

The Role of Project Management Information Systems towards the Success of a Project: The Case of Construction Projects in Nairobi Kenya

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DOI: 10.6007/IJARBSS/v3-i9/193 URL: <http://dx.doi.org/10.6007/IJARBSS/v3-i9/193>

Abstract

Organizations are continually been involved in projects as a competitive tactic to ensure that they remain relevant in their respective fields. To ensure the success of these projects organizations are investing in Project Management Information Systems (PMIS) to assist project managers and the project team in the management and undertaking of the project activities. This research seeks to find the contribution of these information systems towards project success. The quality of the software, the quality of information output, the influence of the PMIS user on the project success was tested. Purposive sampling was used and data measured on a likert scale. The research found out that the use of the software 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 success rate of the project. The three independent variables (quality of software, quality of information output and influence of the user) were transformed to get a single variable PMIS which had a strong and positive correlation (0.954) with the dependent variable (project success). It was therefore concluded that the use of PMIS helped in the achievement of the project success while respecting the projects constraints and meeting the project objectives.

Key Words

Project Management Information Systems (PMIS), Software, Information, User, Project Success

Introduction

The era of globalization and information age has led to the reduction of information illiteracy and the digital divide. This in turn has led to competitiveness in the businesses not only locally but also internationally. Increased competition has led organizations to change their tactics to ensure they retain their market share. Among this tactics is engaging in projects that are critical for the survival of the organization. These projects run across all industries including but not limited to construction, Information Technology (IT) and pharmaceutical.

The projects need to be planned, monitored, controlled, evaluated and staffed. The aspects of quality and risk management must also be incorporated in the management of projects. The commonality of all these projects is the aspect of management. For these organizations to be successful the projects must be managed well to achieve their objectives while considering the three major constraints of projects i.e. quality, budget and time.

According to Raymond et al., 2008, it is paramount for organizations to adequately manage their projects if they are to achieve their performance objectives. They further observe that project management remains highly a problematic endeavor since most projects are either not completed on time or exceed the budget. For instance the Athens Olympic Games Stadium exceeded its budget by 9 billion Euros while the Canadian Arms Registry was completed 10 years later (Ibid).

They continue to note that Gartner Research (an Information Technology Research and Advisory Company) estimates that 75% of IT projects managed with the support of Project Management Information Systems (PMIS) will succeed while 75% of those that don't have the support of PMIS will fail. Although the use of PMIS in the management of projects is not a guarantee that projects will be successful PMIS have become a necessity in the management of all projects whether small or large, public or private.

Use of PMIS has become necessary to effectively and efficiently manage projects while supporting the project team to meet the constraints associated with projects. Thus the purpose of this paper is to study the role of PMIS towards the success of projects a case of construction projects.

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. Due to their technical and complex nature even with good designs and plans it is of paramount importance that they are well managed if they are to be successful. 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. An interview with a ministry official exposed an ineffective mechanism of monitoring progress as well as poor information management. According to the ministry official, project documents were available, but there was no evidence of a system for tracking implementation of plans contained in the documents or even a repository of data relating to the projects in progress. For instance, the Thika Super highway project whose construction budget was initially Ksh27 billion but eventually consumed Ksh31 billion; an amount the Kenya National Highways Authority attributed to inflation and additional works on the road. The 50.4km project overshot its budget by Ksh4 billion due to inflation and additional features that changed the original design work. These additional works were either initially ignored or were not well planned to fit into the overall project plan without pushing the cost higher and increasing the time initially set. Another project was the construction of the Police Department houses under the Office of the President. It is one of the stalled projects that were earmarked for completion in the 2011/2012 financial year. The first

contract project was started on 1st December, 1997 and was mutually wound up in 1999. The 2nd contract commenced on 23rd January, 2006 and was due to be completed on 22nd January, 2008. Due to poor cost-time trade off by the contractor the contract was terminated on 8th October, 2008. This points out to poor or underutilization of information necessary for planning and for use during project implementation.

With the advent of computer software that facilitate the process of decision making, data retrievability (for better documentation), timeliness of information and general project planning. The use of PMIS can potentially improve documentation, better decision making based on accurate information from the database and helps in time and cost management (Kaiser and Ahlemann, 2010). This paper sought to explore how the use of PMIS can facilitate management of projects and in particular construction related projects with regard to information quality, effectiveness and efficiency of use of the information during the entire project phases to increase project success rate.

Objective

The objective of this paper was to investigate the contribution of PMIS towards the success of construction projects. The research intended to find out the role of each of the three components of PMIS (namely software, information and user) towards the success of construction projects.

Literature Review

IS are developed using IT to assist people in performing their tasks. PMIS are an example of these IS 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. What sets PMIS apart from other classes of IS 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). PMIS need to continuously match project requirements that originate from project-specific governance, complexity, strategic importance among other project requirements. Below is a conceptual framework showing the independent and dependent variable.

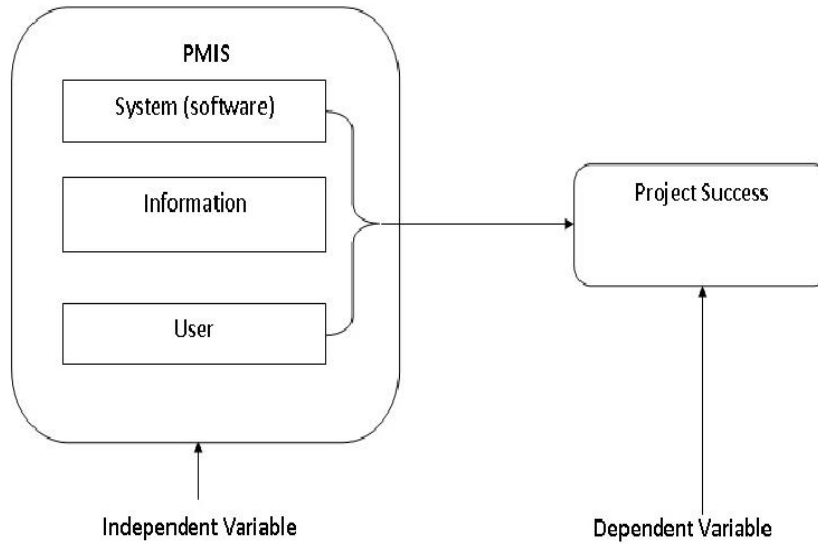


Figure 1: Conceptual Framework

PMIS can be defined as the tools and techniques used in the management of projects whether simple or complex. It can also be described as an electronic information system used to plan, schedule, control, report, communicate, forecast and handle cost for most aspects of a project. According to (Project Management Knowledge, 2010) PMIS are system tools and techniques used in project management to deliver information. Some PMIS tools include Micro-Soft Project, dotProject and Primavera. The major challenge of Project Management is to achieve all of the project goals and objectives while honoring the preconceived project constraints of time, budget, quality and scope as well as optimizing the allocation and integration of inputs needed to meet pre-defined objectives while mitigating any risks.

PMIS are important building blocks of efficient and effective project management and have considerably changed from been just scheduling applications to complex information systems that cover wide range of project processes while addressing multitude of stakeholders (Kaiser et al., 2010)

Ahleman (2009, cited in Caniels et al., 2011) notes that PMIS have become comprehensive systems that support the entire life cycle of projects, project programs and project portfolios. They can support project managers in their planning, organizing, control, reporting and decision making tasks while evaluating and reporting at the same time. (Raymond et al., 2008)

According to Elonen et al. (2003, cited in Caniels et al., 2011) inadequate balancing of scarce resources often results in additional pressure on the organization leading to poor quality of information and longer lead times of project. PMIS is considered advantageous to project managers because of the alleged contribution regarding timelier decision making and project success (Raymond et al., 2008).

Powerful PMIS have become a prerequisite in the management of projects more efficiently and effectively while aiding the project manager in decision making and communication of information among the project team and the stakeholders.

According to Raymond et al., (2008) a successful PMIS should have individual impact in terms of satisfied users and effective use of the system and organizational impact i.e. impact on project

success in terms of respecting the budget, schedule and specifications. Some factors that determine whether a project manager will use PMIS in the daily running of the projects include; the quality of information it will generate, the ability of the PMIS to provide them with the appropriate level of details in relation to their needs, ease of use of the information generated and easy to share it with the project team members.

It cannot be ignored that PMIS have become an important block towards the success of a project. Just like any other Information System (IS) or computer software PMIS has evolved tremendously to cater for more and more of the project's aspects. Initially they were just deployed as a scheduling application but with time they have been upgraded to cover most of the projects aspects like planning, controlling, evaluating just to mention a few of these aspects.

The use of PMIS is advantageous to project managers in that it improves effectiveness and efficiency of managerial tasks (planning, scheduling, monitoring and controlling) as well as the productivity in that decision making is timelier (Ibid).

Parks (2005, cited in Lee et al., 2011) argue that for efficient work performance among the project team members; PMIS supports three basic functions namely communication (PMIS delivers related knowledge and information promptly between members of the team via either external or internal networks), collaboration (PMIS supports an active cooperative management system among the members) and community (PMIS supports accumulation of related information and data through information sharing). Availability of high quality information in PMIS is essential since it assist the project manager to make sound and timely decision thus improving on his/her performance.

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 PMIS 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 PMIS scope enables organizations to not only manage individual projects but whole project portfolios. These PMIS 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.

The System qualities of any system refer to the non-functional requirements used to evaluate the system performance and when measuring the quality of a system the focus is on the performance characteristics of the system under study. According to Kim (2007, cited in Lee et al., 2011) system qualities of a PMIS includes convenience, simplicity, accuracy, reliability, speed, availability, stability, compatibility and accessibility of the system. PMIS should be flexible enough in order to meet the varying construction management responsibility as the scope of construction management varies from project to project (Jung et al., 2011). PMIS that have risk management tools (e.g. risk impact assessment, risk classification and risk ranking) have high quality since they support and ameliorate better decision making.

The quality of information 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 been made and consequently negatively affect the outcome of the project. PMIS 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 PMIS 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 PMIS is advantageous since it provides relevant and correct information that may be required in the day to day running of a project.

Research Methodology

A case study research design was used to help describe in details the contribution of PMIS towards the success of a construction project. The target population was project managers, construction managers and project supervisors working in several construction project management firms based in Nairobi, Kenya. Purposive sampling was used to select the sample from the population as it allowed the researcher study a certain cultural domain with knowledgeable experts within. Snow balling was also used. Questionnaires were used to collect data and were administered to a sample of 44 respondents. It contained both open ended and close ended questions. A likert scale was used where necessary. The questionnaires were sent via email and some hand delivered to the respondents.

To test the contribution of PMIS on the project success three factors associated with the PMIS were tested. These factors are quality of the software, quality of PMIS information output and the use of PMIS by the project/construction managers to perform project tasks.

The quality of the software was measured using eight characteristics: Response time (how long does it take to respond to a command), Ease of querying, Accessibility, Ease of learning, Integration with other system (like human resource management, financial management systems), Flexibility (withstand component failure), Ease of use (user friendly) and Security (does it protect your information from invasion & corruption). Each of the characteristic was measured on a five-point likert scale varying from 1 (very poor) to 5 (excellent).

The quality of information output was measured on the basis of four characteristics namely: Availability (at disposal when needed), Comprehensive (understandable), Relevance (appropriate to the matter at hand), Precision (accuracy/ correctness) and Reliability (sound and dependable). A 5-point likert scale was used to measure these characteristics with values varying from 1 (very poor) to 3 (excellent).

The use of PMIS was measured by determining how best the various tasks in a project were performed using their associated PMIS tools by the respondents. The associated tools were categorized as follows planning and scheduling function tools (used to prepare the overall project plan), monitoring function tools (used to assess project progress), resource management function tools (assist manager in managing the project's resources),

communication function tools (assist in passing information among the project’s stakeholders), reporting function tools (used to generate necessary reports for decision making among other things) and lastly evaluation function tools (they assist to audit the project). A score for each was obtained by measuring them on a 5-point likert scale that varied from 1 (very poor) to 3 (excellent).

Collected data was coded and analyzed using Statistical Packages for Social Sciences (SPSS).

Results and Discussion

Out of the 44 administered questionnaires 30 were received thus a 68% final response rate. The responses for the likert scale questions were transformed to get a single value for each of the characteristics. The general information on the respondents is shown in the table below.

Table 1: Respondents' General Information

Characteristics of the respondents (n=30)	Number of the sample
Gender	
Male	18
Female	12
Use of PMIS software	
Yes	30
No	0
Age (years)	
26 – 30	18
31 - 35	9
36 - 40	3
Level of Education	
Undergraduate degree	19
Masters degree	11
Duration of PMIS use (years)	
1-3	12
4-6	10
7-9	8
Computer skills	
Good	14
Very good	16

Quality of the software:

Several characteristics were used to determine the quality of software, the figure below depicts how each of the characteristics was rated on a likert scale. Most of the respondents felt that the software had an excellent response time (with a rating of 5) the rest of the characteristics were rated good (4) with an exception of security which was rated neutral (3). This meant that most of the respondents were not very confident with the ability of the PMIS to protect the information from any kind of invasion (corruption by viruses or by hackers). On average the quality of the software was rated good. This meant that the users felt that the software played

an important role in the performance of their tasks. 100% of the respondent felt that the software 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 software played an important role in generating the information to be used in management of the projects.

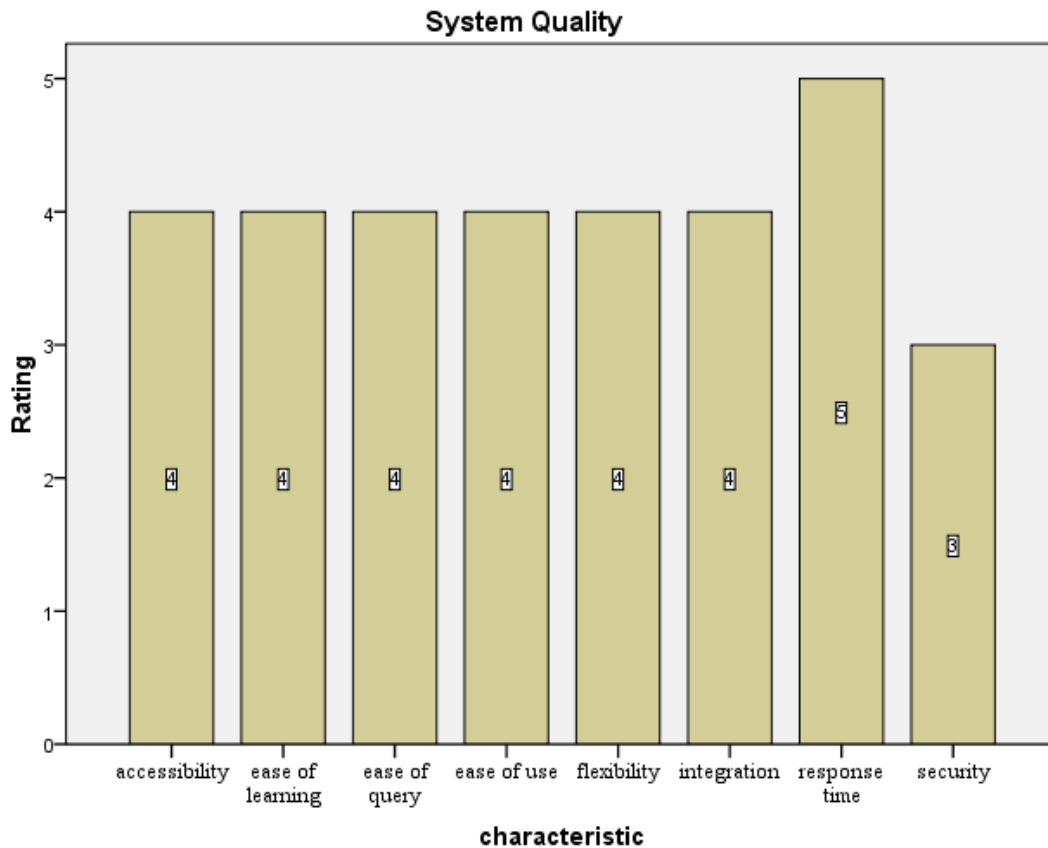


Figure 2: Software Characteristics

Quality of the Information:

The quality of generated information was measured using five items which were rate as either good or excellent of the likert scale. The availability and relevance of the information generated by the software were the characteristics that were rate excellent. This meant that the information was readily available and was also appropriate for the task at hand. The information output component was rated 4 i.e. good on the likert scale. 100% of the respondents felt that the quality of the information generated was good for the management of projects while 80% 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.

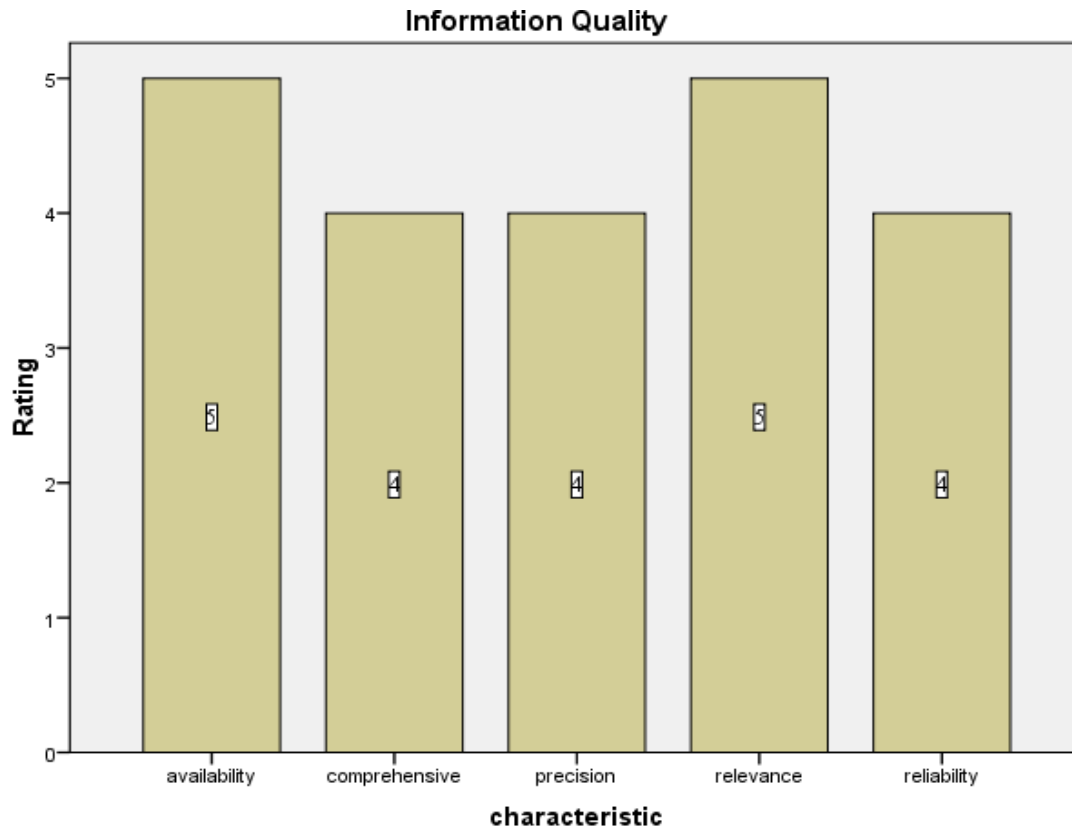


Figure 3: Information Characteristics

Influence of PMIS User on Project Success:

This component was measured by determining how well the project managers were able to perform various project tasks using the software and information generated by the software. The figure below shows how the users rated their performance of various tasks using the software. The performance of the tasks were rated as either good or excellent meaning that with the use of the software the project managers were able to perform their tasks in a much better way. All the respondents agreed that their task performance had improved with the use of the software. 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. The use of software had helped the managers improve on performance of their project tasks thus improving the probability of project success.

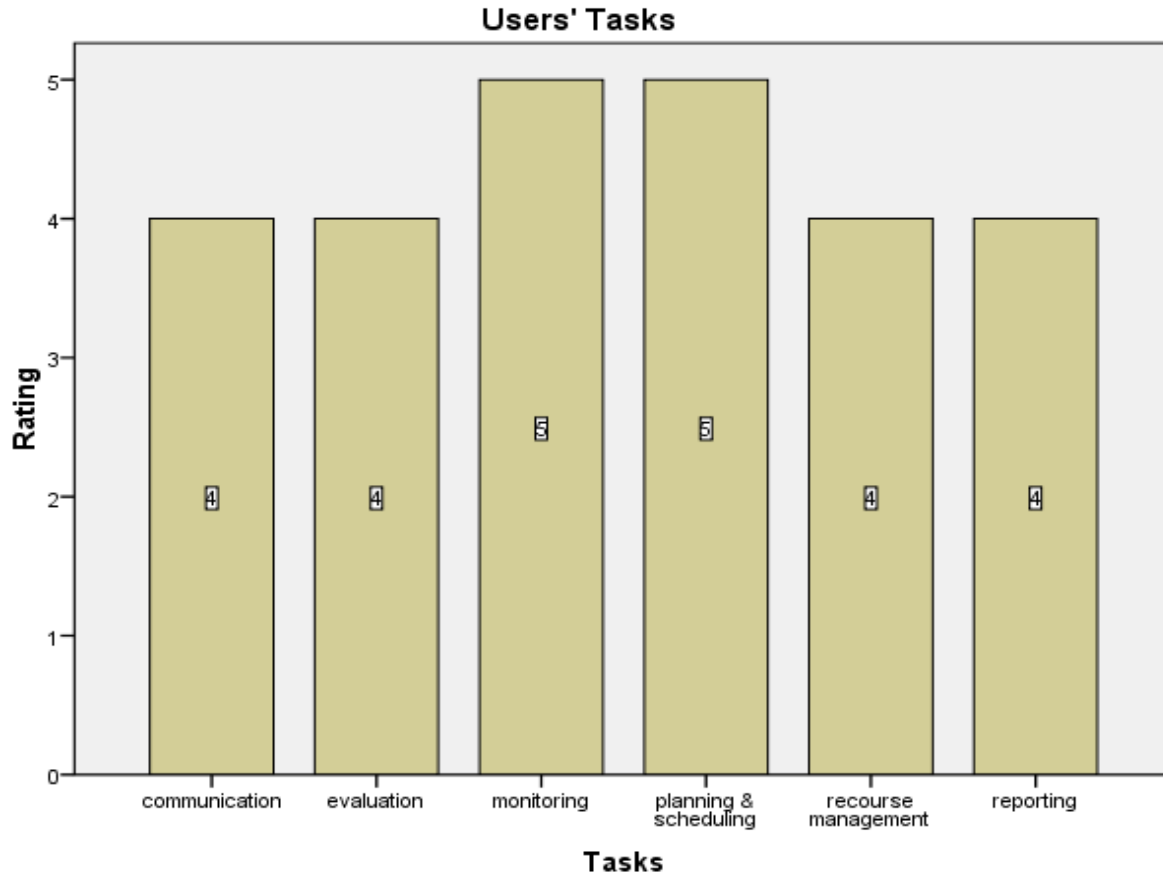


Figure 4: Project Managers' Tasks

Project success:

Project success was measured using the constraints of time, cost and quality. How well were the project mangers able to meet the time schedule and the project budget while meeting the quality i.e. totality of features. The use of PMIS helped project managers to achieve higher project success in terms of time, budget and quality with all been rated either good or excellent. Attainment of time was rated highest at 5(excellent) as per the figure below; this meant that they were able to adhere to the projects time schedule. It could be attributed to the fact that planning and scheduling task was rated excellent by the respondents. Due to the quality of information generated by the PMIS project managers are more productive in their work since the PMIS tools enhances their capacity to perform the various tasks.

Project performance improvement like staying within the project budget, timeline and quality specifications may be achieved through the use of the system by the user to perform project tasks.

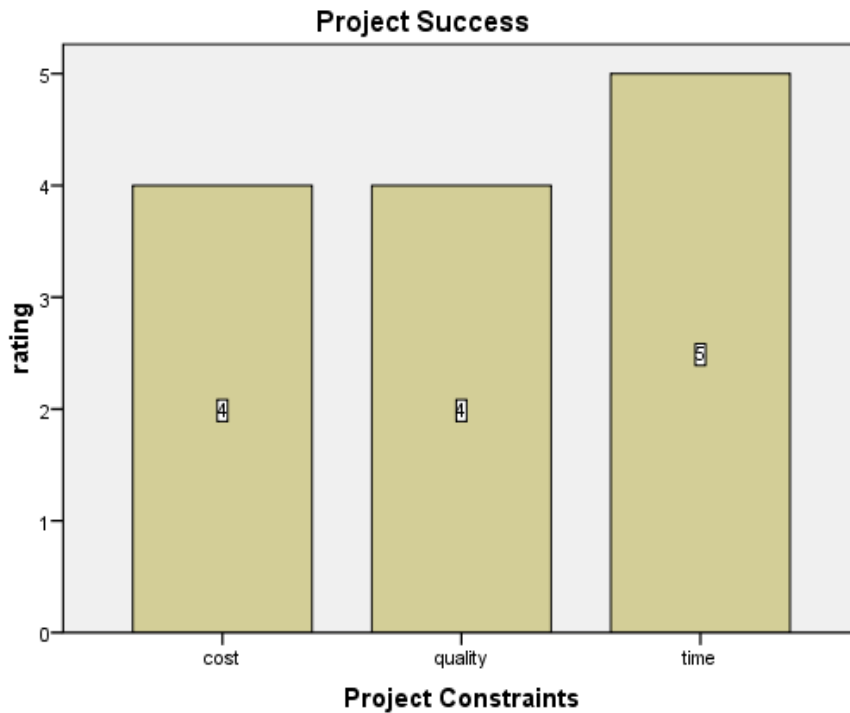


Figure 5: Project Constraints

Correlation of the independent and dependent variables:

The table below shows the correlation coefficient which described the strength and direction of the relationship between the independent and dependent variables. The independent variables had further been transformed to get a single variable (PMIS) whose correlation was also determined. At 0.954 the correlation between the PMIS and the project success was positive and strong.

Table 2: Correlation of the Variables

Correlations

		information	software use	PMIS	Project Success
information	Pearson Correlation	1	.831	.762	.944
	Sig. (2-tailed)		.000	.000	.000
software	Pearson Correlation	.831	1	.636	.913
	Sig. (2-tailed)	.000		.000	.000
use	Pearson Correlation	.762	.636	1	.873
	Sig. (2-tailed)	.000	.000		.000
PMIS	Pearson Correlation	.944	.913	.873	1
	Sig. (2-tailed)	.000	.000	.000	

Project	Pearson Correlation	.948	.853	.811	.954	1
Success	Sig. (2-tailed)	.000	.000	.000	.000	

Conclusion and recommendations

The software 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. When tasks are best performed project success is achieved.

It is recommended that organizations should adopt the use of PMIS in the management of their projects. PMIS guarantees better management of project since it generates quality information needed for the management of the project.

Acknowledgement

Prof. Henry M. Bwisa who made available all information, knowledge and time needed to carry out the research. For his consideration and help which has been invaluable to me in carrying out my research.

Am also indebted to all the construction managers who took time to provide data needed for this research

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