier relevance, accuracy, availability, reliability, consistency and timeliness are factors related to information quality (DeLone & McLean, 2003; Raymond &Bergeron, 2008; Seddon & Kiew, 1994). Ali & Money (2005) found several studies that used these factors to measure the degree of user satisfaction with a given system's performance and concluded that the information quality has the greatest total effect on the use of project management software. This suggests that project managers are more eager to accept Project Management Information System on the basis of the quality of the information output and that they are more likely to use software that provides them with an appropriate level of details that fits

their work needs, is free of complexity, and is easy to understand and communicate with the project team.

Seddon & Kiew (1994) also found indications in literature that information quality is an important determinant of satisfaction. According to (Raymond & Bergeron, 2008) quality of information output has a positive impact on the project manager, since the project manager will feel more professional at work if he or she has access to project information of high quality and uses the system more intensively and more extensively. Further, user satisfaction is not restricted to individual satisfaction but positively affects the intention of Project Management Information System use, through which PMIS use is expanded and sharing of information is facilitated within an organization; user satisfaction acts as a premise for efficient and effective construction management.

DeLone and McLean (2003) showed that user satisfaction is one of the most widely used success measures of an information system's success. One of the major purposes of Project Management Information System is the smooth sharing of information among project stakeholders and therefore, when the use of the system is expanded among them, and not restricted to individual users, the effects become greater. In other words, positive effects of improved quality of Project Management Information System should lead to intention of use, not limited to satisfaction with its use, thereby expanding its use; then, smooth information sharing and systematic information management would be enabled, thereby enhancing efficient and effective construction management. Behavioral intention is a measure of the strength of one's intention to perform a specified behavior (Fishbein, 1975).

Studies on the use of Project Management Information System in single projects show that there are several important factors that drive project managers to use Project Management Information System. First, whether or not project managers will use Project Management Information System strongly depends on the quality of the information generated by the Project Management Information System. Second, project managers are more eager to use an information system if it provides them with the appropriate level of details in relation to their need in work. Third, it is important that the generated information is free of complexity, easy to understand and easy for project managers to communicate with the project team(s). Fourth, when project managers have to deal with large and complex projects they tend to use Project Management Information System to make it easier to cope with the difficulty in work and control of project progress (Ali & Money, 2005). Project managers who deal with less

complex projects may not be willing to use PMIS because the time they have to invest in keeping the system up to date may exceed the benefits gained from utilizing the system (Bendoly & Swink, 2007).

2.5 Project Management Information System use and Project Performance

Caldwell suggests that a Project Management Information System does not necessarily mean a state-of-the-art technology tool that provides features for every project because every project has different information needs both in quality and in quantity. Every project requires different levels of technologies to satisfy its basic information management needs, a small project with small needs will suffice with simple technologies, but large projects with large information needs can benefit from more extensive technological solutions (Caldwell 2004). It is very advantageous to use a specialized Project Management Information System for it provides the project team and manager to use to correct amount and thus quality information. Figure 1 below illustrates how the four levels help define the technology required based on the information requirements of a project.

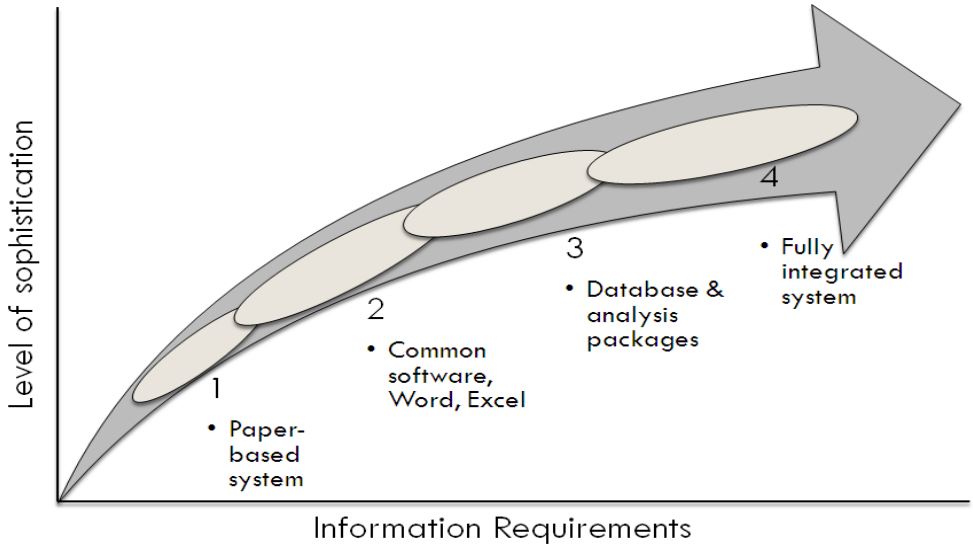

Figure 1: PMIS Levels of Technology (Caldwell 2004)

The ovals 1-4 represent the four levels progressively from low sophistication (level 1) to the higher level of sophistication (level 4). The overlapping ovals denote the occurrence of simultaneous characteristics among two levels. The upward-slanting arrow (from left to right) - represents the rising technical and resource requirements for setting up an increasingly automated information system and the ever greater complexity of the system itself as a project shifts from level 1 toward level 4. This classification of levels is for guiding projects in assessing their location on the range of lower to more sophisticated information systems.

During the life of a project the levels may alter, while on the other hand, a project manager with several projects, programs, and sectors may have each one at a different location on the range (Caldwell 2004). A project needs to determine its information requirements and match it with the appropriate technology.

The use of Project Management Information System in this study were measured by determining extent to which planning, monitoring, controlling, evaluating and reporting function tools were used by the project managers.

One of the major purposes of Project Management Information System is the smooth sharing of information among project stakeholders and therefore, when the use of Project Management Information System is expanded among them, and not restricted to individual users, the effects become greater. In other words, positive effects of improved quality of Project Management Information System should lead to intention of use, not limited to satisfaction with its use, thereby expanding its use; then, smooth information sharing and systematic information management would be enabled, thereby enhancing efficient and effective construction management (Caruan, 2002).

2.6 Theoretical framework

This study is based on the concept of information system (IS) success which is widely accepted for the evaluation of information systems (Yuan et.al, 2006). In management information systems (MIS) scholarship, a wide range of research has proposed IS success models (Delone et.al, 1992 and Raymond et.al, 2008). Various studies have been carried out in which the success factors of the models are applied to the evaluation of IS success or performance.

2.6.1 DeLone and McLean Information Success Model (ISSM) (1992)

DeLone and McLean (1992), introduced the first IS success model which was based on Shannon and Weaver's (1949) theory of communication. DeLone and McLean's model present different features differentiated by the two essential concepts: system quality and information quality. The utilizing of the system has a clear impact on the way individuals accomplish their performance. This impact may eventually effect on the organizational performance. It was among the first studies to impose some order in IS researchers' choices of success measures (Seddon et al. 1999). The model is based on theoretical and empirical research conducted by a number of researchers in the 1970's and 1980's. To construct the

model, DeLone and McLean reviewed 100 papers containing empirical IS success measures published in seven publications during 1981-1987. They distilled the resulting huge range of Information system success measures into an integrated view of IS success, represented by the following the six dimensions: System Quality, Information Quality, Information Use, User Satisfaction, Individual Impact and Organizational Impact.

While the model integrates the comprehensive dependent variables used by IS researchers, it received several criticisms. Ten years later, DeLone and McLean presented an updated model reflecting the criticisms by other researchers and the situation at the time. As the service concept was added to IT with the use of the Internet, they increased the number of information system success factors to seven, including service quality, and analyzed the interdependence and correlation of these seven factors. Figure 2 represents the updated ISSM model of Delone and McLean (2003)

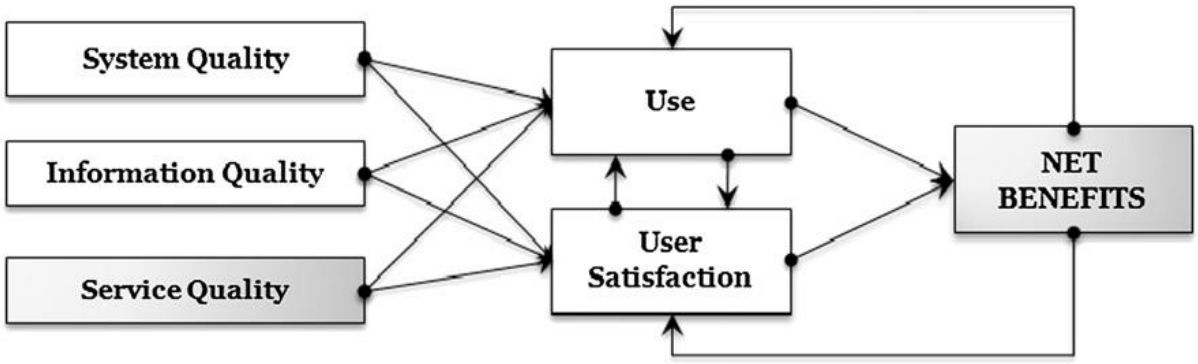

Figure 2: The Updated Information System Success Model (ISSM) (DeLone, McLean 2003)

2.6.2 Technology acceptance model (TAM) (Davis et al, 1989)

Several studies of IS success models in the field of construction have been carried out the technology acceptance model (TAM), (Chung *et al*, 2009) attempted to determine the elements of the success or failure of the introduction of enterprise resource planning (ERP) systems that are widely utilized in construction enterprises with the purpose of contributing to assessing, planning, and conducting a project for introducing and establishing an ERP in an enterprise. In the research, the success factors of the ERP system are divided into two categories; the first category is user-related variables, including output, job relevance, image and result, demonstrability, compatibility, and system reliability. The second category is project-related variables, including internal support, function, and consultant support. It can

be said that this research has a high level of completion in that it suggested a success model for construction ERP systems through extensive data collection and empirical analysis. Nevertheless, the success model suggested has limitations in its application to other types of IS because it was verified by focusing on ERP systems. Hjelt (2007) analyzed factors related to end-users' attitudes toward Electronic Document Management (EDM) systems that are used for large-scale construction projects. The research conducted a survey to draw factors that affect acceptance of an EDM system to a construction project. Schematics of TAM is presented in figure 3 below.

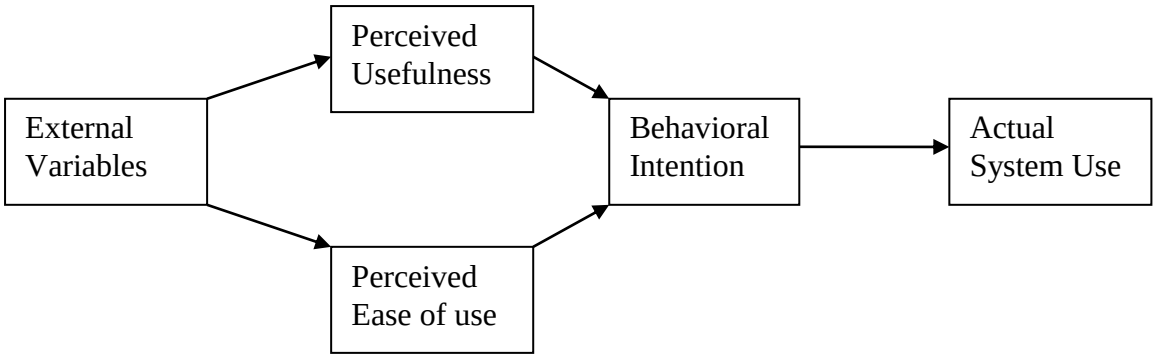

Figure 3: Technology Acceptance Model (TAM) (Davis, Bagozzis and Warshaw 1989)

This study was thus founded on the recurrent constructs of antecedents and consequences of IS use developed in DeLone and McLean's IS success model (ISSM) (1992), later updated (2003), and in Davis et al.'s (1989) technology acceptance model (TAM). The ISSM incorporates information quality and system quality as antecedents of IS use, leading to individual IS impacts, that is, on users and their work (e.g., in regard to their effectiveness), and in turn to organizational impacts (e.g., in regard to business strategy and performance) (Raymond, Bergeron 2007). While the TAM explains IS use in a similar manner by the system's perceived usefulness and perceived ease of use. Both the ISSM and the TAM offer widely accepted and validated representations and explanations of the IS use phenomenon. This is supported by studies done by Larsen, Lee and Rai (Larsen 2003, Lee, Kozar & Larsen 2003, Rai, Lang & Welker 2002).

2.7 Conceptual Framework

The interrelationship of the various variables were conceptualized in figure 4 below.

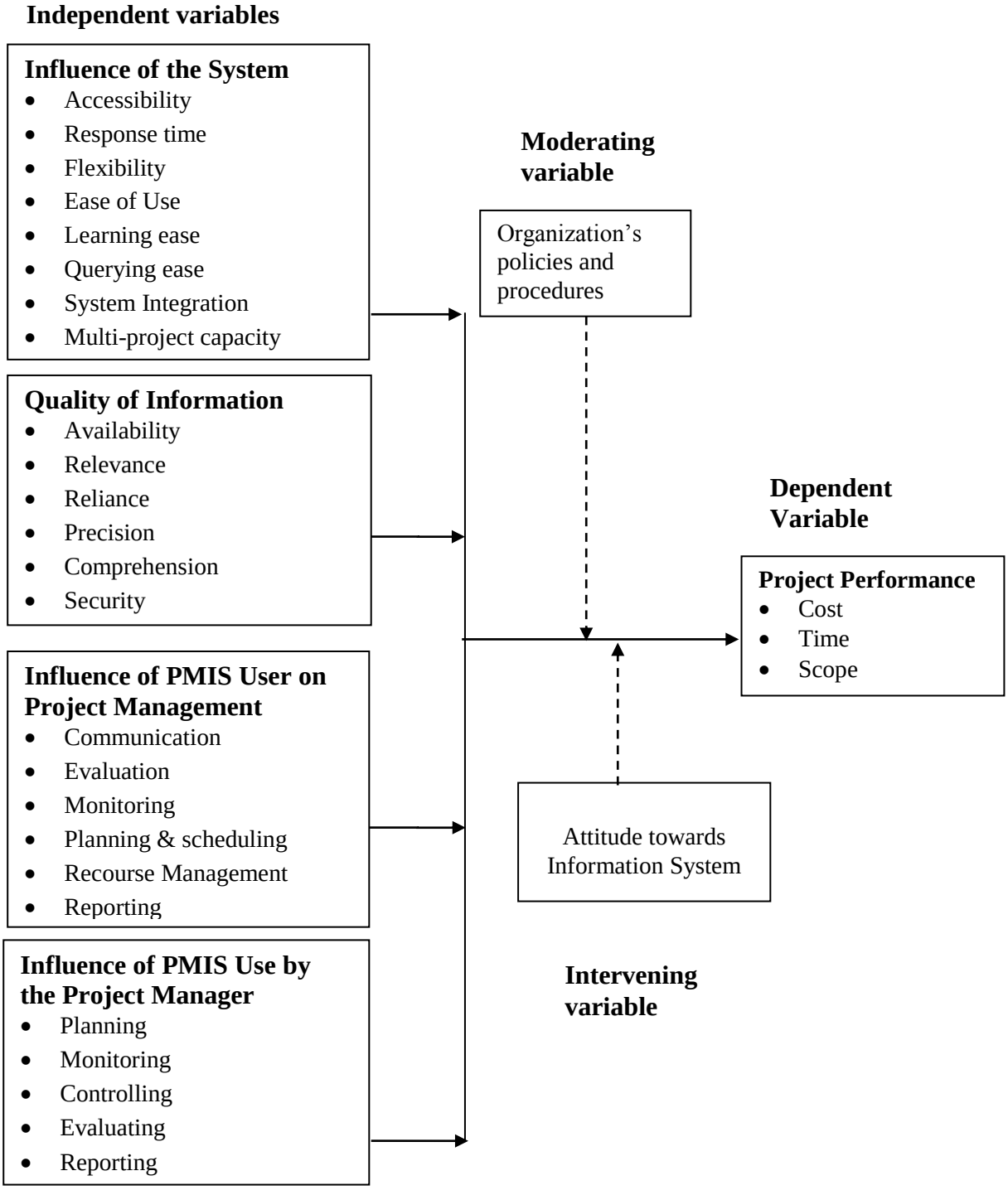

Figure 4: Conceptual Framework

The conceptual framework has four independent variables and one dependent variable. The independent variables identified for the study were: the System, quality of information, the

System User, and the System Use in Project management information system. The project performance which is the dependent variable was assessed on whether the project is completed within the set time, budget and within the specified specification of the projects. The ability of the project to perform is also linked to a large extent on an Organization's policies and procedures (moderating variable). The performance of project tasks with regards to cost, time and quality by utilizing the of Project management information system will also be affected by the project manager's attitude towards Information technology to aid in decision making and managing the project (intervening Variable).

2.8 Knowledge Gap

Table 2-1: Knowledge Gap

Variable	Author(s)	Key Findings	Knowledge Gap
Project Performance	Baccarini, D 1999	Came up with the concept that project success, is equal to project management success and project Product success. Dimensions such as the quality of the project management process and the satisfaction of the project stakeholder's expectations also need to be considered to measure project success	He did not focus on the construction sector and thus need for further research.
Information Quality	Wilcox, M, and Bourne, M. (2002)	All decision making in a system is about the future, therefore if we are to use data to improve decision making we need to build a model that provides some predictive support. It is insufficient for data to merely contribute to an understanding of current	Investigating the influence of quality information in provision of predictive management capabilities in the construction sector, hence need for further research.

		performance; it must also allow the development of predictive management capabilities.	
The System User	B.Y. Chung, M.J. Skibniewski, H.C. Lucas, Y.H. Kwak, 2008	Suggested a success model for construction ERP systems through extensive data collection and empirical analysis. However, they Analyzed factors related to end-users' attitudes toward Electronic Document Management (EDM) systems that are used for large-scale construction projects.	They focused on large-scale construction projects.
The System Use	Raymond, L. & Bergeron, F. (2007).	Use of Project Management Information Systems (PMIS) is considered to be advantageous to project managers because of the supposed contribution regarding timelier decision making and project success	Investigating the influence of project management information system use in timelier decision in performance of construction projects

2.9 Summary of Chapter two

Essentially, the task of Project Management Information System has been described as "subservient to the attainment of project goals and the implementation of project strategies", it supplies project managers with "essential information on the cost, time performance parameters of a project and on the interrelationship of these parameters" (Raymond L., 1987). In the information technology (IT) industry, Gartner Research estimates that 75% of large IT projects managed with the support of a project management information systems will

succeed, while 75% of projects without such support projects will fail (Light M., *et.al*., 2005).

Project Management Information System in construction can be largely categorized into three types of information systems: those that are self-developed and used in construction firms; systems based on a widely distributed application service provider (ASP); and specialized systems used in specific capital projects (Moon, 2003). The architectural, engineering, and construction (AEC) industry is characterized by fragmentation which exists both within individual phases as well as across project phases (Howard et.al., 1989). Because of this fragmentation, participants from various organizations who are involved in a project phase or in different project phases are facing ineffectiveness and inefficiency in their coordination, collaboration and communication processes. As a tool to reduce the problems generated by this fragmentation, Information Technology (IT) is routinely and extensively used in the construction industry (Nitithamyong *et.al*, 2004). Powerful project management software has become a prerequisite to manage the projects more efficiently and effectively, and aid the project managers in their decision-making (Havelka *et.al*, 2006).

One of the major purposes of Project Management Information System is the smooth sharing of information among project stakeholders and therefore, when the use of Project Management Information System is expanded among them, and not restricted to individual users, the effects become greater. In other words, positive effects of improved quality of Project Management Information System should lead to intention of use, not limited to satisfaction with its use, thereby expanding its use; then, smooth information sharing and systematic information management would be enabled, thereby enhancing efficient and effective construction management (Caruan, 2002).

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The chapter describes the methodology that was adopted in the study. It describes the research design, target population, sample size and sampling techniques, data collection instrument, piloting, validity and reliability of the instrument, data collection procedure and data analysis techniques that were used.

3.2 Research Design

The research used descriptive survey design. This is because descriptive research does not involve modifying the situation under study or determining the cause-effect relationship. It also enabled the researcher to obtain the opinions of project managers involved in construction projects in their natural setting. This design is also useful in management decision making. It involves acquiring information about a certain segment of the population and getting information on their characteristics, opinions or attitudes (Orodho, 2003). Churchill and Brown (2004) also observe that descriptive research design is appropriate where the study seeks to describe the characteristics of certain groups, estimate the proportion of people who have certain characteristics and make predictions.

3.3 Target population

The target population for the study was 98 construction firms. The study population included project managers, construction managers and project supervisors working on construction project management firms based in Nairobi, Kenya.

3.4 Sampling and sampling procedures

Churchill and Brown (2004) noted that the correct sample size in a study is dependent on factors such as the nature of the population to be studied, the purpose of the study, the number of variables in the study, the type of research design, the method of data analysis and the size of the accessible population. Cooper & Schindler (2003) define sampling as selecting a given number of subjects from a defined population as representative of that population. This defined population is referred to as a sampling frame. Generally, sample sizes larger than 30 and less than 500 are appropriate for most research.

3.4.1 Sample Size

The sample size for this study was 80 respondents. The sample size was derived from the Krejcie and Morgan Table attached in appendix III which shows that a target population of 98 should have a sample size of 80 respondents.

Table 3-1: Sampling Frame

Constituency	Target Population	Sample size
Westlands	35	29
Langata	15	12
Ruaraka	12	10
Embakasi East	20	16
Makadara	16	13
Total	**98**	**80**

3.4.2 Sampling Procedure

Purposive sampling was used to select the sample from target the population. Expert judgment and knowledge of roles in the organization was used to select participants that are a representative of the population.

3.5 Data collection Instruments

Questionnaires were used to collect information from the selected construction project managers. A Likert scale was used in the questionnaire to measure attitudes presented by the respondents as recommended by Babbie (2011). The questionnaires were self-administered by use of two trained research assistants and the researcher. The questionnaire was divided into two sections: Section one collected the demographic characteristics of the target population i.e. the age, gender, level of education etc., while section two was divided into five parts based on the themes of study; part A the PMIS system was measured with eight items: accessibility, response time, and flexibility, ease of use, querying ease, learning ease, systems integration and multi-project capability. Each of items will be measured on a five-point scale varying from 1 (low quality) to 5 (high quality).

Part B information quality was measured with six items: availability, relevance, reliability, precision, comprehensiveness, and security. Each of these items was measured on a five-point scale varying from 1 (low quality) to 5 (high quality). Part C PMIS use was measured

by ascertaining the extent to which various system functions and their associated tools was actually used by project managers. The PMIS functions was divided into five categories. The planning function tools aim at preparing the overall project plan, the monitoring function tools are used to regularly assess project progress, the controlling function tools are used to make specific changes to the project, the evaluating function tools are targeted toward project auditing and the reporting function tools which give information on the most basic aspects of the project. A score for each category was obtained by averaging the project managers' use of specific tools. Five-point scales was be employed: 1 (never used), 2 (rarely used), 3 (occasionally used), 4 (often used), and 5 (very often used).

Part D impacts on the PMIS user was measured by the perceived effect of the PMIS on the following 10 items: improvement of productivity at work, increase in the quality of decisions, reduction of the time required for decision making, reduction of the time required to complete a task, improved control of activity costs, better management of budgets, improved planning of activities, better monitoring of activities, more efficient resource allocation, and better monitoring of the project schedule. A five-point Likert scale was used, varying from 1 (completely disagree) to 5 (completely agree). Part E impacts of the PMIS on project performance was based on the perceived contribution of the PMIS with regard to three performance criteria: respecting deadlines, respecting budgets, and respecting quality specifications, using a five-point scale varying from 1 (null contribution) to 5 (very high contribution).

3.5.1 Pilot testing the Instrument

10% of target population was selected to test the reliability of the research instruments. Cronbach's Alpha was used to test the internal consistency of the questionnaires. In the pilot test five constructs of the questionnaire were studied.

3.5.2 Instrument Validity

The content validity of the questionnaire was established by the researcher by seeking the opinions of experts in the field of study especially the University of Nairobi lecturers in the department of Extra Mural Studies. Validity relates to the extent to which the research data and the methods for obtaining the data are accurate, honest and on target (Denscombe 2003). Before using a research instrument it is important to ensure that it has some validity.

3.5.3 Instrument Reliability

Cronbach's alpha test was used to check the reliability of the instrument, it is based on internal consistency of the research instruments. Cronbach's Alpha was established for five the themes in the questionnaire, which formed a scale in order to test the reliability of the questionnaires.

Table 3-2: Cronbach's Alpha Values

Variable	Cronbach's Alpha	N of Items
PMIS software	.985	8
Quality of Information	.985	6
PMIS use	.992	24
PMIS user	.933	10
Project Performance	.897	3

From the findings, 'project management information system' was found to have an Alpha value of 0.985. Further, the construct 'quality of information' was found to have an Alpha value of 0.985. In addition, 'project management information system use' construct had an Alpha value of 0.992, 'project management information system user' had an Alpha value of 0.933 and project performance had an alpha value of 0.897. A co-efficient of 0.6 and above is a commonly accepted rule of thumb that indicates acceptable reliability, (Churchill and Brown 2004), and this threshold of Alpha value 0.6 formed the study's benchmark. The findings show that the research instrument used was reliable.

3.6 Data collection procedure

The questionnaires were self-administered by use of two trained research assistants and the researcher. Self-administered questionnaire enabled one to clarify the questions and probe for more answers. This makes it clear and yielded relevant responses. To increase the response rate, a letter of introduction was attached to all the questionnaires to assure the respondents of their confidentiality.

3.7 Method of Data Analysis

The Statistical Package for Social Sciences (SPSS) version 20 was used in the analysis. After data collection, the data was organized and edited to remove any inconsistencies, repetitions or errors that made analysis difficult. The cleaned data collected was analysed using both quantitative and qualitative methods. The quantitative data was be coded this enabled the

responses to be grouped into various categories. Qualitative data are based on meaning expressed through words. It involves the collection of non-standardized data that require classification and are analysed through use of conceptualization. Conceptual content analysis involved development of data categories, allocating units of data and recognizing relationships within and between categories of data to produce well-grounded conclusions. The data was analysed in the most logical and meaningful way and relevant comments made appropriately.

Descriptive statistics such as mean, standard deviation and frequency distribution were used to analyse the data. Frequency tables were used to present the data collected for ease of understanding and analysis. Karl Pearson's Product moment correlation was conducted to determine the relationship between the independent variables: the system, quality of information, the system user and the system use against the dependent variable of Project performance. Correlation was established using the Karl Pearson's coefficient of correlation.

3.8 Operational Definition of Variables

Table 3-3: Operational Definition of Variables

Variable	**Indicator**	**Measurement scale**	**Data Collection Methods**	**Tools of Analysis**	**Data analysis**
Project Management System Software and Project performance	Accessibility Response time Flexibility Ease of Use Learning Ease System Integration Multi-project Capability	Nominal	Questionnaire	Mean Range Std. Deviation Correlation	Correlation

Variable	**Indicator**	**Measurement scale**	**Data Collection Methods**	**Tools of Analysis**	**Data analysis**
Quality information and Project Performance	Availability Relevance Reliability Precision Comprehensiveness Security	Nominal	Questionnaire	Mean Range Std. Deviation Correlation	Correlation
Project Management Information System user Project Performance	Improved work productivity. Reduced time in decision making. Reduced time in task completion. Improved control of activity costs. Better management of Budgets. Better Monitoring of activities Efficient resource allocation Better Monitoring of project schedule.	Nominal	Questionnaire	Mean Range Std. Deviation Correlation	Correlation

Variable	Indicator	Measurement scale	Data Collection Methods	Tools of Analysis	Data analysis
Project Management Information System use Project Performance.	Preparing the overall project plan by use of the following planning tools WBS, Gantt charts, PERT, and CPM. Better Monitoring of activities using monitoring function tools. Making changes as the project is on-going using the controlling function tools. Utilizing evaluating function tools during project auditing.	Nominal	Questionnaire	Mean Range Std. Deviation Correlation	Correlation
Project Performance	Respecting deadlines Respecting budgets Respecting scope of work	Nominal	Questionnaire	Mean Range Std. Deviation Correlation	Correlation

3.9 Ethical Considerations

The researcher ensured that proper authority was sought from the relevant authorities before commencement of the study. The researcher also ensured the respondents who participated in the research with the full knowledge of what their participation involved. During fieldwork, the respondents were enlightened on the purpose, duration and potential use of the research

results would not be beyond academic purposes; any other research related information as might be of interest to the respondents were clarified before any data was collected. The respondents were also informed that no piece of information gathered in the course of the study will be used to jeopardize their welfare. They were also assured of their anonymity during publication of the research findings.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter covers the presentation and interpretation of the findings. The purpose of this study was to establish the influence of Project Management Information System on performance of projects in the construction industry a case of Nairobi County, Kenya. Additionally, the study further sought to determine the influence of Project Management Information System software, quality information, Project Management Information System user and Project Management Information System use on performance of construction projects. The findings are presented in tables.

4.2 Questionnaire Response Rate

This study had a sample of 80 respondents whereby only 61 responses were obtained. This represents a response rate of 76.25%. According to Babbie (2002) any response of 50% and above is adequate for analysis thus 76.25% is even better.

4.3 Demographic Characteristics of Respondents

The study sought to establish the background information of the respondents which includes the respondents' gender, age bracket, level of education, function and their role in the project.

4.3.1 Gender Distribution of Respondents

The study sought to find out the gender of the respondents. The findings obtained are as shown in below.

Table 4-1: Distribution of Respondents by Gender

	Frequency	Per cent
Male	36	59.0
Female	25	41.0
Total	**61**	**100**

As shown on table 4.1 majority (59.0%) of the respondents were male while females contributed to 41.0% of the respondents. This is a very good representation of gender and shows that both genders are well represented. At least 2/3 majority of either gender indicates

that there is gender equity and that there is no discrimination in terms of gender. These findings also indicate that most project managers were male.

4.3.2 Age Brackets of the respondents

The study also sought to establish the age bracket of the respondents. Age bracket was important in order to know which age bracket formed the majority of those who utilised the system in project management. The findings were as shown in the table below.

Table 4-2: Distribution of Respondents by Age

	Frequency	Per cent
21-30 years	20	32.7
31-40 years	25	41.1
41-50 years	12	19.7
Above 50 years	4	6.5
Total	**61**	**100**

From the study findings, 41.1% of the respondents were aged between 31-40 years, 32.7% were aged between 21-30 years, 19.7% were aged between 41-50 years, and 6.5% were aged above 60 years. From these findings, it can be deduced that most of the project managers were aged between 31 and 40 years

4.3.3 Level of Education of the respondents

The study also sought to establish the respondents' highest level of education. The level of education was important in order to determine the capability of the respondents to utilise Project Management information system.

Table 4-3: Distribution of Respondents by their highest level of education

	Frequency	Per cent
Undergraduate	20	32.8
Master's Degree	22	36.1
Diploma	15	24.6
Others	4	6.6
Total	**67**	**100**

From the findings in table 4.3, 32.8% of the respondents indicated that their level of education was masters, 32.8% indicated it was undergraduate, 24.6% indicated it was a diploma whereas 6.6% indicated other levels. These findings show that most of the project managers had master's degree as their highest level of education.

4.3.4 Project Management Experience

The respondents were requested to indicate their experience in project management. The researcher obtained the following results.

Table 4-4: Distribution of Respondents by their Project Management Experience

	Frequency	Percent
More than 30 years	5	8.2
20 -30 years	17	27.9
10 -20 years	20	32.8
Less than 10 years	19	31.1
Total	**61**	**100.0**

From the findings, 32.8% of the respondents indicated that they had an experience of between 10 and 20 years in project management, 31.1% indicated that they had less than an experience of less than 10 years, 27.9% indicated that they had an experience of between 20 and 30 years while 8.2% indicated that they had an experience of more than 30 years. These findings show that most the project managers had an experience of between 20 and 30 years in project management.

4.4 Project Management Information System

The study sought to determine the influence of Project Management Information System software on the performance of construction project. The respondents were requested to rate various aspects of general performance of Project Management Information System in their organization. The results are shown in table 4.5 below.

Table 4-5: Project Management Information System Software

	Range	Mean	Std. Deviation
Accessibility	3.00	3.245	.869
Response Time	3.00	3.032	.893
Flexibility	3.00	3.262	.911
Ease of use	3.00	3.114	1.050
Querying Ease	3.00	3.114	.984
Learning Ease	3.00	3.557	1.057
System Integration	3.00	3.623	1.002
Multi-project Capability	3.00	3.475	1.177

According to the findings, the respondents rated systems integration in their organization as high as shown by a mean of 3.623 and a standard deviation of 1.002. The respondents also indicated with a mean of 3.557 and a standard deviation of 1.057 that the general performance of learning ease in their organization was moderate. Further, the respondents indicated with a mean of 3.475 and a standard deviation of 1.177 that the general performance of multi-project capability in their organization was moderate. Additionally, the respondents rated the general performance of flexibility in their organization as moderate as shown by a mean of 3.262 and a standard deviation of 0.911. Also, the respondents indicated with a mean of 3.2459 and a standard deviation of 0.869 that the general performance of accessibility in their organization was moderate. In addition, the general performance of ease of use was rated as moderate as indicated by a mean of 3.114 and a standard deviation of 1.050. As well, the respondents indicated with a mean of 3.114 and a standard deviation of 0.984 that the general performance of querying ease was moderate and the general performance of response time was moderate as shown by a mean of 3.032 and a standard deviation of 0.893 that.

4.5 Quality of Information

The study sought to establish the influence of quality information on the performance of construction project. The respondents were further asked to rate the impact of various aspects of quality of information produced by Project Management Information System in project implementation in their organizations. The findings are shown in table 4.6 below.

Table 4-6: Quality of Information

	Range	Mean	Std. Deviation
Availability	3.00	4.032	.937
Relevance	3.00	3.524	.976
Reliability	3.00	3.491	.905
Precision	3.00	3.442	.847
Comprehensiveness	3.00	3.770	.933
Security	3.00	3.278	.874

From the findings, the respondents indicated with a mean of 4.032 and a standard deviation of 0.937 that availability of information produced by Project Management Information System in project implementation in their organizations was very high. In addition, the respondents indicated with a mean of 3.770 and a standard deviation of 0.933 that comprehensiveness of information produced by Project Management Information System in project implementation in their organizations was high. Also, the relevance of information produced by Project Management Information System in project implementation was rated as high as shown by a mean of 3.524 and a standard deviation of 0.976.

Additionally, the respondents indicated with a mean of 3.491 and a standard deviation of 0.905 that reliability of information produced by Project Management Information System in project implementation in their organizations was moderate. Precision of information produced by Project Management Information System was also rated as moderate as shown by a mean of 3.442 and a standard deviation of 0.847. Lastly, the respondents indicated with a mean of 3.278 and a standard deviation of 0.933 that security of information produced by Project Management Information System in project implementation in their organizations was moderate.

4.6 The System User

The study sought to assess the influence Project Management Information System user on performance of construction project. The respondents were asked to indicate the extent to which they agreed that the quality of information produced by Project Management Information System in use influences Project performance in various activities highlighted. The findings are presented in table 4.7 below.

Table 4-7: The System User

	Range	Mean	Std. Deviation
Improvement of productivity of work	3.00	3.278	.819
Increase in the quality of decisions	2.00	3.278	.733
Reduction of the time required for decision making	3.00	3.196	.909
Reduction of the time required to complete a task	3.00	3.377	.83992
Improved control of activity costs	3.00	3.377	.756
Better management of budgets	3.00	3.147	.813
Improved planning of activities	3.00	3.623	.710
Better monitoring of activities	3.00	3.852	.726
More efficient resource allocation	3.00	3.541	.992
Better monitoring of the project schedule	3.00	3.688	.885

From the findings, the respondents agreed with a mean of 3.852 and a standard deviation of 0.726 that better monitoring of activities produced by project management information system in use often influences the project performance. Also, the respondents agreed with a mean of 3.688 and a standard deviation of 0.885 that better monitoring of the project schedule produced by project management information system in use often influences the project performance. The respondents also agreed with a mean of 3.623 and a standard deviation of 0.710 that improved planning of activities produced by project management information system in use often influences the Project performance. Furthermore, the respondents agreed with a mean of 3.541 and a standard deviation of 0.992 that more efficient resource allocation produced by project management information system in use often influences the project performance.

In addition, the respondents agreed with a mean of 3.377 and a standard deviation of .839 that reduction of the time required to complete a task produced by project management information system in use occasionally influences the project performance. The respondents also agreed with a mean of 3.377 and a standard deviation of 0.756 that improved control of activity costs produced by project management information system in use occasionally influences the project performance. They also agreed with a mean of 3.278 and a standard deviation of 0.819 that improvement of productivity of work produced by project management information system in use occasionally influences the project performance. In addition, the respondents agreed with a mean of 3.278 and a standard deviation of 0.733 that

the increase in the quality of decisions produced by project management information system in use occasionally influences the project performance. Further, the respondents indicated with a mean of 3.196 and a standard deviation of 0.909 that reduction of the time required for decision making produced by project management information system in use occasionally influences the project performance. Lastly, the respondents indicated with a mean of 3.147 and a standard deviation of 0.813 that better management of budgets produced by project management information system in use influences the project performance.

4.7 The System Use

The use of the Project Management Information System was measured by establishing the degree to which various system functions and their associated tools were actually used by project managers (Raymond, Bergeron 2007). The PMIS functions were divided into five categories: planning function tools, monitoring function tools, controlling function tools, evaluating function tools and reporting function tools. The results were as shown below.

4.7.1 Planning Function Tools

The respondents were asked to indicate how often various planning function tools were utilized within the Project Management Information System in project implementation in their organizations. The results are presented below.

Table 4-8: Planning Function Tools

Planning Function Tools	Range	Mean	Std. Deviation
Work Breakdown Structure	4.00	3.409	.972
Resource Estimation	3.00	3.426	.902
Overall Schedule	4.00	3.000	.894
Gantt	3.00	3.573	.717
PERT	4.00	3.377	1.011
CPM	3.00	2.688	1.026

According to the findings, the respondents indicated with a mean of 3.573 and a standard deviation of 0.717 that Gantt was often utilized in project implementation in their organizations. In addition, the respondents indicated with a mean of 3.426 and a standard deviation of 0.902 that resource estimation was occasionally utilized in project implementation in their organizations. Further, the respondents indicated with a mean of

3.409 and a standard deviation of 0.972 that work breakdown structure was occasionally utilized in project implementation in their organizations occasionally. In addition, the respondents indicate with a mean of 3.377 and a standard deviation of 1.019 that PERT was occasionally utilized in project implementation in their organizations. Additionally, the respondents indicated with a mean of 3.000 and a standard deviation of 0.894 that the overall schedule was occasionally utilized in project implementation in their organizations. Lastly, the respondents indicated with a mean of 2.688 and a standard deviation of 1.025 that CPM was occasionally utilized in project implementation in their organizations.

4.7.2 Controlling Function Tools

The respondents were asked to indicate how often various controlling function tools were utilized within the Project Management Information System in project implementation in their organizations. The results are presented below.

Table 4-9: Controlling Function Tools

	Range	Mean	Std. Deviation
Fine-Tune Forecasting	2.00	3.541	.621
Modify Tasks	2.00	2.688	.592
Reassign resources to lower the costs	4.00	2.639	1.316
Cancel tasks	3.00	2.098	1.106
Modify cost of resources	3.00	2.688	1.008

According to the findings, the respondents indicated with a mean of 3.541 and a standard deviation of 0.621 that fine-tune forecasting is often utilized in project implementation in their organizations. Further, the respondents indicated with a mean of 2.688 and a standard deviation of 0.592 that modifying tasks was occasionally utilized in project implementation in their organizations. Additionally, the respondents indicated with a mean of 2.688 and a standard deviation of 1.009 that modifying cost of resources was occasionally utilized in project implementation in their organizations.

The respondents also indicated with a mean of 2.639 and a standard deviation of 1.316 that reassigning resources to lower the costs was occasionally utilized in project implementation in their organizations. Lastly, the respondents indicated with a mean of 2.098 and a standard deviation of 1.106 that cancelling tasks was rarely utilized in project implementation in their organizations.

4.7.3 Monitoring Function Tools

The respondents were also requested to indicate how often various monitoring function tools were utilized within the Project Management Information System in project implementation in their organizations. The results are shown in table 4.10 below.

Table 4-10: Monitoring Function Tools

	Range	Mean	Std. Deviation
Project Reports	3.00	3.852	.980
Completed Tasks	4.00	3.245	1.043
Percent Project Completed	4.00	3.000	1.140
Effective Schedule	4.00	2.557	1.147
Remaining Tasks	4.00	3.442	.992
Remaining days to complete	3.00	3.573	.902

According to the findings, the respondents indicated with a mean of 3.852 and a standard deviation of 0.980 that project reports were often utilized in project implementation in their organization. Also, the respondents indicated with a mean of 3.573 and a standard deviation of 0.902 that the remaining days to complete a project were often utilized in project implementation in their organization. Also, the respondents indicated with a mean of 3.442 and a standard deviation of 0.992 that remaining tasks were occasionally utilized in project implementation in their organizations. In addition, the respondents indicated with a mean of 3.245 and a standard deviation of 1.043 that the completed tasks were occasionally utilized in project implementation in their organizations. Further, the respondents indicated with a mean of 3.000 and a standard deviation of 1.140 that percent project completed was occasionally utilized in project implementation in their organizations. Lastly, the respondents indicated with a mean of 2.557 and a standard deviation of 1.147 that effective schedule was occasionally utilized in project implementation in their organizations.

4.7.4 Evaluating Function Tools

The respondents were asked to indicate how often various evaluating function tools are utilized within the Project Management Information System in project implementation in their organizations. The results are presented in table 4.11 below.

Table 4-11: Evaluating Function Tools

	Range	Mean	Std. Deviation
Identification of costs	2.00	3.508	.595
Identification of Schedule variation	2.00	3.098	.568
Tracking the use of Resources	2.00	3.065	.853

According to the findings, the respondents indicated with a mean of 3.508 and a standard deviation of 0.595 that identification of costs was often utilized in project implementation in their organizations. In addition, the respondents indicated with a mean of 3.098 and a standard deviation of 0.568 that the identification of schedule variation was occasionally utilized in project implementation in their organizations. Lastly, the respondents indicated with a mean of 3.065 and a standard deviation 0.853 that tracking the use of resources was occasionally utilized in project implementation in their organizations.

4.7.5 Reporting Function Tools

The respondents were also asked to indicate how often various rreporting function tools are utilized within the Project Management Information System in project implementation in their organizations. The results are shown in table 4.12 below.

Table 4-12: Reporting Function Tools

	Range	Mean	Std. Deviation
Overview of the Project	3.00	3.754	.649
Overview of the work-in-progress	3.00	3.377	.819
Budget overruns	2.00	2.901	.568
Task and schedule slippage	3.00	2.672	.700

From the findings, the respondents indicated with a mean of 3.754 and a standard deviation of 0.649 that the overview of the project was often utilized in project implementation in their organizations. Additionally, the respondents indicated with a mean of 3.377 and a standard deviation of 0.819 that the overview of the work-in-progress was occasionally utilized in project implementation in their organizations. Also, the respondents indicated with a mean of 2.901 and a standard deviation of 0.568 that budget overruns were occasionally utilized in project implementation in their organizations. Lastly, the respondents indicated with a mean

of 2.672 and a standard deviation of 0.700 that the task and schedule slippage was occasionally utilized in project implementation in their organizations.

4.8 Project Performance

The respondents were asked to rate the impact of PMIS on the general project performance. The findings are shown in table 4.13 below.

Table 4-13: Impact of PMIS on Project Performance

	Range	Mean	Std. Deviation
Meeting Deadlines	3.00	3.278	.755
Respecting Budgets	1.00	2.721	.452
Meeting Quality Specification	3.00	2.639	.817

According to the findings, the respondents indicated with a mean of 3.278 and a standard deviation of 0.755 that meeting deadlines had moderate contribution on the general project performance. Also, the respondents indicated with a mean of 2.721 and a standard deviation of 0.452 that respecting budgets had moderate contribution on the general project performance. Lastly, the respondents indicated with a mean of 2.639 and a standard deviation of 0.817 that meeting quality specification had a moderate contribution as well on the general project performance.

4.9 Correlation Analysis

A correlation is a number between -1 and +1 that measures the degree of association between two variables. A positive value for the correlation implies a positive. A negative value for the correlation implies a negative or inverse association.

The data presented on the system, quality of information, project management information system user and project management information system use were computed into single variables per factor by obtaining the averages of each factor. Pearson's correlations analysis was then conducted at 99% confidence interval and 1% confidence level 2-tailed.

The table below indicates the correlation matrix between the factors (system, quality of information, PMIS user and PMIS use) and performance of construction projects.

Table 4-14: Correlation Matrix

		Project Performance	The system	Quality of Information	PMIS use	PMIS user
Project Performance	Pearson Correlation	1	.925**	.925**	.941**	.914**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	61	61	61	61	61
Project management information system	Pearson Correlation	.925**	1	.979**	.977**	.945**
	Sig. (2-tailed)	.000		.000	.000	.000
	N	61	61	61	61	61
Quality of Information	Pearson Correlation	.925**	.979**	1	.980**	.968**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	61	61	61	61	61
PMIS use	Pearson Correlation	.941**	.977**	.980**	1	.953**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	61	61	61	61	61
PMIS user	Pearson Correlation	.914**	.945**	.968**	.953**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	61	61	61	61	61
**. Correlation is significant at the 0.01 level (2-tailed).						

From the correlation analysis, the study found that there is a positive relationship between the project management information system and project performance, where the correlation coefficients was 0.925 and a p-value of 0.000. The study also found that the quality of information and project performance correlate positively with correlation coefficients of 0.925 and p-value of 0.000. The study further established that there is a positive relationship between project management information system use and project performance with a correlation coefficient of 0.941 and p-value of 0.000. Lastly, the study found that there is a positive relationship between the project management information user and project performance with a correlation coefficient of 0.914 and a p-value of 0.000.

These findings clearly shows that all the four independent variables (Project management information system, Quality of Information, PMIS use and PMIS user) had a significant influence on the dependent variable (project performance). This is because the p-value in all the relationships was 0.000 which is less than the alpha value (level of significance) 0.01.

From these findings we can infer that Project management information system and Quality of Information had the most significant influence on project performance followed by project management information system use and project management information system user.

CHAPTER FIVE

SUMMARY OF FINDINGS, DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discussion of key data findings, conclusions drawn from the findings highlighted and recommendations made. The conclusions and recommendations drawn were focused on addressing the objectives of the study.

5.2 Summary of Findings

The study sought to examine the influence of project management information system on project performance, assess the influence of quality information on performance of project, and establish the influence of the system user and system use on performance of construction projects.

5.2.1 The Project Management Information System Software

According to the findings, the respondents' systems integration had an excellent response in their organization with a mean of 3.623 and a standard deviation of 1.002. However, most of the respondents were not very confident with the ability of the system to protect the information from any kind of invasion (corruption by viruses or by hackers). On average the system was rated good. This meant that the users felt that the system played an important role in the performance of their tasks. 85% of the respondent felt that the system helped them in keeping track of information needed for monitoring the projects while 60% were able to retrieve information for a different but similar project to use it as baseline data for their projects. It was noted that the system played an important role in generating the information to be used in management of the projects.

5.2.2 Quality of Information

From the findings, the availability and relevance of the information generated by the software were the characteristics that were rated highly with means of 4.032 and 3.524 respectively. This meant that the information was readily available and was also appropriate for the task at hand. 85% of the respondents felt that the quality of the information generated was good for the management of projects while 65% said the information generated was adequate for the day to day management of the project. They also felt that with the availability of quality

information they were able to make better informed decisions as well as perform tasks in a more professional manner.

5.2.3 The System User

Form the findings the respondents agreed that their task performance had improved with the use of the system. Decision making process had improved due to the timely availability of quality information needed for making the decision. The project managers also said they were able to effectively and efficiently manage the project resources.

5.2.4 The System Use

The use of the various function tools i.e. planning, monitoring, Evaluation and reporting tools within the system had helped the managers improve on performance of their project tasks thus improving the probability of project performance.

5.3 Discussion of Findings

The objective of this research was to have a better understanding of the elements (the system software, quality of information, the system user and the system use) that contribute to the impact of a project management information system on project performance. The study results are discussed in terms of the objectives and their direct and indirect effects of project management information system on project performance.

The system software ease of use, flexibility, response time, learning ease and system integration play an important role in producing quality information, as perceived by the project manager. Indeed, the system is a strong predictor of the quality of information to be obtained. A project management information system that produces information of poor quality would be a system that is more difficult to use, less flexible, and less integrated to other organizational information systems used by the project manager and other managers or employees.

The quality of information is directly and strongly related to project management information system use and to the system's impacts on the project manager. Information quality is not an end by itself however, as it leads only indirectly to project performance. It is only through the actual use of the project management information system by – and the system's impacts on – the project manager that the quality of information can influence project performance.

Cleland agrees that the best information loses its value if it is not available to people who need it to make decisions and direct actions (Cleland, 2004b)

Better quality of information output increases the opportunity of the project management information system being used, which in turn allows the system to have a positive impact on the project manager. As such, the quality of information output by the project management information system leverages the project manager's work as a professional. Ali & Money (2005) through several studies also concluded that information quality has the greatest total effect on the use of project management software. This suggests that project managers are more eager to accept Project Management Information System on the basis of the quality of the information output and that they are more likely to use software that provides them with an appropriate level of details that fits their work needs, is free of complexity, and is easy to understand and communicate with the project team.

It was also noted that the system itself had no direct influence upon project performance; it is only through quality information, extensive use of the system, and individual impacts on the project manager that the system had an effect on project performance.

Raymond noted from his studies that among the managers who participated in the study, a number indicated strong impacts of the Project Management Information System upon the successful completion of their projects, while others did not (Raymond, Bergeron 2007). The results of this study also indicate that, in general, the low use of Project Management Information System depended upon a system of lower quality that produced lower quality information; hence they used their system less and were less supported in their project management task. Whereas project managers who used Project Management Information System use highly were those who the sufficient conditions were met, that is, system quality, information quality, project management information system use and positive impacts on managerial work.

In summary, if it is to make a significant contribution to the attainment of project objectives, i.e., to make an impact in terms of project budget, schedule, and specifications, a project management information system must first be sufficiently sophisticated and serviced to produce information of sufficient quality. It must then be used with sufficient depth and breadth by project managers and it must have a sufficiently beneficial impact on their work.

5.4 Conclusions of the Study

The research aim of this study was to determine the impacts of Project Management Information Systems upon project performance. More specifically, one objective was to determine the influence of the system on the performance of construction projects. Another objective was to establish the influence of quality information on performance of construction projects. Another objective was to assess the influence of the system user on performance of construction projects and the last objective was to assess the influence of the system use on performance of construction projects in order to get a better understanding of the contribution of these systems to the performance of projects.

Following the conclusions of previous research that project management information system success models should continue to be validated and challenged, the results of this research show that the use of a project management information system is in fact advantageous to construction project managers in Nairobi County, Kenya. Improvements in effectiveness and efficiency in managerial tasks were observed in terms of better project planning, scheduling, monitoring, and control. Improvements in productivity were also observed in terms of timelier decision-making and proper budgeting. Advantages obtained from project management information system use are not limited to individual performance but also include project performance.

It should also be noted that the systems must provide reliable and accurate information that will enable the project team to perform their tasks efficiently and effectively. It is not the complexity of the software that matters but the quality of the information generated by the system and the ability of the user to use the information to manage the project. This information helps the users/ project managers to perform their tasks in a much professional manner. One can therefore conclude that project management information system make a significant contribution to project performance and should continue to be the object of project management research.

5.5 Recommendations of the Study

It is recommended that:

1. The results of this research show that organizations should adopt the use of Project Management Information System in the management of their projects. This is because

they guarantee better management of project since it generates quality information needed for the effective and efficient management of the project.

2. The results of this research show that the use of a project management information system is advantageous to project managers (PMIS Users). This is due to the fact that improvements in effectiveness and efficiency in managerial tasks were observed in terms of better project planning, scheduling, monitoring, and control. Improvements in productivity were also observed in terms of timelier decision-making.

3. The system itself has no direct influence upon project performance; it is only through quality information, extensive use of the system, and individual impacts on the project manager that the system has an effect on project performance.

5.6 Suggested areas for further Research

Future studies of the influence of Project Management Information System towards project performance could:

1. Evaluate performance from the client's perspective, that is, evaluate if the impacts of the Project Management Information System on project outcomes provide an adequate solution to the client's problem, bring true advantages to the organization in terms of quality of product/services offered, greater output volume, quicker delivery, and provide tangible benefits such as increased sales and revenues.

2. Evaluate the effects of the use of Project Management Information Systems in decision making in a multi-project environment

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Appendix I

Letter of Transmittal of Data collection Instrument

Date: 28th July, 2014.

Diana Kerubo Ogero,

P O Box 78516 – 00507,

NAIROBI

Dear Sir/Madam

RE: REQUEST FOR PARTICIPATION IN A RESEARCH STUDY

I am a Postgraduate student at the University of Nairobi, pursuing a Master's degree in project Planning and Management. As partial fulfillment for the degree I am conducting a research study on "Influence of Project Management Information System on Project Performance in the Construction Industry: A Case of Construction Projects in Nairobi, Kenya."

Therefore I would appreciate if you could spare a few minutes of your time to answer the following questions in regard to how Project Management Information system (PMIS) influences project performance in your organization. All the information provided will be purely used for academic purposes and your identity will be treated with utmost confidentiality.

Your assistance will be highly appreciated and thank you in advance.

Yours faithfully,

Diana Ogero

Mobile Number: 0715148182.

Appendix II

Questionnaire

IMPORTANT NOTE:

Information provided through the questionnaire will be treated with confidentiality and will be exclusively for academic purpose. All answers will be considered right.

INSTRUCTION:

i. Do not write your name on the questionnaire.
ii. Please read each question carefully.
iii. Kindly answer all the questions by ticking or filling in the spaces provided.

SECTION ONE: BACKGROUND INFORMATION

1. Name of Institution : _____

2. Gender: Male ☐ Female ☐

3. Age: i)21- 30years ☐ ii) 31-40 years ☐ iii) 41 – 50years ☐

   iv) Over 51 years ☐

4. Position held in the Institution: _____

5. For how long have you held the position**:** _____

6. Which category of management are you representing? _____

   i) Senior Management ☐ ii) Project Manager ☐ iii) Functional Manager ☐

7. Level of Education

   i) Masters ☐ ii) Undergraduate ☐ iii) Diploma ☐

   iii) other please specify? _____

SECTION TWO: PROJECT MANAGEMENT INFORMATION SYSTEM IN USE AT THE ORGANISATION

Please mark with a Tick in the applicable box with regard to the current Project Management Information System used in your organization.

A. Project Management Information System Software

How would you rate the general performance of Project Management Information System in your organization in the following areas? Please Tick

	Very Low	**Low**	**Moderate**	**High**	**Very High**
	1	**2**	**3**	**4**	**5**
Accessibility					
Response Time					
Flexibility					
Ease of use					
Querying Ease					
Learning Ease					
System Integration					
Multi-project Capability					

B. Quality of Information

In your opinion, how would you rate the impact of the quality of information produced by Project Management Information System in project implementation? Please Tick

	Very Low	**Low**	**Moderate**	**High**	**Very High**
	1	**2**	**3**	**4**	**5**
Availability					
Relevance					
Reliability					
Precision					
Comprehensiveness					
Security					

C. The Project Management Information System Use

In your opinion, how often are the following functions within the Project Management Information System utilized in project implementation? Please Tick

Planning Function Tools	**Never**	**Rarely**	**Occasional**	**Often**	**Very Often**
	1	**2**	**3**	**4**	**5**
Work Breakdown Structure (WBS)					
Resource Allocation					
Overall Schedule					
Gantt Chart					
PERT					
CPM					
Controlling Function Tools	**Never**	**Rarely**	**Occasional**	**Often**	**Very Often**
	1	**2**	**3**	**4**	**5**
Fine-Tune Forecast					
Modify Tasks					
Reassign resources to low cost					
Cancel Tasks					
Modify cost of Resources					
Monitoring Function	**Never**	**Rarely**	**Occasional**	**Often**	**Very Often**
	1	**2**	**3**	**4**	**5**
Project Reports					
Completed tasks					
Percent Project Completed					
Effective Schedule					
Remaining Tasks					
Remaining days to complete					
Evaluating Function Tools	**Never**	**Rarely**	**Occasional**	**Often**	**Very Often**
	1	**2**	**3**	**4**	**5**
Identification of cost					
Identification of Schedule variation					
Tracking the use of Resources					

Reporting Function Tools	Never	Rarely	Occasional	Often	Very Often
	1	2	3	4	5
An Overview of project					
Overview on work-in-progress					
Budget overruns					
Task and schedule slippage					

D. Impact on Project Management

In your opinion, do you agree that the quality of information produced by Project Management Information System in use influences the Project performance in the following activities? Please Tick

	Completely Disagree	Rarely Disagree	Occasionally Agree	Often Agree	Completely Agree
	1	2	3	4	5
Improvement of productivity at work					
Increase in the quality of decisions					
Reduction of the time required for decision-making					
Reduction of the time required to complete a task					
Improved control of activity costs					
Better management of budgets					
Improved planning of activities					
Better monitoring of activities					
More efficient resource allocation					
Better monitoring of the project schedule					

E. Impact of PMIS on Project Performance

How would you rate the general project performance in the following areas? Please tick

	Very Low Contribution	**Low Contribution**	**Moderate Contribution**	**High Contribution**	**V. High Contribution**
	1	**2**	**3**	**4**	**5**
Meeting Deadlines					
Respecting Budgets					
Meeting quality specifications					

Thank you very much for your time and participation!!

Appendix III

Krejice and Morgan Table.

N	S	N	S	N	S
10	10	220	140	1,200	291
15	14	230	144	1,300	297
20	19	240	148	1,400	302
25	24	250	152	1,500	306
30	28	260	155	1,600	310
35	32	270	159	1,700	313
40	36	280	162	1,800	317
45	40	290	165	1,900	320
50	44	300	169	2,000	322
55	48	320	175	2,200	327
60	52	340	181	2,400	331
65	56	360	186	2,600	335
70	59	380	191	2,800	338
75	63	400	196	3,000	341
80	66	420	201	3,500	346
85	70	440	205	4,000	351
90	73	460	210	4,500	354
95	76	480	214	5,000	357
100	80	500	217	6,000	361
110	86	550	226	7,000	364
120	92	600	234	8,000	367
130	97	650	242	9,000	368
140	103	700	248	10,000	370
150	108	750	254	15,000	375
160	113	800	260	20,000	377
170	118	850	265	30,000	379
180	123	900	269	40,000	380
190	127	950	274	50,000	381
200	132	1,000	278	75,000	382
210	136	1,100	285	1,000,000	384

Note.—N is population size and S is sample size
Source: Krejcie, R.V., & Morgan, D.W., (1970)